

CRANFIELD UNIVERSITY

Hamed Al Hashemi

Pathways to Diversification

Cranfield School of Management
International Executive Doctorate

DBA
Academic Year: 2012 - 2016

Supervisor: Professor Mark Jenkins
September 2016

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ABSTRACT

A fundamental research question in regional economic development, is why some regions are able to diversify into new products and industries, while others continue to face challenges in diversification? This doctorate research explores the different pathways to diversification. It follows the three-stage modular structure of DBA for Cranfield School of Management. This thesis consists of a systematic literature review, a single qualitative case study on UAE, and a research synthesis of published cases on Singapore, Norway and UAE. The linking document provides a summary of the three projects and consolidates findings and contributions into a path creation model that provides new understanding on the pathways to regional diversifications.

This research integrates existing theoretical foundations of evolutionary economic geography, institutional economic geography, path dependence, industry relatedness, economic complexity, and path creation into a unified conceptual path creation model. It generates propositions, builds a framework and develops a matrix for path creation that integrate context, actors, factors, mechanisms and outcomes shaping regional diversification. It finds that in the context of path dependence and existing conditions of a region, economic actors undertake strategic measures to influence the institutional capabilities to accumulate knowledge and trigger indigenous creation, anchoring, branching, and clustering diversification mechanisms to create complex varieties of related and unrelated diversification outcomes. The institutional collaboration capabilities are found to be instrumental in accumulating knowledge and determining the relatedness and complexity of diversification outcomes. This research further provides a set of integrated platform strategies to guide policy-makers on setting up the pathways to regional diversification.

Keywords:

Economic Diversification, Path Creation, Path Dependence, Related Variety, Unrelated Variety, Economic Complexity, Institutional Capabilities, Institutional Collaboration, Regional Development, Evolutionary Economic Geography, Institutional Economic Geography

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LIST OF ABBREVIATIONS

ABI/INFROM	Database Source for Articles through ProQuest
CSC	Committee for Singapore's Competitiveness
DBA	Doctorate of Business Administration
EBSCO	Database Source for Articles
ECI	Economic Complexity Index
EDB	Singapore's Economic Development Board
EEG	Evolutionary Economic Geography
ESC	Economic Strategies Committee in Singapore
GDP	Gross Domestic Product
GNP	Gross National Product
IE	Institutional Economics
IEG	Institutional Economic Geography
Jafza	Jabal Ali Free Zone
JTC	Jurong Township Corporation
LE	Learning Region
LPE	Large Private Enterprise
MNE	Multinational Enterprise
NEG	New Economic Geography
NIS	National Innovation System
NVivo 10	Software for Qualitative Data Analysis
OECD	The Organisation for Economic Co-operation and Development
SEZ	Special Economic Zone
SLR	Systematic Literature Review
SME	Small-Medium Sized Enterprise
SOE	State Owned Enterprise
SSP	Singapore Science Park
R&D	Research and Development
RIG	Regional Innovation System
RP	Restructuring Program
UAE	United Arab Emirates

1 PATHWAYS TO DIVERSIFICATION

1.1 Introduction

The growth of human civilisations has developed from producing plants and domesticating animals, to the production of garments, manufacturing and electronics where new products have emerged and evolved over time. Regions have pursued different pathways to navigate through the product space, continuously exploiting what is available and creating new products that previously did not exist. “As countries become more complex, they become more diversified; they add more products to the export mix, without really abandoning the products they started with” (Hausmann and Hidalgo, 2010). However, only advanced economies and a few developing countries have been able to transform their economic productive structure over the past four decades (Hidalgo, 2009).

A fundamental research question in regional economic development is why some countries have been able to diversify into new products and industries, while others continue to face challenges in diversification? “Little is known about why it is that some regional economies have become locked into development paths that lose dynamism, whilst other regional economies ... seem able to reinvent themselves through successive new paths of development” (Marin and Sunley, 2006).

The answer could rest on the new paradigm of evolutionary economic geography (EEG) (Martin and Sunley, 2006; Boschma and Frenken, 2011) as a foundation concept, where the emergence and evolution of industries and clusters are central to theorising the changes of regional economies. EEG is about “the uneven distribution of economic activity across space” (Boschma and Frenken, 2011:296) that results from specific contextual, spatial, and historical activities of a location, which in a sense provides a general theory of change within a specific context, space and time (Boschma and Frenken, 2011). However, the approach is challenging; as there is no clear analytical framework for developing theory around evolutionary economics (Dopfer and Potts,

2004:195) but rather various approaches and concepts around evolutionary economics (Martin and Sunley, 2006:396). The continuous change of the productive structure of regional economies and nations shape a phenomenon that is interwoven between evolutionary economic geography, institutional economic geography, and path dependence theories. This makes theorising the creation of new paths for growth and diversification a challenge, which may explain why the process of creating new pathways is weakly addressed in literature. Foster & Metcalfe (2012) argue that there is a need to “shift towards a fundamentally new ontology that recognises, explicitly, the dissipative nature of economic structure”.

This doctorate research explores the creation of pathways to diversification. It integrates existing theoretical foundations of evolutionary economic geography, institutional economic geography, path dependence, industry relatedness, economic complexity, and path creation into a unified conceptual path creation model. The aim is to interpret, define and construct path creation propositions, elements, framework and matrix that integrate context, actors, factors, mechanisms and outcomes shaping economic growth and diversification. This is to provide a better understanding of the pathways to diversification pursued by regions. Moreover, to provide a set of integrated platform strategies to guide policy makers on setting up the pathways to diversification.

This linking document provides a summary of the doctorate research. First, the research strategy and methodologies are highlighted. Second, summaries of findings of each of the research projects are presented. Third, concluding the discussions and propositions of the three research projects and framing contribution to knowledge. Fourth, conclusions and contributions to knowledge are stated.

1.2 Summary of Research Strategy & Design

This doctorate research follows the modular structure of DBA for Cranfield School of Management. The overall research questions and research design for this doctorate research are illustrated in Figure 1 and Figure 2 respectively.

This doctorate research consists of three research projects and a linking document.

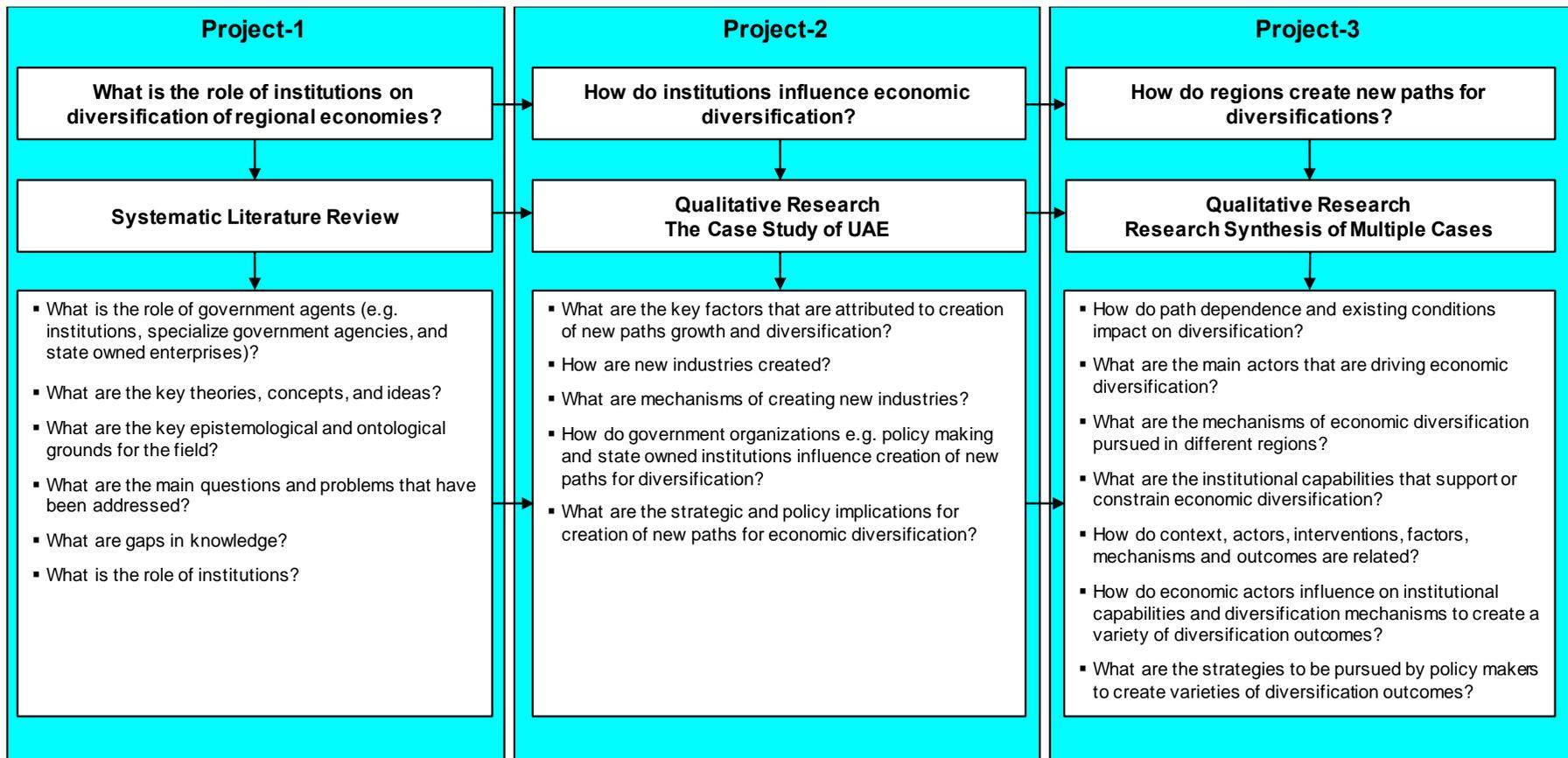


Figure 1: Linking Research Questions

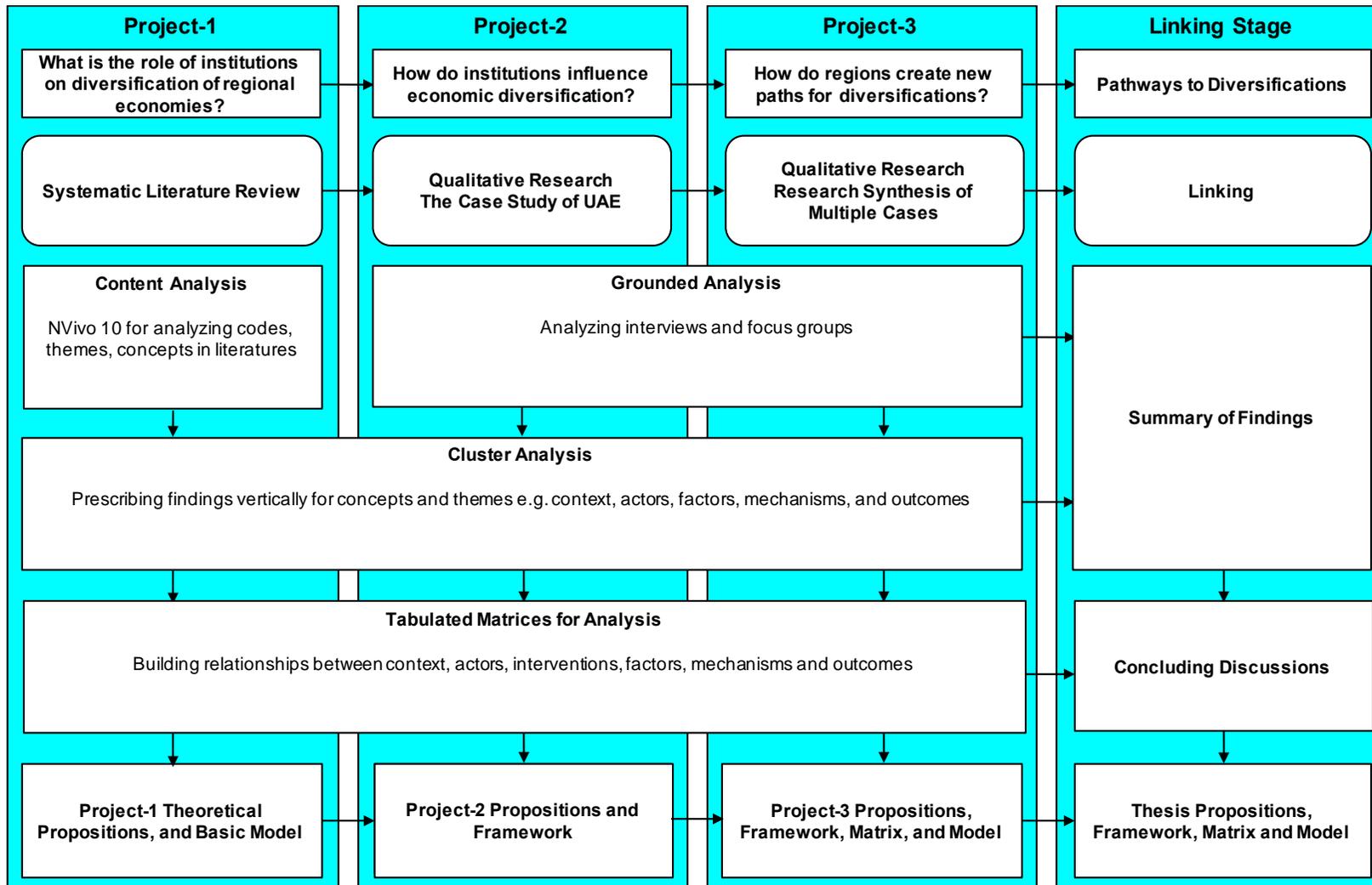


Figure 2: Summary of Research Methodologies and Data Analysis

First, the systematic literature review generates the preliminary theoretical propositions and elements for a basic path creation framework that shape the research questions for the second projects. Second, the single case study on UAE is a qualitative study that includes interviews, focus groups, strategies, and policies. It generates propositions, builds a framework and develops a matrix for path creation. These also frame the research questions for the final project. Third, the qualitative research is extended to explore three cases (Singapore, Norway and the UAE) through the research synthesis of published cases. It refines the previous propositions, framework, elements and matrix. This linking document summarises and consolidates propositions, elements, framework and matrix into a final path creation model.

The method of data analysis is intertwined through the three research stages. It includes grounded analysis, content analysis, cluster analysis, and tabulated matrices for analysis. The methodology and analysis for this doctorate, though it is initially based on the prior propositions of the systematic literature review, is iterative and exploratory and adds, refines, and rejects propositions as the research progresses through the three stages. These shape the path creation model, explaining pathways pursued by the various regions to create new paths for growth and diversification.

1.2.1 Methodologies

In this section, the systematic literature review, the qualitative research on single case and the qualitative research on multiple cases are summarised.

The systematic literature review (SLR) is an evidence-based and transparent, approach that focuses on a main research question to identify, appraise, select and synthesis relevant and quality literatures in a defined area (Tranfield et al., 2003). The aim of literature review is to survey existing literatures to identify the key theories, concepts, and ideas; what the key epistemological and ontological grounds are for the field, what are the main questions and problems that have been addressed; and gaps in knowledge that determine the research question for further research experiments (Hart, 1998; Tranfield et al., 2003). The SLR

surveys and identifies literatures through a systematic search methodology that include strategy, selection criteria, and evaluation quality criteria. It maps the field of study by breaking down into its constituent parts e.g. research dimensions of evolutionary economic geography, institutional economic geography, path dependency and knowledge base view; domain factors e.g. capability and knowledge; and economic agents of change e.g. institutions. It evaluates literatures: through Wallace and Wray (2011) methodology. It extracts main data such as citations, context, descriptive information, methodological information, main emerging themes, concepts and contribution. It synthesises across literatures by reframing, reconciling, and representing (Tranfield et al, 2003) emergence and evolution of regional economies i.e. products, industries and clusters; and framing the role of institutions on the transformation of underlying factors of diversification i.e. capability & knowledge, proximity, relatedness, and variety. The outcome of SLR is a set of preliminary propositions based on literature, the conceptualisation of phenomenon of interest and the construct of a basic preliminary model. Moreover, it generates the research questions for the case studies.

The single case study is a grounded analysis (Glaser, 1992 in Easterby-Smith, 2012; Gioia et al., 2012) on UAE that includes interviews, focus groups, case studies, and review of strategies and policies. The findings and synthesis of interviews and focus groups further support, refine and reject the previous propositions, and introduce new propositions. The outcomes are a set of propositions, framework and matrix to make sense of the emerging phenomenon of interest, and construct an initial conceptual framework (Gioia et al., 2012)

The final project is a continuation of the second stage, it is a grounded analysis, based on research synthesis of published cases. The systematic literature review (Tranfield et al. 2003) conducted for this doctorate research “provides a powerful method, but faces the challenge of synthesising review results” (Denyer et al., 2008). The “design propositions result from empirical work of individual, original research projects”, as this research has done for the case

study on the UAE “but these often offer only a single perspective” (Denyer et al., 2008). Denyer et al. (2008) propose a complementary approach to systematic review and single case studies by formulating propositions using the existing published research base through research synthesis. The use of the research synthesis approach is applied to this research mainly to construct the framework based on the elements, propositions, and concepts generated from the grounded analysis of published research cases.

1.2.2 Scope of the Research

The study of path dependence and path creation of regional development in existing literatures is normally bound to single industry or single industry region. The unit of analysis for this research is regional case studies. The investigation is multifaceted, it covers the systematic literature review, a rich case study of a single country i.e. Abu Dhabi-UAE, and research synthesis of published research on three selected cases - Singapore, Norway and the UAE.

The scope of the systematic literature is comprehensive as it surveys and maps theories, concepts, and ideas in existing literatures for the research field of interest. However, it “faces the challenge of synthesising review results” (Denyer et al., 2008). The use of tools such as NVivo-10, enables analysis of the articles along with content analysis, cluster analysis and tabulated matrices for analysis. The theories, themes, and concepts are structured in a way to make sense of the findings. The systematic literature survey, while it provides the theoretical foundation, preliminarily propositions and basic framework, it is not sufficient to theorise the creation of new paths for diversification without testing these empirically. Thus single case and multiple cases are pursued in Project 2 and Project 3 of the doctorate research.

The single case study of Abu Dhabi-UAE through semi-structured interviews offers a specific focus on how institutions influenced the economic development of a regional economy, characterized by high path dependence on natural resources. The main purpose is first to test the propositions of the systematic literature review then develop an initial conceptual framework that explains the creation of new paths for diversification. Taking into consideration the limitation

of single case study, in Project 3, multiple cases are pursued to test further the propositions and framework.

In Project 3, the selection of three cases represent the generic features of creating new paths for diversification regional development, or as George & Bennett (2005) in Jackobsen & Hovig (2014) highlight, “we selected typical cases that represent generic features of restructuring programmes from their respective phases of policy development”. A “typical case exemplifies what is considered to be a typical set of values, given some general understanding of a phenomenon” (Gerring 2007:91 in Jackobsen & Hovig, 2014). The information sources i.e. existing published research on the three cases are examined for key concepts and themes e.g. context, actors, mechanisms, and outcomes (Denyer et al., 2008). Moreover, “We intend to represent our cases, not as statistically defined types, but rather, as exhibiting characteristics typical of the phenomena under study” (Gerring 2007 in Jackobsen & Hovig, 2014).

Selection bias could be a pitfall for the selection of cases. Examples include a selection of cases that only support the theory being advanced, rejection of cases that appear to contradict, or only the selection of a typical or extreme case/s, from which erroneous inferences may be made (Jakobsen & Høvig, 2014). These selection biases could be avoided by “a preliminary study of potential cases” (George & Bennett, 2005 in Jackobsen, 2014). The selection of the three regions of this study is based on the commonality of the role of government directing economic growth and diversification, and similarity in being small sized countries. The similarity of Norway and UAE on sources of path dependence, while Singapore has a scarcity of natural resources. The descriptive statistics demonstrate varying degrees of diversification outcomes, and a variety of diversification mechanisms by each case. Moreover, the main economic players of government, SOEs, LPEs, MNEs, SEZs and SMEs in these three cases influence pathways to diversification differently.

1.2.3 Samples and Data Collection

In this section, samples and data collections in the three stages are described.

The SLR surveys existing literature of the field of interest. The search strategy comprises identification of main themes, key works, search strings, and subsequently articles across research theoretical dimensions of agglomeration economics, economic geography, evolutionary economics, institutional economic geography, and paths including clusters and industrial clusters. The databases selected for the system literature review are ABI/Proquest, EBSCO, and Web of Science. Additional sources included World Bank and OECD. The search strings (Table 11) are applied to the three selected databases, which generate a total of 6,537 articles Table 12. The inclusion, exclusion and rationale selection criteria of articles included scholarly journals, English language, relevant theoretical and literature domains, both theoretical and empirical research, and both qualitative and quantitative methodologies are considered Table 13. These articles are then subjected to the selection and quality criterions.

The selection process consists of three main steps. First, the articles resulting from the search strings amounting to 6,537 were subject to titles and abstracts review that generated 457 articles (Refer to Appendix A for samples of these articles). Second, these articles were processed through NVivo 10 for content analysis; outcome of content analysis is 225 articles as summarised in Appendix B (samples only) indicating key actors, factors and themes for each article. Third, articles are evaluated based on modified quality assessment criteria conducted on systematic literature reviews (Denyer et al., 2008) as illustrated in Table 14 resulted into 112 selected articles (Table 15).

In stage 2 of the research, the data collection is cognitively founded on the preliminarily conceptual framework that is shaped around the findings of the systematic literature review, in particular around the path creation framework. Although, there is an element of a prior selective process, i.e. elements of the path creation framework generated from existing literature propositions, hence, are anticipated to be the main themes for interviews and discussions; the data collection is exploratory, based on interviews and focus groups discussions; thus themes and codes emerge and evolve accordingly. The process of data

collection consists of three steps. First, a focus group was conducted that included a policy-maker executive, a policy advisor executive, an executive of a state owned enterprise and an executive of a special economic zone. Second, three focus groups, attended by 60 firms operating in three different special economic zones. Each focus group included a mix of firms operating in different zones. Third, 12 individual interviews were conducted of various policy-makers representing different government entities. The outcomes are refined and a new set of propositions and a path creation framework are generated. However, in order to generalise the findings, other cases are considered.

In the third stage of the doctorate research, the synthesis of published cases is applied to Singapore, Norway and UAE. The selection of the three countries of this study is based on commonality around coordinated market economies. In coordinated market economies “endeavours are coordinated strategically” where coordination is constructed through multiple institutions maintaining institutional arrangement to mediate national responses to enhance economic results (Hall and Thelen, 2009). This is in contrast to liberal market economies whereby “firms rely heavily on competitive markets to coordinate their endeavours” (Hall and Thelen, 2009).

The three selected countries coordinated successfully different pathways to diversification, and the descriptive statistics demonstrate varying degrees of diversification outcomes and business environment conditions [Refer to Table 28 to Table 32]. Moreover, Norway and UAE are natural resource based economies where oil and gas industries contributed 26% and 34% to their GDPs in 2013 respectively. While Singapore sets on the other side of the scale with scarcity on natural resources. Furthermore, the main economic players of government, SOEs, LPEs, MNEs, SEZs and SMEs in these three cases influenced the pathways to diversification differently.

The search strategy followed the same approach applied to SLR. The databases selected are ABI/ProQuest, EBSCO, and Web of Science. Additional sources used mainly included International Monetary Fund, World Bank, OECD (Organization for Economic Co-operation and Development)

cases from Harvard Business School. The search process included several steps: First, identified keywords and defined search strings that covers diversification to economy or regional development [refer to Table_Apx 1]. Second, searched for articles in the three data bases (ABI/ProQuest, EBSCO, and Web of Science). The search generated unduplicated articles amounting to 2091 for Singapore, 2639 for Norway and 792 for UAE. The total unduplicated articles for the three cases are 4919 [Refer to Table_Apx 2]. Third, the review of titles and abstracts generated only 38 articles relevant articles based on the selection criteria) and quality criteria similar to SLR quality criteria). Fourth, due to the limited number of articles, others sources are utilized i.e. International Monetary Fund, World Bank, OECD, and cases from Harvard Business Schools. Total articles cross referenced and generated from other sources is 86 articles. Finally, the process data extraction content analysis and synthesis findings are based on tabulated matrixes that captures main findings as discussed above in the method of data analysis.

1.2.4 Methods of Data Analyses

The method of data analysis for this doctorate research is of four types intertwined through the three research stages. It includes content analysis, grounded analysis, cluster analysis, and tabulated matrices for analysis (Figure 2).

The first project is based on the conductive content and cluster analysis (Miles & Huberman, 1994; Easterby-Smith et al., 2012) of selected literatures resulting from the systematic literature review. The content analysis of selected articles resulting from the review of titles and abstracts is conducted through Nvivo 10. It captures the complexity of qualitative data represented in the research articles. The key words, codes, themes and concepts emerge from the analysis that define the data structure (Figure 3) in a similar way to grounded analysis. Consequently, the structure of the research field is derived from the content of the research articles, without having a bias over the research subject (Hart, 1998:145; Easterby-Smith et al., 2012:166). The process for data extraction and synthesis included bibliographical information, content information, theoretical

information, type of research, methodology, main arguments, and contribution to knowledge. Moreover, the cluster analysis and tabulated matrices focus the task across concepts, themes and codes, in a sense reducing the data to a tabulated matrix that captures linkages and relationships.

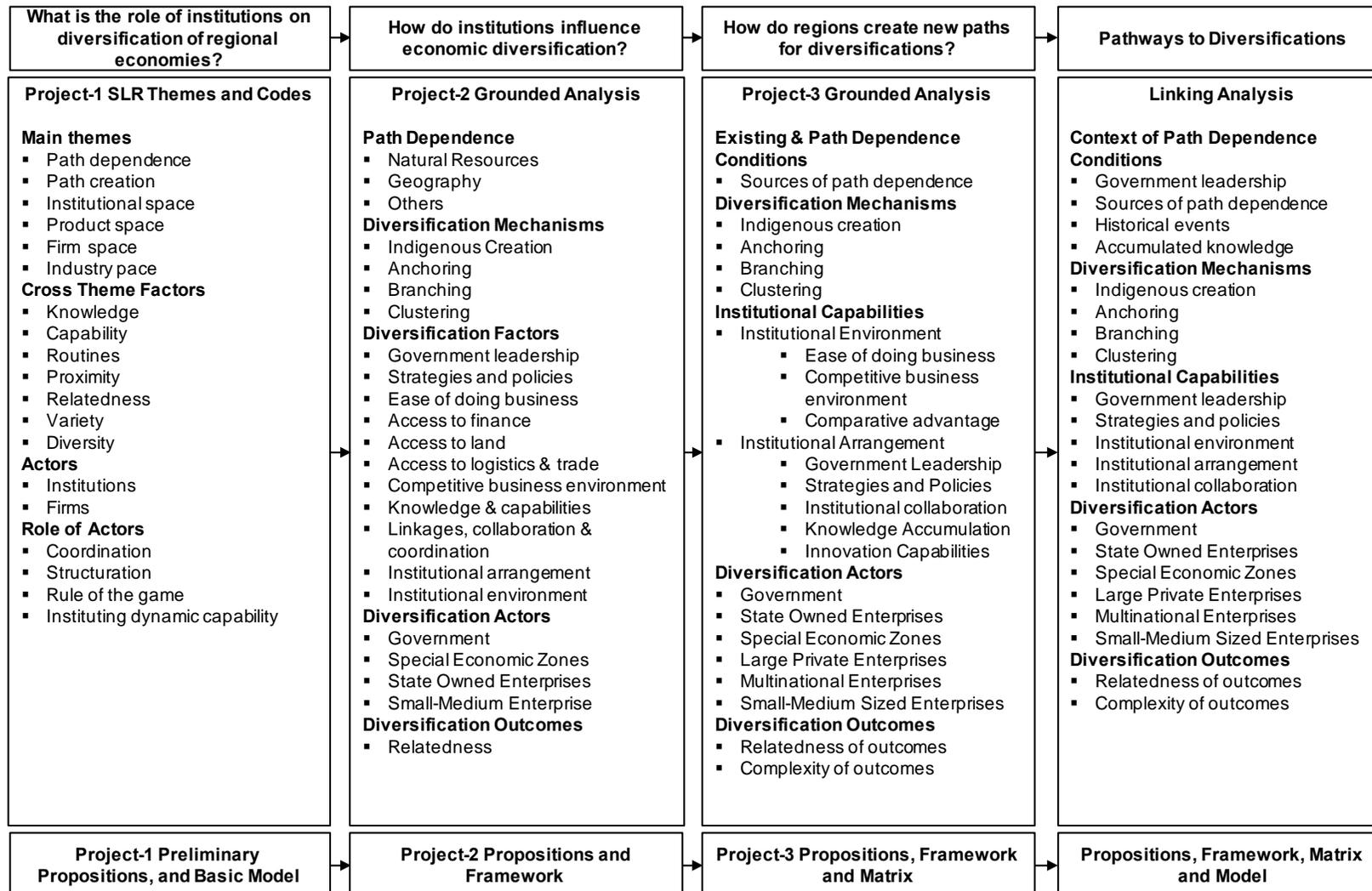


Figure 3: Data Structure of Research Projects

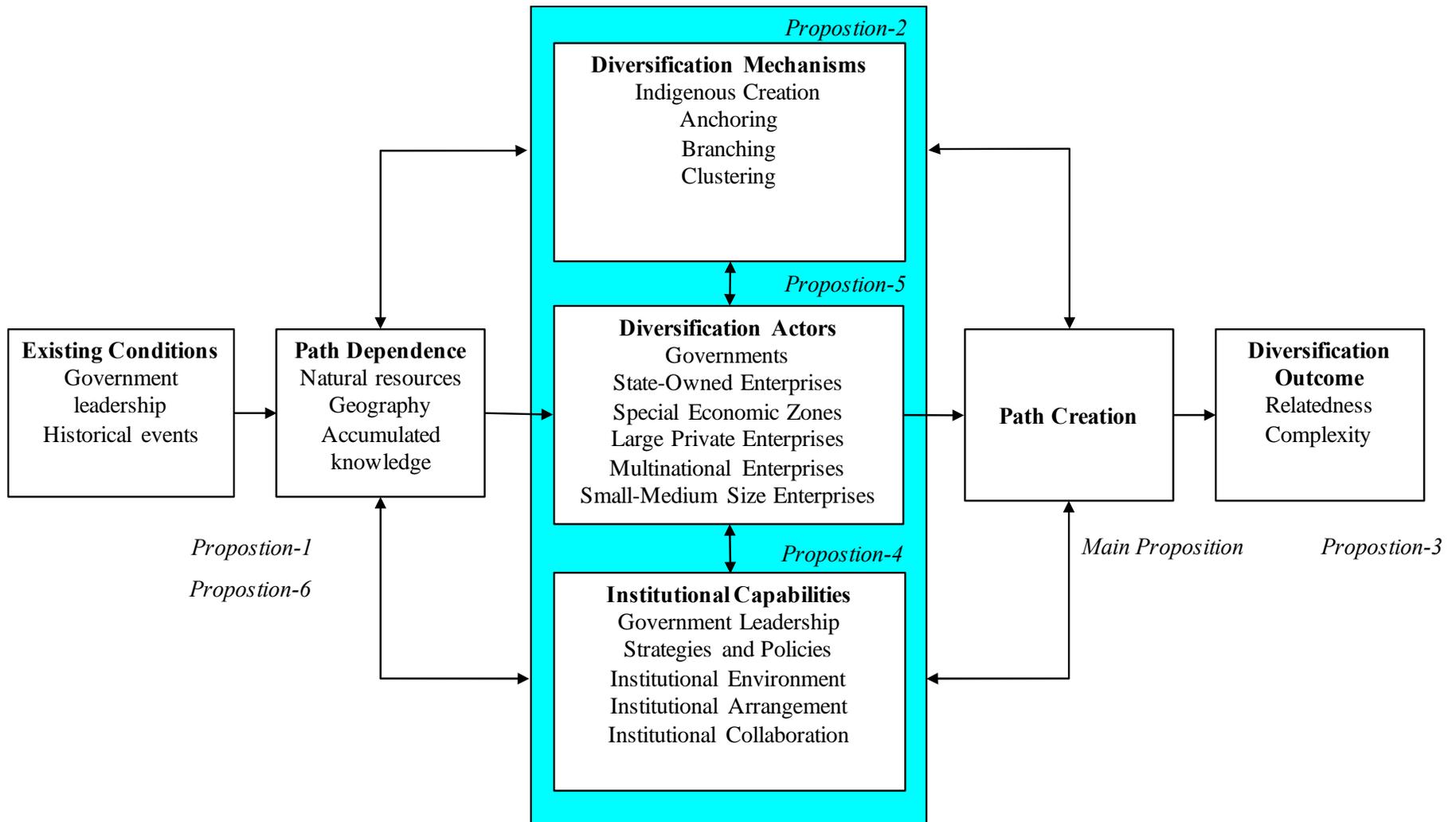


Figure 4: The Data Constructs of Path Creation Framework

In the second project, grounded analysis is applied to a single case study. The grounded analysis offers a more open and flexible approach, while theory emerges from data (Glaser, 1992 in Easterby-Smith, 2012). However, as suggested by Straus and Corbin (1990, 1998) some prescription and elaboration on sampling of the data maybe essential to systematically make sense of data.

The preliminary propositions of SLR (first project) provides the preliminarily codes, themes and concepts for grounded analysis. The source of the grounded data analysis is the interview and focus group transcripts, which are systematically analysed to refine preliminarily propositions and suggest new ones that are declared in findings and discussions (Easterby-Smith et al; 2012) on the single case study.

Moreover, grounded data analysis through the seven processes of Easterby-Smith et al. (2012) is applied to this research. It enables a practical approach to sift through volumes of non-standard data (Easterby-Smith, 2012). It commenced with the familiarisation and reflection of interview and focus group transcripts, which generated a loose set of clustered themes and codes (Miles and Huberman, 1994). These shaped the main data structure around themes of path dependence, diversification mechanisms, and diversification factors, and diversification actors (Figure 3). The results are presented in vertically clustered tabulation around the resulting data constructs (themes and codes) of the path creation framework (Figure 4), along with associated codes and statements. The conceptualisation and linking processes are established based on the tabulated matrix analysis (Figure 5) (Miles and Huberman, 1994). The tabulated matrices are pursued to build horizontal relationships amongst the elements of context, actors, factors, mechanisms, and outcomes for path creation (used in both projects 2 & 3 of the research i.e. single and multiple case studies). This linking process is the most crucial, as it is makes sense of the findings and frames the theory and contributions. The last process of re-evaluation is instrumental in validating findings, particularly through the discussion with the supervisor and research panel. For example, avoiding

forced linkages and propositions that are not strongly supported by interview data.

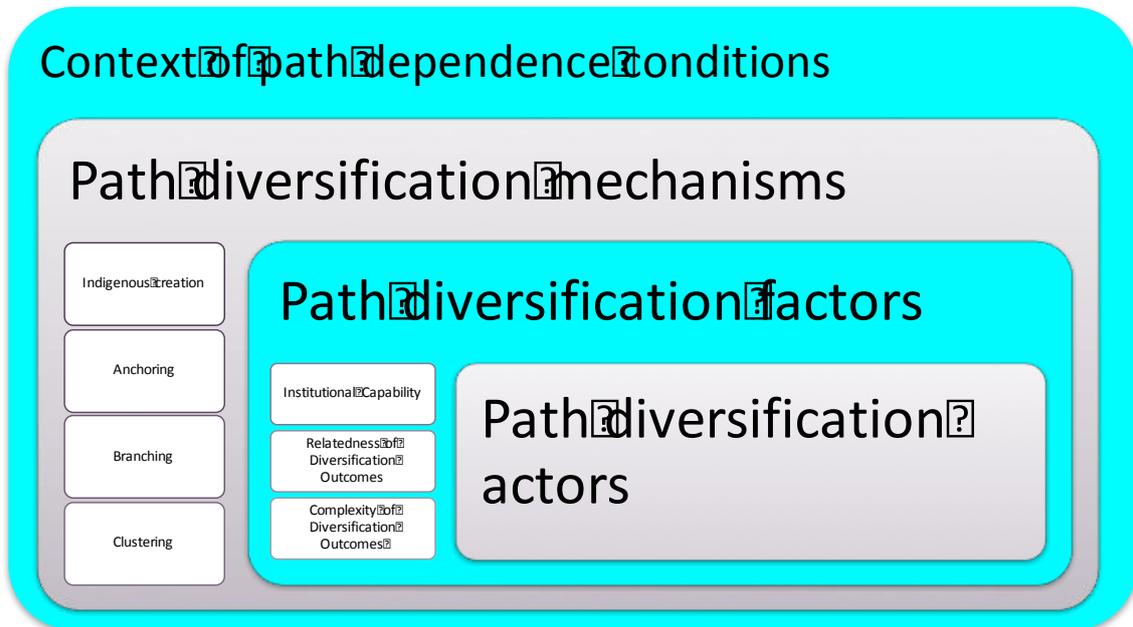


Figure 5: Tabulated Matrix Structure for Data Analysis

The third project is a continuation of the grounded analysis based on research synthesis of published cases. The constructs of the path creation framework (Figure 4) provide the codes, themes and concepts for grounded analysis in the third project. The propositions of Project 2 generate the research questions for the research synthesis. These propositions are tested, refined, rejected, and new propositions are introduced through “synthesising previously published research” (Denyer et al, 2008).

The analysis not only extends the use of research synthesis for developing propositions for regional development, but also further refines the construct a framework that explains the creation of new paths for regional growth and diversification. It builds an understanding of how previous findings work in various types of contexts. The cluster analysis and tabulated matrices are once again applied to information sources to synthesise knowledge and build interrelationships. The cluster analysis provides a declarative knowledge about the research field, which follows by acquiring a procedural knowledge about the relationships between concepts and themes generated from the information

sources that make up the knowledge of the research topic (Hart, 1998:145), i.e. the constructs of the path creation framework.

The tabulated matrix analysis (Miles and Huberman, 1994) is then applied around the constructs of a framework. The purpose is to interpret and explain the interrelationships among actors, mechanisms, factors, and outcomes in the path creation of new industries in several regions. The logic is as follows: in the 'context' of a region, the 'intervention(s)' undertaken by 'actors' to influence underlying 'factors' to trigger the 'mechanism(s)' to generate set of 'outcomes'. The overall objective is then not only research synthesis for developing propositions, but also to construct a framework and develop a model that explain the creation of new paths for regional growth and diversification.

In this linking stage of the doctorate research, a workable set of concepts, themes, codes are in hand to frame the overall data structure (Gioia et al., 2012). "The ultimate goal to build a vibrant inductive model that is grounded in the data, the resulting grounded theory model should be one that shows the dynamic relations among the emergent concepts that explain the phenomenon of interest, and one that makes clear all relevant data-to-theory connections. The key question is how to account for not only all the major emergent concepts, themes, and dimensions, but also for their dynamic interrelationships" (Gioia et al., 2012).

The findings and contributions represented by the propositions, elements, framework, and matrix, provide the constructs of the path creation model, hence, this research in "the theoretical realm" (Gioia et al., 2012) interpreting and conceptualising the creation of pathways to diversification, as well as establishing the interrelationships between context, actors, factors, mechanisms and outcomes. The logic is, "in the context of path dependence and existing conditions of a region, economic actors undertake measures to influence the institutional capabilities that trigger indigenous creation, anchoring, branching, and clustering diversification mechanisms, in order to create complex varieties of related and unrelated diversification outcomes".

Table 1: Summary of Research Findings & Contributions

	Project 1 Systematic Literature Review	Project 2 The Case of UAE	Project 3 Other Cases of Diversifications
Research Questions	What is the role of institutions on diversification of regional economies?	How do institutions influence economic diversification?	How do regions create new paths for diversification?
Findings	<ul style="list-style-type: none"> ▪ Evolutionary economic geography, new economic geography, and path dependence are related in literatures, while path creation is weakly connected to these through learning region and is not strongly connected to other fields of knowledge ▪ Moreover, path creation is not addressed sufficiently in existing literature, hence a research gap ▪ Firms and institutions sharing similar fields and factors e.g. knowledge and capability ▪ States (& government) are mainly associated with industry and policy, are linked to development, but are inadequately associated with 	<ul style="list-style-type: none"> ▪ Path dependence of Abu Dhabi economy on natural resources i.e. oil and gas dependency is a sticky phenomenon that not only impacts on creation of new paths for growth but also reinforces exiting conditions, as it offers comparative advantages ▪ However, related and unrelated new products and industries have emerged but economic complexity remains low ▪ Main mechanism of creation of paths for growth and diversifications is anchoring new industries through SOEs ▪ Main enabling and constraining factors for 	<ul style="list-style-type: none"> ▪ In the context of scarce path dependence resources, Singapore pursued concurrent anchoring and clustery by MNEs, while SOEs provided infrastructure and funding and supported by high business competitiveness environment and highly complex institutional collaboration, capabilities consequently creating complex unrelated varieties of products and industries ▪ In the context of high path dependence conditions (fishing and oil), Norway mainly adopted branching through LPEs supported by restructuring programmes resting on national and

	Project 1 Systematic Literature Review	Project 2 The Case of UAE	Project 3 Other Cases of Diversifications
	<p>growth, relatedness, variety & diversity in existing literatures; thus a research gap</p> <ul style="list-style-type: none"> ▪ The role of institutions rests around coordination, structuralising economic process, the role of games, and instrumenting dynamic capabilities 	<p>emergence and evolution of new industries are attributed to access to finance, access to land, and access to logistics and trade, awareness of investment and business opportunities, and innovation capacity</p> <ul style="list-style-type: none"> ▪ Linkages, collaboration, and coordination amongst SOEs, SEZs, and SMEs are weak, thus limiting branching new paths for diversification ▪ Various government and non-government economic agents foresee the government continuing coordinating economic development ▪ There is a need for an integrated platform to enable collaboration and coordination amongst SOEs, SEZs, and SMEs, whereby government either play an enabling or a coordinating role, which is key for future growth and diversification 	<p>regional innovation systems that created medium-range complexity of related varieties and unrelated varieties serving path dependence resources industries.</p> <ul style="list-style-type: none"> ▪ In the context of high path dependence conditions on oil and gas, the UAE mainly anchors through SOEs. While business competitiveness is high, the collaboration amongst economic players is weak, and national or regional innovation policies are not established, consequently creating related and unrelated varieties, but of less complexity compared to Singapore and Norway.

	Project 1 Systematic Literature Review	Project 2 The Case of UAE	Project 3 Other Cases of Diversifications
Contribution to Theory-Propositions	<ul style="list-style-type: none"> ▪ Proposition-1: Path dependence impacts on diversification. ▪ Proposition-2: New regional development paths are created on the basis of existing ones. ▪ Proposition-3: Relatedness determines path dependence in the diversification process of regional economy. ▪ Proposition-4: Institutions impact on the direction of the economic diversification process. 	<ul style="list-style-type: none"> ▪ Proposition-1: Path dependence impacts on diversification. ▪ Proposition-2: New paths for diversification are created through indigenous creation, anchoring, branching, and clustering path creation mechanisms undertaken by economic actors. ▪ Proposition-3: Degree of path dependence and level of relatedness underpin diversification mechanisms. ▪ Proposition-4: Degree of relatedness and complexity of institutional capabilities underpin diversification mechanisms. ▪ Proposition-5: Economic actors drive diversification mechanisms, and influence institutional capabilities to achieve desired diversification outcomes. 	<ul style="list-style-type: none"> ▪ Proposition 1: Context of path dependence and existing conditions underpins diversification mechanisms and impacts relatedness and complexity of diversification outcomes. ▪ Proposition 2: New paths for diversification are created through indigenous creation, anchoring, branching, and clustering path creation mechanisms that are associated with relatedness and complexity of diversification outcomes. ▪ Proposition 3: Relatedness and complexity shape diversification outcomes. ▪ Proposition 4: institutional capabilities underpin diversification mechanisms and determine relatedness and complexity of diversification outcomes. ▪ Proposition 5: Economic

	Project 1 Systematic Literature Review	Project 2 The Case of UAE	Project 3 Other Cases of Diversifications
		<ul style="list-style-type: none"> ▪ Project-2 Main Proposition “New paths for regional diversifications are created through indigenous creation, anchoring, branching, and clustering mechanisms. Economic actors are found to drive diversification mechanisms and influence institutional capabilities to achieve related and unrelated varieties of industries”. 	<p>actors drive diversification mechanisms depending on institutional capabilities to create complex varieties of related and unrelated diversification outcomes.</p> <ul style="list-style-type: none"> ▪ Project-3 Main Proposition: “In the context of path dependence and existing conditions of a region, economic actors undertake measures to influence the institutional capabilities that trigger indigenous creation, anchoring, branching, and clustering diversification mechanisms, in order to create complex varieties of related and unrelated diversification outcomes.”
Contribution to Theory-Framework	<ul style="list-style-type: none"> ▪ Basic model that includes enabling environment, constraining environment and factors 	<ul style="list-style-type: none"> ▪ It contributes to evolutionary economic geography and conceptualizes creation of new paths for growth and diversification through a set of 	<ul style="list-style-type: none"> ▪ It redefines path creation elements to include context of path dependence conditions, actors, institutional capabilities, mechanisms, and relatedness & complexity of

	Project 1 Systematic Literature Review	Project 2 The Case of UAE	Project 3 Other Cases of Diversifications
		<p>propositions.</p> <ul style="list-style-type: none"> ▪ It constructs an initial path creation framework composed of path dependence, actors, mechanisms, factors, and outcomes ▪ It integrates actors, mechanisms, relatedness and institutional capabilities into a path creation matrix shaping pathways to diversification. ▪ It provides government organisations with different set of strategies to influence policies for economic growth and diversification. 	<p>outcomes</p> <ul style="list-style-type: none"> ▪ It further develops a path creation framework composed of context of path dependence conditions, actors, institutional capabilities, strategies, mechanisms, and outcomes (relatedness and complexity) ▪ It redefines a path creation matrix where relatedness & complexity of diversification outcomes and institutional collaboration shape regional economies.
Contribution to Practice	<ul style="list-style-type: none"> ▪ Existing literatures calls for development of integrated platform policies for regional development 	<ul style="list-style-type: none"> ▪ It formulates an initial set of diversification strategies based on the initial path creation framework 	<ul style="list-style-type: none"> ▪ It suggests a set of integrated platform diversification strategies, based on pathways to diversification to be pursued by regions, taking into consideration elements of the path creation framework

1.3 Summary of Findings

In this section, the summaries of findings and contributions for each of the three stages of the doctorate research are presented. These are summarised in Table 1 and are outlined below.

1.3.1 Project-1 Systematic Literature Review

The SLR explores “the role of institutions on diversification of regional economies”.

Research Questions

The guiding research questions are as follows

- What is the role of government agents (e.g. policy making institutions, specialise government agencies, and state owned enterprises)?
- What are the key theories, concepts, themes, and ideas in existing literature?
- What are the ontological and epistemological grounds for the field of research?
- What are the existing propositions and factors that shape regional diversification?
- What is the role of institutions on diversification of regional economies?

Descriptive Findings

This section summarises the descriptive findings of systematic literature reviews, including selection of articles, characteristics of selected articles, and content analysis by themes, actors and factors.

The systematic literature review effectively is a process of mapping the field of research. As the research field being studied is diverse, representing different perspectives, the identification of relevant articles becomes a challenge. The author resorted to content analysis of selected articles from the review of titles and abstracts through Nvivo 10. The content analysis captures the complexity of qualitative data represented in the research articles. Key themes, concepts,

and codes emerge from the analysis, following the approach of grounded analysis, where the structure of the research field is derived from the content of the research articles (Easterby-Smith et al., 2012:166). This provides a structured overview of the topic without having a bias over the research subject (Hart, 1998:145). Moreover, acquiring a declarative knowledge of the research field that makes up the knowledge of the research topic (Hart, 1998) through cluster mapping of themes, concepts, and codes.

The results of the content analysis on frequency of key themes and codes are illustrated in (Table 18 to Table 20). These effectively represent concepts, actors, and factors addressed in the field of research. Firms, institutions, states and government are the main actors in literature, receiving roughly the same level of distribution by journals. Policy, knowledge, growth, relatedness, variety & diversity, and proximity are key factors referenced in literature. Evolutionary Economic Geography and Path Dependence are addressed equally in the literatures; however, Institutional Economic Geography and Path Creation have not received sufficient interest.

The cluster mapping analysis establishes linkages amongst concepts, actors and factors. It indicates four clusters, 1) Path Creation and Path Dependence, 2) Evolutionary Economic Geography (EEG) & Institutional Economic Geography (IEG), 3) New Economic Geography (NEG) & Institutional Economics (IE), 4) National Innovation Systems (NIS), Regional Innovation Systems (RIG) and Learning Regions (LR). However, these themes are coded or related differently, or factors related to these clusters differ. This research finds that EEG, NEG and Path Dependence are related in literature, while Path Creation is not strongly connected with other fields of knowledge, which is the focus of this research. Firms and institutions share similar words and coding, indicating that they fit into the same research field, particularly addressing knowledge, capability and routines, and are associated with growth, industry and policy. On the other hand, States (and government) are mainly associated with industry and policy and are linked to development, but are weakly

associated with growth, relatedness, variety & diversity; which are the focus of this research.

In summary, the systematic literature review demonstrates that institutions (States and Government), variety & diversity and path creation, are three elements of the research project that reside in different research fields that can be linked through routines, capability and knowledge. These are explored in this research.

Theoretical Findings

The main outcomes of systematic literature review are seven findings and four main propositions. First, economic regions are composed of different macro, meso, and micro factors and actors, and as a result new pathways result from the interplay between these factors and actors which make the system complex, thus demanding a network and heterodox economic approach to theorise regional economies. Therefore, neither neoclassical growth theory in a neutral space, institutions in a real space or a region, clustering or agglomeration of firms in a real space, or region or geography alone, can provide a sufficient explanation for regions undertaking different development trajectories and achieving varying degrees of economic growth.

Second, the evolution of space or region, comprising institutions, firms, products and industries can be reconciled in evolutionary economic geography thinking by viewing the emergence and evolution of institutions, firms, products and industries as a dynamic process. The coevolution of institutions, firms, products and industries create novelty over time, which is an essential conceptual framework to be studied to understand path dependence and path creation of regional economies. It provides a framework for analysing the mutual causal influences between systems, including factors and actors. The evolutionary economic geography, path dependence and path creation are promising foundational concepts to understand the evolution of regional economies.

Third, the existing structure of the economy acts as an underlying factor for future changes. In a sense, the current state of regional economies matters in

economic development (Hidalgo, 2009) because “at any point in time the state of the economy depends on the historical adjustment path taken to it” (Martin and Sunley, 2006: 400) for that “once a particular pattern of socio-economic development is established, it can become cumulative and characterised by a high degree of persistence or ‘path dependence” (Martin and Sunley 2003:27; Martin & Sunley 2006; Martin & Sunley 2008). Sources of path dependence include institutional arrangement, institutional environment, and factors such as accumulated capabilities & knowledge, variety and interrelatedness of products, services and industries. Hence, understanding the sources of path dependence, such as geographical location, natural resources, infrastructure, and existing capabilities in the economic structure is essential for shaping future growth and development.

“Path dependence impacts on diversification”

(Project-1 Proposition-1)

Fourth, “new regional development paths” are created on the basis of existing ones (Martin 2010) and pre-existing accumulated and embedded capability and knowledge in the variety of products generated by regional economies determine the development trajectories of regions. Therefore, related and unrelated products that are distanced from existing capabilities and knowledge will be difficult to produce, and it will also be difficult to attract new industries that are technologically unrelated to pre-existing industries.

“New regional development paths are created on the basis of existing ones”

(Project-1 Proposition-2)

Fifth, the creation of new capabilities and knowledge shaping new paths for development is a complex economic process undertaken by economic agents such as institutions and firms.

The concepts of “building blocks of economic complexity” (Hidalgo and Hausmann, 2009; Hidalgo, 2009); “related and unrelated variety” (Frenken et a,

2007; Boschma and Frenken, 2011); “industry relatedness” (Neffke and Henning, 2009; Neffke et al., 2011a; Neffke and Henning, 2014); and “differentiated knowledge base” (Ashiem and Coene, 2005; Ashiem et al., 2007); form building blocks on factors that impact branching process and path creation (Martin & Sunley, 2006; Frenken and Boschma, 2007; Martin, 2010; Neffke et al., 2011a). Moreover, the argument is that “new regional development paths” are created on the basis of existing ones (Martin 2010) through proposed conceptual mechanisms such as indigenous creation (emergence of new technologies and industries that did not exist before in a region), diversification, transplantation (the import of a new industry or technology from elsewhere, which then forms the basis of a new pathway of regional growth), and upgrading (revitalization of an industry through new technology, products and services) (Martin & Sunley 2006); provides a step foundation to theorise the mechanism of path creation.

Furthermore, Neffke et. al. (2011a) provide empirical evidence that “the rise and fall of industries is strongly conditioned by industrial relatedness”, whereas technological relatedness determines path dependences in the diversification process of regional economies. Therefore, new paths emerge in the context of existing capabilities, which can be “existing structures, and paths of technology, industry and institutional arrangements” (Martin, 2008:186). Regions branch into related and unrelated varieties or industries (Frenken et al., 2007) or related and unrelated knowledge and capabilities (Hausmann & Hidalgo, 2010). In a sense, the variety and interrelatedness of pre-existing capability, knowledge, products and industries in a regional economy determine the path creation mechanism and trajectories of regions. Therefore, it will also be difficult to attract new industries that are technologically unrelated to pre-existing industries.

“Relatedness determines path dependence in the diversification process of regional economies”

(Project-1 Proposition-3)

Sixth, the main argument laid out is the need to integrate institutions, firms, products, and industries into one unified framework to understand the emergence and evolution of regional economies; whereby capability, knowledge, proximity, relatedness, and variety are underlying factors for the creation of new paths for diversification and growth through the actions undertaken by economic agents. Moreover, the complexity of economic systems would require integrated “platform policies” (Cooke, 2007; Ashiem et al., 2011; Cooke, 2012) that take into consideration a variety of factors and actors that shape emergence and evolution of institutions, firms, products and industries.

Finally, while both firms and institutions are instrumental in shaping trajectories of regional economies, institutions could form the nucleolus of industrial clusters that consequently lead to spin-off of firms establishing a cluster (Wolf and Gertler, 2004). However, the role of institutions on establishing path dependence conditions and creating new paths of regional economies remains undercut in literatures. The main findings show that the role of institutions rests around coordination, structuralising economic process, the role of games, and instrumenting dynamic capabilities. Thus presenting an area of interest for future research agenda as they play a crucial role in the diversification and branching activities as

“Institutions impact on the direction of the economic diversification process”

(Project-1 Proposition-4)

The four propositions discussed above, form the construct of a guiding conceptual framework for path creation (Figure 6).

The initial conceptual path creation framework is constructed on the proposed path dependence model of local industrial evolution of Martin (2010) and path creation mechanisms (Martin & Sunely, 2006). It attempts to construct the mechanisms on how institutions influence development of a region, particularly the creation of new industrial paths for growth within a path dependence

constraining conditions, specifically natural based economies. Moreover, it provides the basis for conducting this doctorate qualitative research i.e. generating research questions for interviews and focus groups, and research synthesis for Projects 2&3.

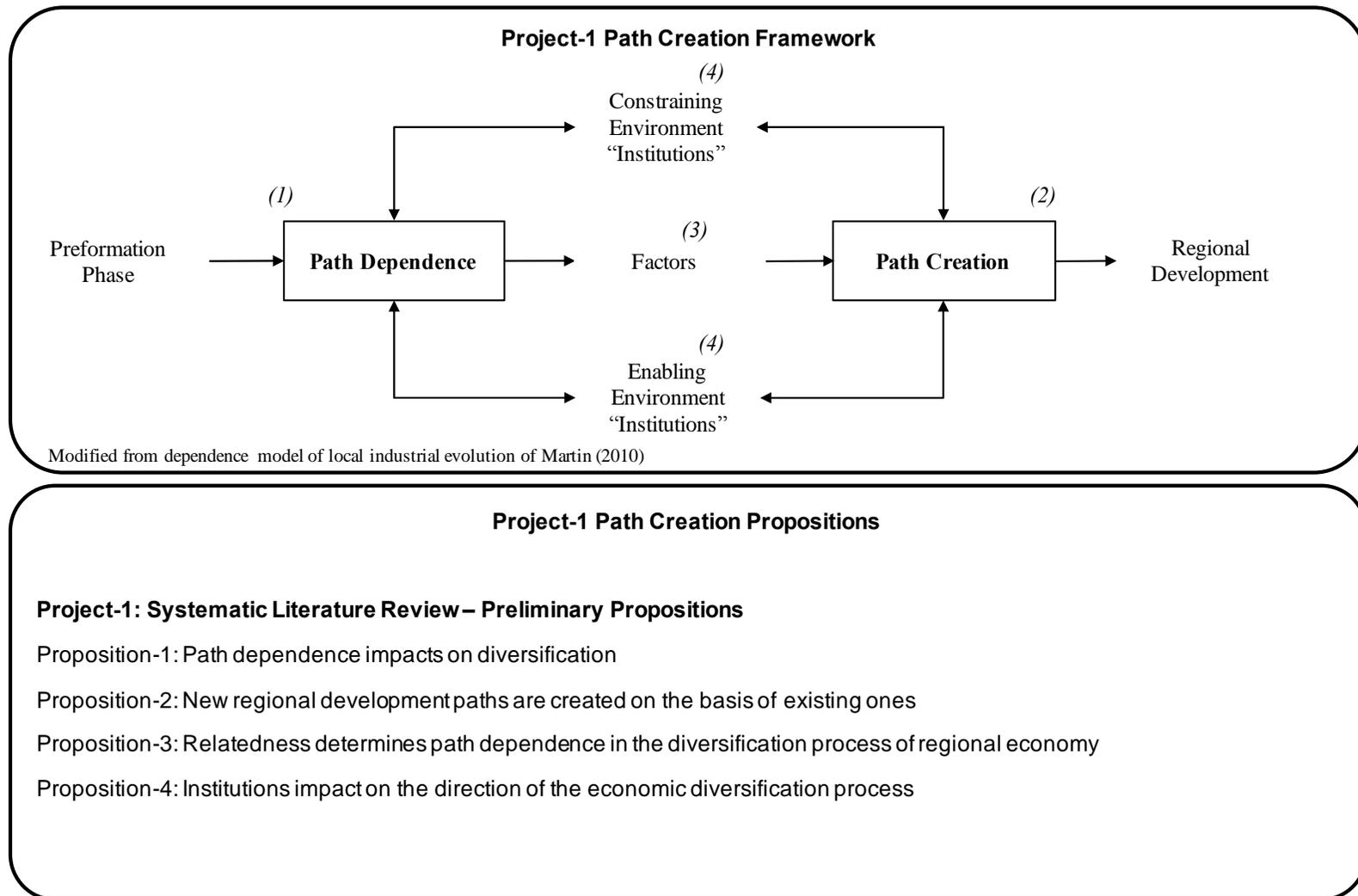


Figure 6: Project-1 Theoretical Propositions and Basic Framework

1.3.2 Project-2: Case of UAE

In this empirical case study of UAE, this research explores “how institutions influence economic diversification”

Research Questions

The propositions framework of SLR generates the following research questions for Project-2

- What are the key factors that are attributed to the creation of new paths for growth and diversification?
- How new industries are created?
- What are the mechanisms to create new industries?
- How do government organisations e.g. policy making and state owned institutions influence the creation of new paths for diversification?
- What are the strategic and policy implications for the creation of new paths for economic diversification?

Summary of Findings

The main results of the qualitative research consist of eleven findings, five propositions, one main overarching proposition, a path creation framework and a path creation matrix (Figure 7) and a set of strategies pursued by government institutions to influence economic diversification Table 27.

First, the dependence of the Abu Dhabi economy on natural resources i.e. oil and gas dependency is a sticky phenomenon that not only impacts on the creation of new paths for growth and development, but also reinforces path dependency on natural resources as it generates comparative advantage for the region.

Second, services and industries that are related and unrelated to oil and gas have emerged over the past four decades; however, products and industries have not evolved into a higher level of sophistication and complexity beyond basic products generated from natural resources.

Third, the main mechanism of creation of paths for growth and diversification is anchoring new industries through direct government investment.

Fourth, SOEs are the dominant active players in the economy, to anchor industries that are both related and unrelated to the energy industry. In a way the government performed an entrepreneurial role by creating and investing in SOEs.

Fifth, the main enabling and constraining factors behind the emergence and evolution of new industries are attributed to; access to finance, land, logistics and trade, awareness of investment and business opportunities, and innovation capacity.

Sixth, the government over the past decade has evolved into a competitive state, playing an essential role towards setting the strategic direction for economic growth and diversification, and in improving competitiveness of the economy.

Seventh, moreover the government established SEZs to circumvent some of the constraints for economic growth aiming to enable growth of SMEs and attract foreign direct investment; however, SEZs have not evolved beyond leasing industrial lands to local and foreign investors.

Eighth, linkages, collaboration, and coordination amongst SOEs, SEZs, and SMEs are weak, thus limiting new paths for diversification.

Ninth, consequently SMEs have not grown to a significant scale and sophistication to have a significant impact on economic growth and diversification.

Tenth, the government has performed an entrepreneurial role during the first three decades of economic growth and diversification in the UAE, which has evolved into a competitive state in the past decade and improved the business environment. However, the future rests on moving towards an innovative state that enables transforming the economy into advanced technological frontiers

where related and unrelated variety of complex products and industries will emerge and evolve over time.

Eleventh, the main strategic and policy implication resulted from the qualitative research is that various government and non-government economic agents foresee the government to continue coordinating economic development. In a sense, an integrated platform that enables collaboration and coordination amongst SOEs, SEZs, and SMEs, whereby governments either play an enabling or a coordinating role which will allow for future growth and diversification.

In conclusion, the overall proposition is that new paths for diversifications are actuated by path creation mechanisms, which are conditioned by sources of path dependence and institutional arrangement and environmental factors, and are propelled by economic actors determining the nature of economic diversification.

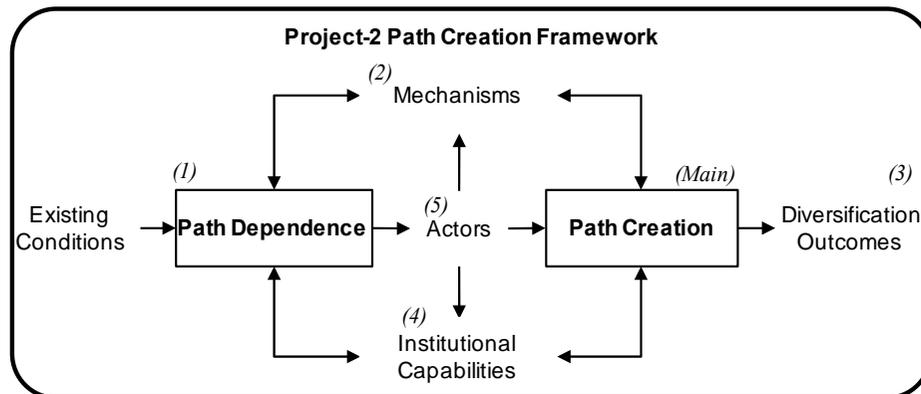
Project-2: Initial Path Creation Propositions

The initial propositions and initial path creation framework are built around the path dependence model of local industrial evolution of Martin (2010), path creation mechanisms (Martin & Sunley, 2006), stages of regional development (Fredin, 2014), “building blocks of economic complexity” (Hidalgo and Hausmann, 2009; Hidalgo, 2009); “related and unrelated variety” (Frenken et al., 2007; Boschma and Frenken, 2011); “industry relatedness” (Neffke and Henning, 2009; Neffke et al., 2011a; Neffke and Henning, 2014); and “differentiated knowledge base” (Ashiem and Coene, 2005; Ashiem, 2007); that impact branching process and path creation (Martin & Sunley, 2006; Frenken and Boschma, 2007; Martin, 2010; Neffke et al., 2011a). The main overarching proposition generated from empirical single case study is that

“New paths for regional diversifications are created through indigenous creation, anchoring, branching, and clustering mechanisms. Economic actors are found to drive diversification mechanisms and influence

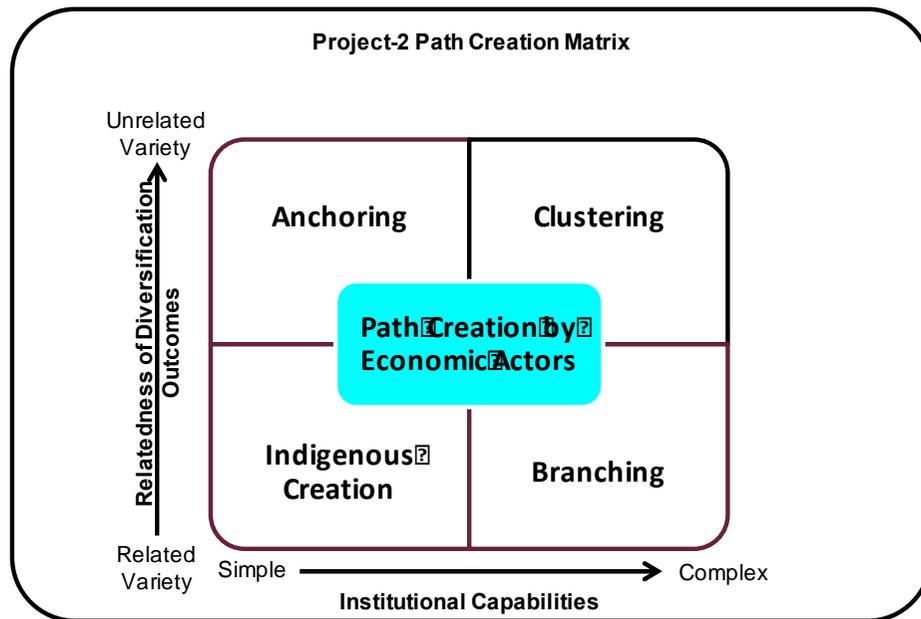
institutional capabilities to achieve related and unrelated varieties of industries”

(Project-2 Main Proposition)



Project-2 Main Path Creation Proposition

“New paths for regional diversifications are created through indigenous creation, anchoring, branching, and clustering mechanisms. Economic actors are found to drive diversification mechanisms and influence institutional capabilities to achieve related and unrelated varieties of industries.”



Project-2 Path Creation Propositions

Proposition-1: Path dependence impacts on diversification.

Proposition-2: New paths for diversification are created through indigenous creation, anchoring, branching, and clustering path creation mechanisms undertaken by economic actors.

Proposition-3: Degree of path dependence and level of relatedness underpin diversification mechanisms.

Proposition-4: Degree of relatedness and complexity of institutional capabilities underpin diversification mechanisms.

Proposition-5: Economic actors drive diversification mechanisms, and influence institutional capabilities to achieve desired diversification outcomes.

Figure 7: Project-2 Path Creation Propositions, Framework and Matrix

This research supports the position of existing literature, that path dependence is significant for regional development, as the existing structure of the economy acts as underlying factor for future changes. Sources of path dependence include natural resources, geography, infrastructure, institutions, accumulated capabilities & knowledge and a variety and interrelatedness of products, services and industries. Hence, understanding sources of path dependence, such as geographical location, natural resources, infrastructure, and existing capabilities in the economic structure is essential for shaping future growth and development. Martin and Sunley (2006: 402) defines path dependence as “a probabilistic and contingent process, in which at each moment of historical time, the suite of possible future evolutionary trajectories (paths) of a technology; institution, firm or industry is conditioned by (its contingent on) both the past and the current states of the system in question”. The current state of regional economies is significant to economic development (Hidalgo, 2009) because “at any point in time, the state of the economy depends on the historical adjustment to the path taken” (Martin and Sunley, 2006: 400) and that “once a particular pattern of socio-economic development is established, it can become cumulative and characterised by a high degree of persistence or ‘path dependence’” (Martin and Sunley 2003:27; Martin & Sunley 2006; Martin & Sunley 2008). Thus, the local context, in particular the institutional capabilities and the “mechanisms, agents and conditions underpinning the geographies of path creation, should remain at the top of the agenda for research in this field” (Sydow, Lerch, and Staber 2010, 190 in Dawley, 2013). The first proposition generated from the systematic literature is confirmed as follows

“Path dependence impacts on diversification”

(Project-2 Proposition-1)

Path dependence matters for regional diversification, however regions evolve over time, they do not abandon products that are path dependent on their natural resources, but add products that are related or unrelated to their

economies. Countries follow different paths to transform their economic structure, moving from simple to complex and diversified products. However, only advanced economies and a few developing countries were able to transform their economic productive structure over the past four decades (Hidalgo, 2009). The “question of how new regional growth paths emerge has repeatedly been raised by leading economic geographers...as one of the most intriguing and challenging issues in our field” (Neffke, Henning, and Boschma 2011:241 in Dawley, 2013). It would appear that researchers still have “little understanding of how regions diversify into new growth paths, and to what extent public policy may affect this process” (Asheim, Boschma, and Cooke, 2011, 894; Dawley, 2013). This research contributes to existing knowledge in different ways. It constructs a path creation framework that explains not only the diversification mechanisms but also establishes the relationships between actors, factors, mechanisms, and diversification outcomes. The second proposition is revised to read as follows

“New paths for diversification are created through indigenous creation, anchoring, branching, and clustering path creation mechanisms undertaken by economic actors”

(Project-2 Proposition-2)

The creation of indigenous industries based on natural endowments and natural resources is the foundation for economic development. However, “as countries become more complex, they become more diversified; they add more products to the export mix, without really abandoning the products they started with” (Hausmann and Hidalgo, 2010). In a way, countries add new products and industries that are either related or unrelated to existing economic structure.

In existing literature, the argument is that regional development is “a branching process where related activities spin out existing activities” (Frenken and Boschma, 2007; Boschma and Frenken, 2011), “new regional development paths” are created on the basis of existing ones (Martin 2010), and “the rise and fall of industries is strongly conditioned by industrial relatedness” Neffke et. al.

(2011a). Hidalgo et al. (2007) show that countries diversify their export portfolios according to such a branching mechanism. Neffke et al. (2011) show that a similar mechanism is at work in the long-term development of Swedish regions. The same line of reasoning has been replicated for regions in Spain (Boschma et al., 2013) and the United States (Essletzbichler, 2015; Neffke et al., 2014). The underlying assumption of this argument is “regions grow through related diversification for similar reasons that firms do ... regions host resources that expand with their use and are valuable, rare, specific to the existing set of economic activities and hard to access from outside the region (Neffke et al., 2014). In summary, “regional diversification will predominantly be related to diversification” (Neffke et al., 2014), regions branch into related varieties or industries (Frenken et al., 2007) or related capabilities (Hausmann & Hidalgo, 2010). Therefore, new paths emerge in the context of existing path dependence conditions and accumulated capabilities, which can be “existing structures, and paths of technology, industry and institutional arrangements” (Martin, 2008:186). Therefore, the third proposition is revised to read

“Degree of path dependence and level of relatedness underpin diversification mechanisms”

(Project-2 Proposition-3)

Consequently, it will also be difficult to attract and create new industries that are technologically unrelated to pre-existing industries. This argument is however conceptualised around an endogenous, self-reinforcing process, resulting from the presence of research organisations and scientists, innovative firms operating in related industries, combinatorial knowledge dynamics, an excellent endowment with supporting institutions, continuous branching activities, a vibrant entrepreneurial culture and regional knowledge spillovers (Isaken & Trippel, 2014). There are however other mechanisms for regional development and diversification. Some countries have been able to transform their economic structure towards unrelated and complex products and industries, achieving a structural change (Neffke et al., 2014) within the context of path dependence conditions through anchoring and clustering mechanisms.

Clustering is one form of development that has been founded around the dominant “new industrial district” (Marshallian or Italianate form) in literature that is attributed to “the role of small, innovative firms embedded within a regionally cooperative system of industrial governance, which enables them to adapt and flourish despite globalizing tendencies” (Markusen, 1996). Markusen (1996) further identified three additional types of industrial districts i.e. hub-and-spoke industrial district formed around an external oriented firm, a satellite platform composed of several unconnected plants embedded in external organisational links, and state-anchored district centred around one or more public sector-institutions. The argument of Markusen (1996) is that the role of large firms and state institutions is significant to shape the development of industrial districts. These forms of development models positioned economic actors to provide the necessary environment for smaller firms to enter and grow. Extending this argument further, many countries have been able to jump-start new industries that are unrelated to existing economic structure through exogenous factors such as anchoring new firms or industries. Therefore, “we need to complement existing approaches by a theoretical framework that takes into consideration exogenous sources of new industrial development, as well as proactive actions taken by key agents, including policy actors across multiple scales to overcome barriers that hamper regional economic development in the periphery” (Isaken & Tripplb, 2014b) or in path dependence conditions on natural endowments & resources, or are distanced from technological frontiers. The creation of new unrelated and complex varieties however “requires a transformation of the local resource base” (Neffke et al., 2014), these are undertaken by key economic actors.

The qualitative case study of the UAE illustrates that economic growth and diversification has evolved over through time through four main mechanisms. First, the indigenous creation of industries such as pearls, fishing, and oil. Second, the anchoring of new industries such as aerospace, military and semiconductor that did not exist earlier, mainly through State Owned Enterprises (SOEs). Third, the branching of related industries such as polymers, aluminium and steel undertaken by both private firms and SOEs. The

clustering of related industries through Special Economic Zones (SEZs). These four diversification mechanisms refine the propositions of Martin and Sunley (2006) and Fredin (2014) and introduce the economic actors as a driving force for the diversification mechanisms. The new fifth proposition is introduced stating

“Economic actors drive diversification mechanisms, and influence institutional capabilities to achieve desired diversification outcomes”

(Project-2 Proposition-5)

The literature in evolutionary economic geography is however centred on firms as protagonists for shaping the economic change. The argument of evolutionary economic geography is “firms affect and change their environment and this change, in turn, affects their performance” (Fitjar & Rodríguez-Pose, 2015). The routines of individual firms, their capacity to learn and adapt through networks and externalities, and self-organisation shape the geographical context and environments in which economic activity takes place determine change & innovation and (Mackinnon et al. 2009; Fitjar & Rodríguez-Pose, 2015). This argument “tends to neglect that firms are embedded in geography and local institutions which they may not always be able to influence” (Morgan 1997; Martin and Sunley 2006). The creation of new paths for growth is enabled and constrained by the local context and environment (Martin & Sunley, 2006; Martin, 2010), as local conditions shape the learning and innovative capacity of the economic agents acting in a particular territory (Morgan, 1997). The learning region and regional innovation system frameworks (Cooke and Morgan, 1998) highlight the importance of regions’ and the work on regional diversification acknowledges the existence and importance of regional resources (Neffke et al., 2014). The local conditions include “local norms & habits”, “quality of local government and other institutions”, “the mix of socioeconomic conditions or the contextual endowments and factors that may facilitate or hinder economic activity (Fitjar & Rodríguez-Pose, 2015). These regional resources include regional knowledge and capabilities in national

economies, such as infrastructure, climate and institutions, “untraded interdependencies” (Storper, 1995) “localised capabilities” (Maskell and Malmberg, 1999). Boschma and Frenken (2011) argue that a degree of technological relatedness between firms and industries affects knowledge spillovers among regional firms, thus impacts branching into related fields, building on existing competence. “a firm’s ability to discover and exploit external knowledge – its absorptive capacity – depends crucially on the endowments of the area in which it operates” (Cohen and Levinthal, 1990). The “context and geography create the territorial conditions and social relationships which shape the potential of firms to emerge, network, learn, and thrive (and/or die) in different environments” (Fitjar & Rodríguez-Pose, 2015) and ability of the firms to discover and exploit external knowledge (Cohen and Levinthal, 1990). In a sense, these institutional capabilities represented by local conditions and local resources affect the capacity of both firms and regions to grow and diversify their economies. In a way “the mechanisms through which contextual factors associated with regional overall educational and innovative or institutional endowments, affect the performance of individual firms and their capacity to learn, change and organise themselves are still poorly understood (Fitjar & Rodríguez-Pose, 2015). The position of this research is that both firms and institutional capabilities are instrumental in shaping trajectories of regional economies, “institutions could form the nucleolus of industrial clusters that consequently lead to spin-off of firms establishing a cluster (Gertler, 2010); however the role of institutions to establish path dependence conditions and create new paths of regional economies remains undercut in literatures, thus presenting an area of interest for future research agenda, as they play a crucial role in the diversification of regional economies.

In a sense, the relatedness and complexity of pre-existing capability, knowledge, products and industries in a regional economy, determine the path creation mechanism and trajectories of regions.

“Degree of relatedness and complexity of institutional capabilities underpin diversification mechanisms”

(Project-2 Proposition-4)

Project-2: Initial Path Creation Framework

The preliminarily theoretical path creation framework (Figure 6) resulting from the systematic literature review is amended in light of the qualitative case research findings, i.e. the six propositions discussed above. The initial path creation framework introduces actors, mechanisms, institutional capabilities that include factors i.e. institutional environment and institutional arrangement factors (Figure 7). It is found that new paths for diversifications are created by path creation mechanisms, which are conditioned by sources of path dependence and institutional arrangement & environment factors, and are propelled by economic actors determining the outcome of economic diversification. The path creation mechanisms include indigenous creation, anchoring, branching and clustering. These are influenced by sources of path dependence, such as natural resources of oil and gas, geography, culture etc. The underlying factors for path creation are categorised into institutional environment and institutional arrangement. Institutional environmental factors are attributed to government functions of liberal market economies, mainly laws & regulations and ease of doing business, such as access to finance, access to trade, access to logistics and access to land. On the other hand, institutional arrangements are attributed to coordinated market economies whereby government agents coordinate economic endeavors by setting diversification strategies, building knowledge and capabilities, increasing innovation capacity, establishing public private partnerships and joint ventures, and creating linkages across economic actors; however, in some cases government agents are actively participating in economic activities through SOEs and SEZs.

Project-2: How Institutions Influence Economic Diversification

The final building block of the path creation framework is the role of institutions to influence path dependence, diversification mechanisms, capabilities, and outcomes. The main argument is that the institutional capabilities that are manipulated by economic actors have important implications for economic performance. In regions that are dominated by coordinated market economies or a higher degree of institutional arrangement, as in the case of Abu Dhabi, the

role of government extends beyond policy making towards collaborating and coordinating across various economic actors, to enable creation of new paths for economic growth and diversifications. The outcomes of such coordinated effort would highly depend on the complexity of institutional environment. In, a sense the role of institutions differs according to existing path dependence conditions, diversification mechanisms, institutional capabilities and desired outcomes (refer to Table 27).

In cases of an abundance of natural resources, it may be sufficient to capitalise on the comparative advantage of these local endowed industries through basic forms of institutional capabilities to support the creation of indigenous industries. In cases where capability is not present, and a region desires to transform the economic productive structure away from their path dependent capabilities and towards new and complex products and industries, then, direct government intervention is essentially required to anchor new unrelated industries through SOEs and coordinate the accumulation of associated capabilities. In cases where embedded capability is complex, a region can branch into a related variety of products and industries that are close to existing path dependence capabilities with minimum institutional arrangement, A minimum active role for government in the productive structure instead a high degree of institutional environment is all that is required to encourage SMEs and attract foreign direct investment, hence accumulating a new set of complex capabilities and a higher degree of diversification. In cases where embedded capability is complex, a region can move into related and unrelated complex varieties of products and industries through clustering that would require a high level of institutional arrangement coordinated by the government through provision of infrastructure, such as Special Economic Zones (SEZs) and high degree of institutional environment enabled by the government to realise competitive advantage and ease of doing business.

In summary, this research contributes to theory and practice. First, it contributes to evolutionary economic geography and conceptualizes creation of new paths for growth and diversification through a set of propositions. Second,

it constructs an initial path creation framework composed of path dependence, actors, mechanisms, factors, and outcomes. Third, it integrates actors, mechanisms, relatedness and institutional capabilities into a path creation matrix shaping pathways to diversification. Fourth, it provides government organisations with different set of strategies to influence policies for economic growth and diversification.

1.3.3 Project-3: Cases of other Diversifications

The project explores “how regions create new paths for diversification through research of published cases on Singapore, Norway and the UAE.”

Project-3 Research Questions

- How do path dependence and existing conditions impact on diversification?
- What are the main actors that are driving economic diversification?
- What mechanisms of economic diversification are pursued in different regions?
- What are the institutional capabilities that support or constrain economic diversification?
- How do context, actors, interventions, factors, mechanisms, and outcomes are related?
- How do economic actors influence on institutional capabilities and diversification mechanisms to create variety of diversification outcomes?
- What are the strategies to be pursued by policy-makers to create a variety of diversification outcomes?

Project-3 Summary of Findings

In this section, the findings of the three regional case studies are summarised, propositions are updated, the elements of the path creation framework are reconstructed, the path creation matrix is modified (Figure 8), and strategies for diversifications are suggested.

Regions pursue different pathways to grow and diversify their economies. This research sheds light on the complexity of path creation (Boschma et al. 2012;

Neffke et al. 2011; Sydow et al. 2010) and explores the interrelationships between context, actors, interventions, mechanisms and factors that shape diversification outcomes. The findings of the three cases are illustrated in Table 29.

Singapore, Norway, and the UAE are economies coordinated by the government and are led by large Multinational Enterprises (MNEs), Large Private Enterprises (LPEs) and State Owned Enterprises (SOEs) respectively. They anchor, branch and cluster, related and unrelated industries with varying degrees of complexity. The interventions and institutional capabilities are significantly different in each case, which may explain the varying degree of diversification outcomes.

The case of Singapore demonstrates that the context of path dependence is mainly related to government leadership and institutional arrangement, whereby states are important actors in enhancing innovation, technological learning, national competitiveness, and national comparative advantage (Parayil, 2005) to create new paths for diversification that are unrelated to existing economic structure. With the absence of path dependence on natural resources, the prevailing path creation mechanism is anchoring simple & complex unrelated industries through Multinational Enterprises (MNEs). Singapore has been able to transform its economy from producing basic garments and textiles in the 1960s towards hydrocarbons, electronics integrated circuits, data processing machines, chemicals, polymers, and biotech. Singapore positioned its economic complexity 11 globally in 2014.

The success of economic diversification is attributed to the high degree of institutional capabilities to coordinate and collaborate amongst SOEs, SEZs, and MNEs; implementation of national science & technology policy programmes (Koh, 2006), as well as on state funding to local and foreign firms and lately on government equity financing (Parayil, 2005; Porter et al., 2013; Wonglimpiyarat, 2013) to stimulate growth of SMEs.

The case of Norway demonstrates that path dependency on indigenous industries can provide a foundation to branch and cluster related industries that

are mainly associated with low complexity products and simple institutional capabilities. It also informs us “how, not only new products create more diversity in old sectors and industries, but also how new resources become the basis for the establishment of new industries of importance for future growth and export specialisation” (Ville & Wicken, 2012) or in other words, how to create new varieties of products and industries that relate to the existing economic structure with varying degrees of complexity. In Norway, path dependence on natural resources e.g. fish and oil remains high. The industries around indigenous resources are led by SME, while the anchoring, branching and clustering of new industries that are related and unrelated to path dependence conditions are pursued through Large Private Enterprises (LPEs), as well as Small-Medium Sized Enterprises (SMEs). The economic structure of Norway is composed of crude oil, gas, hydrocarbons, polymers, fish, aluminium, transport vessels, and machines. The complexity of related and unrelated generated comparatively, is simpler than advanced economies. The economic complexity of Norway is ranked 33 globally in 2014. The underlying factors to create new paths for growth and diversification, are associated with the high degree of institutional capabilities to implement national and regional innovation systems, and pursue restructuring programmes through regional development agencies.

In the UAE, path dependence on oil and gas continues to be the backbone of the economy. The economy is dominated by SOEs that anchor simple complexity of varieties that are related and unrelated to natural resource based industries. Special Economic Zones (SEZs) provide the infrastructure for SMEs to cluster new related and unrelated industries. The economic complexity of the UAE is ranked 66 globally in 2014. The institutional capabilities to formulate policies and strategies are high and the country has been able to position itself as the easiest nation to do business in the region. However, the institutional capabilities to collaborate research, development, fund, and innovate among economic actors, in particular SOEs, as SMEs and SEZs are weak, may explain the limited complexity of related and unrelated varieties that are branched and clustered around anchored firms.

In a sense, the overarching proposition is revised to read

“In the context of path dependence and existing conditions of a region, economic actors undertake measures to influence the institutional capabilities that trigger indigenous creation, anchoring, branching, and clustering diversification mechanisms, in order to create complex varieties of related and unrelated diversification outcomes”

(Project-3 Main Proposition)

Project-3: Path Creation Propositions

In the multiple empirical cases of Project-3, the previous five propositions are refined as follows

Path dependence is a phenomenon that is well established in existing literature as declared in Project-1 (SLR) and is supported in Project-2 (the case of the UAE). However, the proposition that path dependence impacts diversification is extended further in this project. It is found that path dependence is a condition that accumulates a specific set of embedded knowledge, which either inhibits or enables the creation of new related or unrelated knowledge that is simple or complex, depending on the complexity of existing knowledge.

Regions with high path dependence conditions on basic natural resources that are embedded with basic knowledge are associated with simple and related varieties of products. These regions would pursue simple varieties of unrelated products and industries that would benefit from the comparative advantage of natural resources, such as cheap energy sources for basic metals.

Regions with low path dependence conditions on natural resources are associated with complex accumulated knowledge and complex related and unrelated varieties of products and industries. In a way, the context of path dependence and existing conditions not only impact on diversification mechanisms but also on the relatedness and complexity of diversification outcomes.

The first proposition is extended to read

“Context of path dependence and existing conditions underpins diversification mechanisms and impact on the relatedness and complexity of diversification outcomes”

(Project-3: Proposition 1)

The results show that the regions followed different pathways to grow and diversify into related and unrelated industries with varying degrees of economic complexity. They also illustrate the different mechanisms to diversify economies, which are associated with the context of path dependence conditions, and the relatedness and complexity of diversification outcomes. These mechanisms include indigenous creation, anchoring, branching, and clustering, which confirm the propositions of the single case study.

“New paths for diversification are created through indigenous creation, anchoring, branching, and clustering path creation mechanisms that are associated with relatedness and complexity of diversification outcomes”

(Project-3: Proposition-2)

It is argued in Project-2 that degree of path dependence and level of relatedness underpin indigenous creation, anchor, branch, and cluster diversification mechanisms. This in a way already addresses the updated propositions 1&2. Instead, a new proposition is introduced that reflects a key relationship emerging from the empirical cases and constitutes a contribution to existing knowledge.

“Relatedness and complexity shape diversification outcomes”

(Project-3: Proposition-3)

As countries and regions evolve, they do not abandon existing products, but rather add new products that are related to natural or indigenous resources. It is found that the creation of related varieties to the existing economic structure can range from simple to complex products and industries. Regions evolve

from fishing to processing fish, from cultivating vegetables and fruit to processing foods, from crude oil to hydrocarbons and chemicals. The process of moving up the value chain production increases the degree of relatedness and complexity of diversification. However, countries and regions continuously jump-start new unrelated industries that did not exist in their economic structure. The creation of unrelated varieties in the existing economic structure can range from simple to complex products and industries. The process of moving up from basic unrelated product to a wide range of unrelated products is associated with increasing levels of products complexity. In a sense, relatedness and complexity of diversification outcomes are associated proportionally.

The outcome from the case studies of Singapore, Norway and UAE are six findings. First, institutional capabilities range from the simple to industrial policies, as in UAE, to the RPs of Norway, to the national and regional innovation systems of Norway, to the science and technology policies and programmes of Singapore, to the complexity of the institutional collaboration capabilities of Singapore to coordinate the development of targeted sectors, e.g. biotech cluster among local and international economic actors. Second, the increased level of capabilities is associated with an increased complexity level of products and industries that demand complex varieties of knowledge. Third, basic capabilities and knowledge are associated with indigenous industries that are created by SMEs and LPEs. Fourth, anchoring diversification mechanisms is driven by SOEs and MNEs creating simple complexity of unrelated varieties of products and industries that are associated with simple capability and knowledge. Fifth, branching diversification mechanisms are driven by SMEs to create complex varieties of related and unrelated products and industries that are associated with complex capabilities and knowledge. Sixth, clustering by SEZs around SOEs and MNEs to create high complex varieties of unrelated industries is conditioned by a high level of capabilities, in particular institutional collaboration capabilities, to accumulate complex varieties of knowledge.

In a sense, the revised proposition is read as follows

“Institutional capabilities underpin diversification mechanisms and determine the relatedness and complexity of diversification outcomes”

(Project-3: Proposition-4)

This research contributes further to existing literature. It is found that different economic actors are associated differently with diversification mechanisms, relatedness and complexity of diversification outcomes and, in particular, the institutional capabilities. First, the creation of indigenous industries is associated with resource endowments and geography. These are created by SOEs for capital-intensive industries, such as oil and gas, and SMEs for small-scale industries, such as forestry and fishing industries. Second, the creation of related varieties is mainly associated with SMEs that are linked to SOEs or LPEs and, to a lesser degree, to MNEs through the branching mechanism as “growth, decline and industrial reorientation of existing establishments, all tend to reinforce a region’s existing resource base” (Neffke et al., 2014). The generation of complex related varieties through branching by SMEs is conditioned by the degree of institutional capabilities, particularly collaboration capabilities, linking SMEs to other economic actors around state funding, science and technology programmes, and innovation systems. Third, unrelated varieties are mainly generated by SOEs and LPEs that anchor new industries as “new establishments, are often set up in more unrelated activities, and hence, induce more structural change” (Neffke et al., 2014). Fourth, the creation of complex unrelated varieties is generated by SMEs and MNEs associated with clustering mechanisms, often through the infrastructures provided by SEZs, but more importantly through institutional capabilities, e.g. business environment, and once again collaboration across various economic actors.

“Economic actors drive diversification mechanisms, depending on institutional capabilities, to create complex varieties of related and unrelated diversification outcomes”

(Project-3: Proposition-5)

Project-3: Path Creation Framework

The main constructs of the path creation framework resulting from Project-3 remain at large the same as is Project-2 but are enhanced to reflect the updated propositions and elements of context, actors, strategies, institutional capabilities, mechanisms, and outcomes (refer to Figure 23).

The context of regional economies is added, the institutional capability factors are categorised into policies and strategies, institutional environment, institutional arrangement and institutional collaboration. Institutional environmental factors are attributed to government functions of liberal market economies, mainly laws & regulations and ease of doing business, such as access to finance, access to trade, access to logistics and access to land. On the other hand, institutional arrangements are attributed to coordinated market economies whereby government agents coordinate economic endeavors by setting diversification strategies, building knowledge and capabilities, increasing innovation capacity, establishing public private partnerships and joint ventures, and creating linkages across economic actors; however, in some cases government agents are actively participating in economic activities through SOEs and SEZs. The institutional collaboration refers to dedicated government agencies undertaking the role of collaborating the creation of industries and clusters.

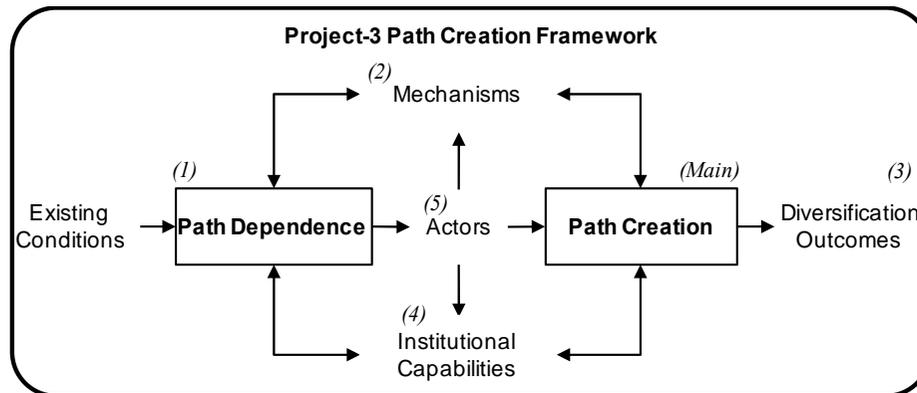
Project-3 Path Creation Matrix

One of the key findings and contributions of Project-3 is the constructs of the path creation matrix that establishes the relationships relatedness, complexity and institutional capabilities shaping pathways to diversification (Figure 8).

Project-3: How Regions Create New Paths to Diversification?

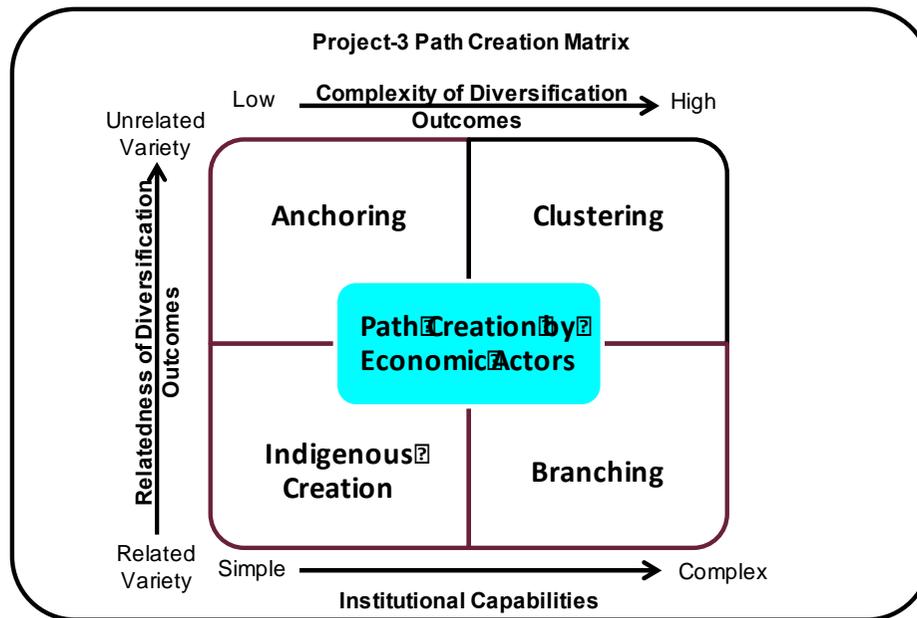
The propositions, elements, framework, and matrix collectively provide the explanation on how regions create new paths to diversification. The main proposition is that in the context of path dependence and existing conditions of a region, economic actors undertake measures to influence the institutional capabilities that trigger indigenous creation, anchoring, branching, and

clustering diversification mechanisms to create complex varieties of related and unrelated diversification outcomes. The primacy of institutional capabilities, particularly the collaboration capabilities to create and accumulate knowledge, are notably emerging as underlying factors for creating new paths for diversification. In a sense, the government undertakes a set of strategic measures to build the institutional capabilities, depending on pathways to diversification and desired diversification outcomes (Table 38). With reference to Project-3, these strategies are further deliberated in the concluding discussions below.



Project-3 Path Creation Propositions

“In the context of path dependence and existing conditions of a region, economic actors undertake measures to influence the institutional capabilities that trigger indigenous creation, anchoring, branching, and clustering diversification mechanisms, in order to create complex varieties of related and unrelated diversification outcomes”



Project-3 Path Creation Propositions

Proposition 1: Context of path dependence and existing conditions underpins diversification mechanisms and impacts on relatedness and complexity of diversification outcomes.

Proposition 2: New paths for diversification are created through indigenous creation, anchoring, branching, and clustering path creation mechanisms that are associated with relatedness and complexity of diversification outcomes.

Proposition 3: Relatedness and complexity shape diversification outcomes.

Proposition 4: institutional capabilities underpin diversification mechanisms and determine relatedness and complexity of diversification outcomes.

Proposition 5: Economic actors drive diversification mechanisms depending on institutional capabilities to create complex varieties of related and unrelated diversification outcomes.

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Figure 8: Project-3 Path Creation Propositions, Framework and Matrix

1.4 Discussions

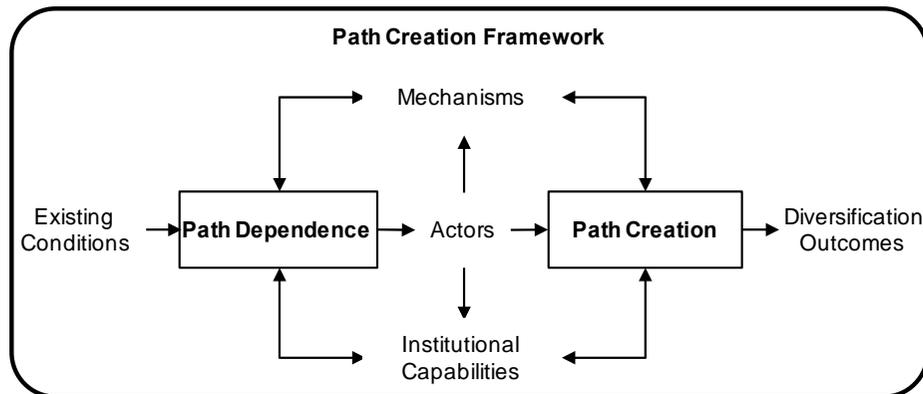
In this section, the main purpose is to conclude the discussions, propositions and contributions of the three research projects.

1.4.1 Path Creation

Path creation represents the essence of regional economic diversification. It is a topic that has only recently been introduced into economic geography, which provides a promising foundation to theorise emergence and evolution of regional economies. The creation of new paths for regional growth and diversification is a complex process, as demonstrated in the findings of the empirical cases. The theorisation of path creation requires a heterodox model to explain the pathways to diversification pursued by regions and countries. This research constructs a path creation model composed of propositions, elements, framework and matrix (Figure 9 & Figure 10). It defines context, actors, institutional capabilities, mechanisms, and outcomes as the constructs of the path creation framework. It further establishes relationships, and integrates the array of context, actors, factors, mechanisms and outcomes which are in continuous interplay, shaping pathways to diversification of regional economies. Moreover, it finds that accumulated knowledge is an underlying factor for path creation. It conceptualises regional diversification and provides a new understanding on creating new pathways to diversification. The overarching proposition is revised to read as follows:

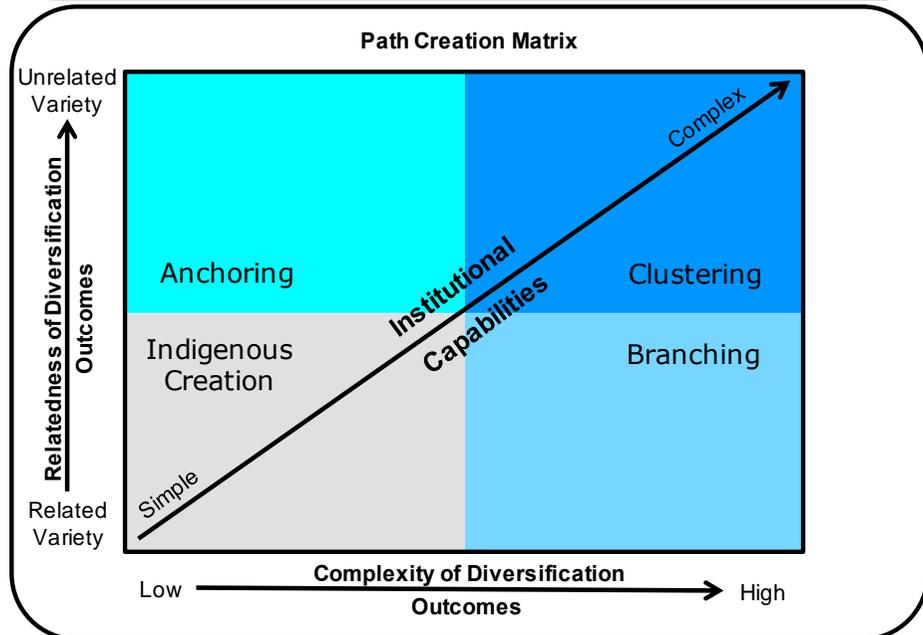
“In the context of path dependence and existing conditions of a region, economic actors undertake measures to influence the institutional capabilities, to accumulate knowledge and to trigger indigenous creation, anchoring, branching, and clustering diversification mechanisms, in order to create complex varieties of related and unrelated diversification outcomes”

(Main Thesis Proposition)



Main Path Creation Proposition

“In the context of path dependence and existing conditions of a region, economic actors undertake measures to influence the institutional capabilities, to accumulate knowledge and to trigger indigenous creation, anchoring, branching, and clustering diversification mechanisms, in order to create complex varieties of related and unrelated diversification outcomes”



Path Creation Propositions

Proposition 1: The context of path dependence and existing conditions underpins the diversification mechanisms and impacts on the relatedness and complexity of diversification outcomes.

Proposition 2: New paths for diversification are created through indigenous creation, anchoring, branching, and clustering path creation mechanisms that are associated with the relatedness and complexity of diversification outcomes.

Proposition 3: Relatedness and complexity shape diversification outcomes.

Proposition 4: Institutional capabilities enable accumulation of knowledge, underpin diversification mechanisms and determine relatedness and complexity of diversification outcomes.

Proposition 5: Economic actors drive diversification mechanisms depending on institutional capabilities to create complex varieties of related and unrelated diversification outcomes.

Proposition 6: Accumulated knowledge is an underlying factor for path creation.

Figure 9: Thesis Path Creation Propositions, Framework and Matrix

The positioning of the research is “to regard path creation as an accidental, adventitious, or serendipitous event is not particularly revealing” (Martin, 2010); on the other hand, to regard path creation as a causal process whereby context, actors, factors and mechanisms are in continuous interplay to condition trajectories of regional economies is revealing. Meaning, path creation is not a random process, as contextual and causal processes matter, even for events that may appear to be random, as these events trigger the birth of new technological and industrial trajectories in some region, while they do not in other regions.

This is evident from the empirical cases studies of this doctorate research on Singapore, Norway and the UAE, as well as other cases of China, South Korea, Indonesia, Malaysia, Taiwan in the east; and Ireland and Finland in the west that cannot be explained by random and chance events. The outcomes achieved by these economies are influenced by contextual conditions (may include historical events) and large elements of strategic purpose and deliberate actions pursued by policy makers and the mindful deviation of strategic agents and entrepreneurs (Steen & Karlsen, 2014). This research confirms from existing literatures that path dependence conditions impact economic diversification, but proposes that these contextual conditions both reinforce existing economic structure and enable creation of related varieties for growth and diversification path creation, thus impacting diversification outcomes.

Economic actors (government and firms) are reacting and adapting to external influences (Steen & Karlsen, 2014) or responding to critical incidents or shocks (Martin & Sunley, 2006) that are critical to the transformation of single industry town (Steen and Karlsen, 2014) or established local conditions for the ‘new path creation’ (Steen and Karlsen, 2014) in regions. Moreover, they continuously attempt to exploit knowledge and explore new opportunities, services and products, fuelling evolution of regional economies mainly by incremental change (Martin 2010) onto a new path. In a sense, both public and private agents develop capabilities that adapt to challenges and opportunities (Steen and Karlsen, 2014). This research restates the role of economic actors and further

proposes that different types of economic actors are associated differently with diversification mechanism, relatedness and complexity of diversification outcomes.

Thus, the strategic decisions made by policy-makers, including the nation-state, should be properly examined to understand regional path creation (Steen and Karlsen, 2014). In this research, integrated platform strategies around the path creation model are suggested to set up the pathways to regional diversification. The heart of these strategies are the institutional capabilities that are found to be instrumental in determining relatedness and complexity of the pathways to diversification.

However, what matters most is that actors and factors within location and context of a region are in continuous interplay to create new paths for growth and make their products and industries the basis of a new path thus institutional collaboration amongst economic actors is essential to realize the desired diversification outcomes as found in this research.

This research offers a path creation model that integrates context, actors, factors, mechanisms and outcomes to provide new understanding on the pathways to diversification.

1.4.2 Knowledge

This research finds that the accumulated and embedded knowledge is emerging as a common underlying factor across all elements of the path creation framework. Knowledge can be considered as a source of path dependence conditions that is embedded in economic agents, products and industries. This knowledge either inhibits or enables creation of new related or unrelated knowledge and consequently a variety of diversification outcomes. While, the institutional capabilities are found to be instrumental for path creation; the underlying objective for institutional capabilities, particularly institutional collaboration, is the creation and accumulation of new knowledge. In a sense, a new proposition is presented as follows

“accumulated knowledge is an underlying factor for path creation”

Thesis Proposition-6

The building block concept of relatedness (Frenken et al, 2007; Neffke et al., 2011a) and complexity (Hidalgo and Hausman, 2009) are the bases of theorising path dependence and path creation (Martin, 2008) particularly creation of knowledge (Ter Wal and Boschma, 2011) consequently creation of related and unrelated varieties of products and industries with different degrees of complexity. These are based on the accumulated knowledge that is embedded in institutions, firms, products, and industries. The SLR surveyed knowledge from four dimensional spaces, institutional, firms, products, and industry spaces. This pre-existing knowledge, conditions development trajectories (Nelson and Winter, 1982; Arthur, 1989; Porter, 1998 and 2003; Frenken et al., 2007; Hidalgo, 2009; Hidalgo and Hausmann, 2009; Hidalgo, 2011; Boschma and Frenken, 2011; Asheim et al., 2011; and Neffke et al, 2011a). There are reciprocal and interdependent relationships between institutions, firms, products and industries. Macro patterns emerge from micro behaviours and interactions (Foxon, 2011) of economic actors, whereby, new paths emerge in the context of existing knowledge and capabilities, which can be "existing structures, and paths of technology, industry and institutional arrangements" (Martin, 2008:186). Moreover, these economic actors are effectively shaping the pathways to diversification by influencing the institutional capabilities to accumulate knowledge and generate desired diversification outcomes.

The argument is that the degree of relatedness and complexity of knowledge is associated with the complexity level of institutional capabilities, in particular institutional collaboration capabilities. In a sense, establishment of complex institutional collaboration aims to create and accumulate complex varieties of knowledge that are related or unrelated to existing knowledge, which is probably the main explanatory factor for different diversification outcomes achieved by regions and countries.

Table 2: Context of Path Dependence Conditions

		Complexity of Diversification Outcomes	
		Simple Variety	Complex Variety
Relatedness of Diversification Outcomes	Unrelated Variety	<p>Anchoring Mechanism</p> <ul style="list-style-type: none"> ▪ High path dependence on basic products ▪ High comparative advantage ▪ Simple & unrelated accumulated knowledge 	<p>Clustering Mechanism</p> <ul style="list-style-type: none"> ▪ Low path dependence on basic natural resources ▪ Very high competitive advantage ▪ Complex and unrelated accumulated knowledge
	Related Variety	<p>Indigenous Creation Mechanism</p> <ul style="list-style-type: none"> ▪ High path dependence on basic natural resources ▪ Unexploited comparative advantage ▪ Basic accumulated knowledge 	<p>Branching Mechanism</p> <ul style="list-style-type: none"> ▪ Low path dependence on basic natural resources ▪ High competitive advantage ▪ Complex and related accumulated knowledge

Thesis Proposition-1: The context of path dependence and existing conditions underpins the diversification mechanisms and impacts on the relatedness and complexity of diversification outcomes.

1.4.3 Context of Path Dependence Conditions

The findings of this research confirm existing theoretical proposition that path dependence impacts the economic diversification process of regions. Path dependence is presented as a major building block of a new interpretive or epistemological paradigm (Martin and Sunley, 2006; Martin, 2010) to explain regional development. However, contrary to the argument of Notteboom et al., (2013); path dependence is a phenomenon that has to be explained. This research views the context of path dependence conditions, both as reinforcing existing economic structures and impacting on relatedness and complexity of diversification outcomes, thus enabling regional diversification. Moreover, it extends existing discussions to interpret and construct relationships between path dependence and pathways to diversification pursued by regions. (Table 2). Therefore, the first proposition is concluded to state

“The context of path dependence conditions underpins pathways to diversification and impacts on relatedness and complexity of diversification outcomes”

(Thesis Proposition-1)

The sources of path dependence in existing literature are categorised as technological (Martin & Sunley, 2006); functional, cognitive, and political, including institutional and political administration (Grabher, 1993); and assets, cultures and practices (Birch et al. 2010:37; Karlsen and Dale, 2014). Moreover, the EEG perspective views path dependence as a source for lock-in and irreversible spatial patterns, due to agglomeration economics and specialised industrial regions that are endowed with particular resources, competencies and institutional structures, infrastructure, that are difficult to adapt to changes (Boschma and Lambooy, 1999:418; Martin and Sunley, 2006:409). On the other hand, EEG also attempts to explore how economic actors respond to wider process of economic change (Mackinnon, 2009:499) and establishes path dependence conditions for regional economies. The plausibility of path dependence is undermined by its lock-in feature that defines

an economic condition that is fixed and inflexible, hence endogenous change is muted. Thus, for change to occur, exogenous forces are the only hope for economics to escape the lock-in state (Martin and Sunley, 2006:406) of products and technologies. This argument is however problematic to theorise on the evolution of regional development, where the role of economic actors to establish path dependence, and the phenomenon of creating new paths (Martin and Sunley, 2006:404) is not considered. We therefore take a different theoretical approach for this research. The context of path dependence conditions underpins pathways to diversification and impacts relatedness and complexity of diversification outcomes

The context of existing conditions and sources of path dependence resulting from the empirical cases, are primarily related to government leadership, historical events, natural resources and endowments, such as fishing, oil and geography, and persisting forms of institutional arrangement.

Government leadership, represented by the head of government is one noticeable regional contextual characteristic driving growth and development in some regions. The leadership of Lee Kuan Yew, the Housing Development Board (HDB), and the Economic Development Board (EDB) are the prominent figures that recognised the challenges upon independence in 1965. These challenges included scarcity of natural resources, a population of 2 million people, a Gross National Product (GNP) of US\$320 per capita, and a poor infrastructure (<https://www.edb.gov.sg/content/edb/en.html>). They triggered the transformation of the social and economic development and their legacy and primacy of these institutions remain to influence development until now. The Singaporean government “maintained a strong involvement in economic policy, developing forward-looking strategies for long-term growth” (Vieter, 2015). The UAE is not much different. It was founded in 1971, through the creation of a federation comprising seven emirates. The building of the nation focused on establishing the welfare system and modern institutions and building the infrastructure. “Over the course of just a few decades, Dubai has transformed itself from a spit of sand about the size of Rhode Island into the Singapore of

the Middle East ... It is a political, economic and financial success story in a region torn by conflict. And it's all the vision of one man: Sheikh Mohamed bin Rashid Al Maktoum" (Steve Kroft CBS, in Mayo et al., 2010).

Historical events matter to the context of path dependence condition, both in reinforcing path dependence and enabling the creation of new paths for growth and diversification. In Singapore, the institutional capabilities have evolved over time, in response to existing conditions, exogenous global market forces, and endogenous drivers for development of targeted industries. Amid the financial crisis, growth of other competitive business centres in other countries and increased competition for foreign direct investment, the Committee for Singapore's Competitiveness (CSC) was formed in 1997. During the same period, Singapore also established the economic strategies committee (ESC) with the goal of "developing strategies for Singapore to maximise our opportunities in a new world environment, by building our capabilities and making the best use of our resources, with the aim of achieving sustained and inclusive growth". The restructuring programmes in Norway are mainly regional government responses to financial crisis of core natural resource based industries. The oil price shocks in the 1970s and early 1980s triggered a wave of economic transformation in the UAE. First, Dubai transforming its economy away from oil, making the region a global logistical hub. Then, Abu Dhabi investing heavily industries that are related to oil and gas, and recently on new industries, such as manufacturing for aerospace sector.

Path dependence on natural endowments and resources is a phenomenon experienced by many regions. However, while it reinforces existing dependence on endowments such as geography, and natural resources such as fishing and oil, it provides opportunities to create new paths to diversification that serve these conditions. Singapore does not have natural resources of its own to develop and create comparative advantage in its economy. It is however, in close proximity to key Asian commercial centres, including Beijing, Tokyo, Seoul, Taipei, Hong Kong, Sydney, and New Delhi. The initial strategy for development is to exploit its geographical position and attract foreign direct

investment. The Singaporean government started development efforts prior to independence; it commenced the development of an efficient system of government control over the economy and welfare of its citizens. The strong drive of the government to increase the competitiveness of its economy, made Singapore one of the most competitive Asian countries. The World Bank ranked Singapore as the world's easiest place to do business in 2009 and 2012. It has become one of the world's top transportation hubs, with efficient trans-shipment of sea cargo, and Changi International Airport provides 5,400 flights per week to 200 cities in 60 countries. Dubai of the UAE followed a similar approach. In its strategy to diversify away from oil and gas, it pivoted economic growth and development on its geographical location, positioning itself as a global trade and logistical hub. It pursued government administration changes that enhanced competitiveness of the business environment, as a result the UAE is ranked first by World Bank in ease of doing business across the Middle East. One noticeable achievement was Jabal Ali Free Zone (Jafza) that has “evolved into a dynamic trade catalyst ecosystem that enables businesses and creates new opportunities for growth. From a modest start in 1985 with just 19 companies, Jafza today flourishes as a business community with over 7,100 companies, including 100 of the Fortune 500s” (refer to Jafza <http://jafza.ae/about-us/#qs.H97jbXI>) . In a sense, geography matters, but to exploit opportunity value, institutional environment that improves business competitiveness, attracts foreign business and provides access to trade and logistics is essentially required for growth and development.

In the UAE, path dependency rests around the oil and gas sector economy, where access to cheap energy feedstock provides a comparative advantage for energy dependent industries. Thus, it determined the nature of industries that have emerged and evolved over time, such as Aluminum, Steel, and Polymers that are highly energy dependent. In contrast to the UAE, Norway, while path dependency on natural resources of fishing and oil industry remains a characteristic of its economic structure, it developed institutional capabilities through restructuring programmes, and innovation systems & policies that enabled creation of new knowledge and industries. “The resources sector

expanded and diversified by developing new technologies that draw on and contribute to learning and knowledge broadly across the economy” (Ville & Wicken, 2012). “Norway’s resource based sectors ... have for decades been highly innovative, drawing on domestic sources of innovation, technology transfer from foreign sources ... and Norway’s universities and research institutes (Fagerberg et al., 2009: Ville & Wicken, 2012). The technological transformation in the sector was concentrated on a relatively small number of actors. Norway “has a tradition of small-scale cooperative enterprises in many of these sectors, overseen by a positive role for the state, which is now giving way to large-scale, corporate enterprise within a highly competitive framework ... have traditionally drawn on domestically generated new technology in their traditional clusters (Ville & Wicken, 2012). The “Norwegian technological style” based on Condeep (concrete deep water) platform in offshore oil production introduced in 1973 is another example of creating related industries within the cluster. Norway as a result has been able to exploit its natural resources and to create new unrelated industries that serve the resource based industries; for example, machines and marine technology for fishing industry and automation control for oil and gas industries.

This research finds that accumulated and embedded knowledge is emerging as a common factor for the context of path dependence conditions and across other elements that influence regional diversification. In a sense, knowledge can be considered as a source of path dependence conditions in a regional economy, embedded in its government institutions, firms, products, industries and clusters. The path dependence conditions e.g. accumulated knowledge either inhibits or enables creation of new related or unrelated diversification outcomes, depending on the complexity of existing institutional capabilities.

Regions with a high degree of path dependence conditions on basic natural resources that are typically embedded with basic knowledge, are associated with simple and related varieties of products as well as basic institutional capabilities. It might be helpful to think of knowledge as one type of path dependence. The degree of path dependence is extremely high, due to the

accumulated knowledge that is basic. This makes it difficult to exploit the comparative advantage of available natural resources and for changes to happen from within, thus inhibiting novelty and the creation of new paths. These regions may pursue anchoring other basic unrelated products and industries that would benefit from the comparative advantage of natural resources, such as cheap energy sources for basic metals industries. This in a sense, reinforces path dependence conditions. Such regions may opt to anchor complex unrelated varieties, however, as demonstrated in the case studies, such an approach is problematic, without establishing the institutional capabilities for clustering and branching around these anchor industries.

Regions with a low degree of path dependence conditions on natural resources are typically associated with accumulated knowledge that is complex and has related & unrelated varieties of products and industries that are complex. The regions that are on a path of development, are able to create new pathways to diversifications that are of a complex variety by the deliberate actions of economic agents.

In a sense, the context of path dependence and existing conditions not only impact diversification mechanisms, but also impact relatedness and complexity of diversification outcomes.

1.4.4 Relatedness and Complexity of Diversification Outcomes

Existing literature in attempting to explain “why some regions are able to diversify into new products and industries while others continue to face challenges in diversification” do not clearly differentiate between the process and outcome of regional diversification. In this research, the building blocks of path creation are progressively constructed, and interrelationships between various blocks and elements are established. This research contributes to existing literature by establishing the interrelationship matrix of relatedness and complexity shaping diversification outcomes. It provides a matrix to interpret the diversification outcomes. It proposes that

“Relatedness and complexity shape diversification outcomes”

(Thesis Proposition-3)

Table 3: Relatedness and Complexity of Outcomes

		Complexity of Diversification Outcomes	
		Simple Variety	Complex Variety
Relatedness of Diversification Outcomes	Unrelated Variety	<p>Anchoring Mechanism</p> <ul style="list-style-type: none"> ▪ High concentration ▪ Limited number of unrelated varieties (low diversification) ▪ Low complexity products & industries (low economic complexity) ▪ Simple and unrelated knowledge 	<p>Clustering Mechanism</p> <ul style="list-style-type: none"> ▪ Low concentration ▪ Higher number of related and unrelated varieties (high diversification) ▪ Higher complexity of products and industries (high economic complexity) ▪ Complex and unrelated accumulated knowledge
	Related Variety	<p>Indigenous Creation Mechanism</p> <ul style="list-style-type: none"> ▪ High concentration ▪ Limited number of related varieties (low diversification) ▪ Low complexity products & industries (low economic complexity) ▪ Basic accumulated knowledge 	<ul style="list-style-type: none"> ▪ Branching Mechanism ▪ High concentration ▪ High number of related varieties (high diversification) ▪ High complexity of products and industries (high economic complexity) ▪ Complex and related accumulated knowledge

Thesis Proposition-3: Relatedness and complexity shape diversification outcomes.

The theory of relatedness views the nature of diversification as related and unrelated variety (Frenken et al., 2007; Boschma and Frenken, 2011) depending on “industry relatedness” (Neffke and Henning, 2009; Neffke et al., 2011a; Neffke and Henning, 2014), “technological relatedness” (Klepper and Simons, 2000) and knowledge proximity (Hidalgo and Hausmann, 2009; Hidalgo, 2009). On the other hand, the theory of capability or economic complexity (Hidalgo and Hausmann, 2009; Hidalgo, 2009) views the outcome of economic diversification as simple or complex, depending on the embedded accumulated knowledge in the country. It is found in this research that degree of relatedness and degree of complexity are proportionally related and are shaping diversification outcomes.

The outcomes of economic diversification among the three empirical case studies differ significantly. Singapore is highly diversified with high complex varieties of unrelated products and industries. Norway’s economy is less diversified than Singapore’s, with a medium range complexity of related and unrelated variety of products and industries. The UAE is less diversified than Singapore and Norway, with low complex varieties of related and unrelated products and industries.

The economic relatedness and complexity of a region is determined by the accumulated knowledge embedded in products, industries, firms and institutions. The argument is that at any given point in time, countries are endowed with a set of knowledge that is dependent on indigenous natural resources, such as forestry, fishing, and crude oil. These are categorically related to path dependence on natural resources and are of low complexity. As countries and regions evolve, they do not abandon existing products, but rather add new products that are related to natural or indigenous resources. It is found that the creation of related varieties to an existing economic structure can range from simple to complex products and industries. Regions evolve from fishing to processing fish, from cultivating vegetables and fruits to processing foods, from crude oil to hydrocarbon and chemicals. The process of moving up

the value chain production increases the degree of relatedness and complexity of diversification. This research however departs from the theory of relatedness. It is also finds that countries and regions continuously jump-start new unrelated industries that did not exist in their economic structure. The creation of unrelated varieties to an existing economic structure can range from simple to complex products and industries. The process of moving up from basic unrelated products to a wide range of unrelated products is associated with an increasing level of product complexity. In a sense, the degree of relatedness and degree of complexity are proportionally related and are shaping diversification outcomes.

1.4.5 Path Creation Mechanisms

The findings of this research show that the regions pursued different pathways to diversification, revealing four diversification mechanisms. These are anchoring, branching, and clustering, as well as indigenous creation. Moreover, these mechanisms are associated with the context of path dependence conditions, relatedness & complexity of diversification outcomes. The second proposition of previous projects are restated as follows

“New paths for diversification are created through indigenous creation, anchoring, branching, and clustering path creation mechanisms that are associated with relatedness and complexity of diversification outcomes”

(Thesis Proposition-2)

Singapore pursued concurrent anchoring and clustering mechanisms to create unrelated industries with varying degrees of complexity, mainly through MNEs. Norway, anchored and branched medium range complexity of related and unrelated industries through LPEs and SMEs serving the indigenous industries. The UAE mainly anchored low complexity related and unrelated products through SOEs, and clustered unrelated industries through SEZs. In a sense, regions and countries can pursue different diversification mechanisms,

depending on other elements such as context of path dependence conditions and desired diversification outcomes, these are discussed below.

Table 4: Path Creation Mechanisms

		Complexity of Diversification Outcomes	
		Simple Variety	Complex Variety
Relatedness of Diversification Outcomes	Unrelated Variety	<p>Anchoring</p> <ul style="list-style-type: none"> ▪ Anchoring through SOEs, LPEs and institutions ▪ Exploiting comparative advantage ▪ Limited number of simple unrelated products and industries ▪ Accumulating simple and unrelated knowledge 	<p>Clustering</p> <ul style="list-style-type: none"> ▪ Clustering around an anchor SOE, LPE or MNE ▪ Clustering within an SEZ ▪ Self-organising clustering ▪ Competitive advantage ▪ Coordinated clustering ▪ Higher varieties of complex products & industries ▪ Accumulating diversified complex knowledge
	Related Variety	<p>Indigenous</p> <ul style="list-style-type: none"> ▪ Natural resource based products such as fishing and crude oil ▪ Unexploited comparative advantage ▪ Very limited number of natural based basic products with low complexity ▪ Accumulating basic knowledge 	<p>Branching</p> <ul style="list-style-type: none"> ▪ Branching out and starting up related SMEs and products ▪ Competitive business environment ▪ High variety of related complex products & industries ▪ Accumulating related complex knowledge

***Thesis Proposition-2:** New paths for diversification are created through indigenous creation, anchoring, branching, and clustering path creation mechanisms that are associated with the relatedness and complexity of diversification outcomes.*

First, the creation of indigenous industries is the basic form of regional development that generate economic growth. It is directly influenced by path dependency on natural resources, such as fishing in Norway and oil & gas in Norway and the UAE. The path dependency on natural resources provides comparative advantage for growth of exports, typically through small-scale firms and industries. However, for such regions where the backbone of the economic structure is natural resources, the accumulated knowledge of low complexity is distanced from the technological frontier, the indigenous creation mechanism is associated with low complexity related varieties of products and industries. The main focus of this research is on pathways to diversification towards other complex products and industries.

“Our remote ancestors did not expand their economies much by simply doing more of what they had already been doing: piling up more wild seeds and nuts, slaughtering more wild cattle and geese, making more spearheads, necklaces, burins and fires. They expanded their economies by adding new kinds of work. So do we.” (Jacobs, 1969, p. 49 in Neffke, et al. 2014)

Regions and countries evolve over time; they navigate through the product and industrial spaces, exploiting what is available out of their natural resources. They do not abandon indigenous industries but create new products and industries that are either related or unrelated to the existing economic structure. They also strive to make complex products and industries to diversify their economies. “As countries become more complex, they become more diversified; they add more products to the export mix without really abandoning the products they started with” (Hausmann and Hidalgo, 2010). However, only advanced economies and a few developing countries were able to transform their economic productive structure over the past four decades (Hidalgo, 2009) generating an unrelated variety of complex products and industries. The transformation is challenging, one aspect is accumulated knowledge, and institutional capabilities are simple, but most importantly, local and international private firms are not taking risks to invest in new industries, due to various

uncertainties. Some of these uncertainties are a weak business environment, limited access to finance, and weak domestic demand.

Second, some governments pursue an entrepreneurial role to anchor new unrelated industries through SOEs, as in the case of the UAE and GCC countries or LPEs as in the case of Norway, and provide the infrastructure and incentives for the MNEs to anchor unrelated industries, as in the case of Singapore. This finding extends the variations of the anchor approach or “the hub-and-spoke” structure, which have been characterised by many scholars in their discussions of current industrial organisation (Gray et al., 1996). The anchor organisation can be state owned enterprises (SOEs), large private enterprises (LPEs), multinational enterprises (MNEs), as well as “non-profit such as a university, a medical centre or a port authority, with a major role in structuring economic activity through spin-offs or management of a particular activity, such as trade or research” (Gray et al., 1996).

In the anchoring mechanism, the diversification progress takes place by adopting new knowledge and new technology through foreign direct investment (Koh, 2006). Moreover, the anchor approach creates major export-oriented industries that are dominated by one or a limited number of large, vertically integrated-firms or non-profit institutions that form its ‘hub’ or nucleus (Gray, 1996). It generates growth for countries distanced from the technological frontier as “is likely to yield greater return ... because the benefits of technological progress can be realised quickly by moving up the technological ladder, as it is less costly and easier to absorb and adapt the existing body of knowledge, than it is to invest and develop new technology with uncertainty of commercial success (Koh, 2006). It positions the economy closer to the technical frontier; however, it offers limited unrelated products and industries by the anchor firm, thus, the knowledge becomes accumulated and embedded in the anchored firms, and the economy becomes concentrated in a few products such as basic metals (UAE) and electronics (Singapore).

Therefore, the long-term growth and diversification prospects for anchoring mechanisms depend on two factors. First, on the anchor firm to build an

infrastructure that enables new firms to form locally in related and unrelated industries, or in other words “encourages growth within the region by spawning local suppliers, spinning off new businesses, or supplying labour or other factors of production to the local economy ... to diversify the region, providing alternative sources of growth and stabilising regional economic activity in periods of cyclical setback or longer-term decline in the hub organisation’s industry” (Markusen, 1996). Second, the institutional capabilities, in particular institutional collaboration arrangement amongst government, anchor firms such as SOEs, LPEs, MNEs, and SEZs, as well as with SMEs to accumulate knowledge, branch and cluster new firms, products, and industries around the anchor firm become essential to sustain growth and create complex varieties of related and unrelated products and industries.

Third, the branching mechanism of firms, products, and industries is one form of development that occurs through the self-organising process in liberal market economies, however, for some countries it is coordinated deliberately by specialised agencies to trigger the branching of targeted industries, as experienced in Singapore and Norway. It is highly conditioned by the business environment and the institutional capabilities, in particular collaboration, funding, science & technology policies and innovation policies coordinated by the government, as demonstrated in cases of the biotech in Singapore and software & ICT in Norway. The experience of the UAE is however different, although the business competitive environment is comparatively high, the branching of firms and products out of the anchor firms or industries has been weak, e.g. polymer, aluminium and steel, which is mainly due to absence of institutional collaboration capabilities amongst SOEs, SEZs, and SMEs.

Fourth, the clustering of firms, products and industries (Porter, 1990) is another mechanism for economic diversification. There are different forms of clustering. One form of clustering is when firms or an industry and suppliers cluster around one or several core firms (Gray et al., 1996), mainly around an anchor to produce related varieties as the case of Norway. Another form is when a special economic zone is established to provide the infrastructure and enable

institutional environment for local and foreign firms to start up and produce related and unrelated industries that are targeted by policy makers as the case of Singapore and UAE. The clustering could also be self-generated through agglomeration of firms in a geographical location, as in the case of Norway and to some degree other free market economies.

In the anchor based clustering, the anchor “hub” generates a second tier of companies that constitute, metaphorically, the spokes radiating from it. (Gray et al., 1996). An example would be the ability of small firms in a particular industry to start up and thrive in the shadow of a major firm, because the latter has built up a local skilled labour pool and a cadre of business services-traditional agglomeration economies. Such neighbouring activity could be conceived as riding on the shoulders of the hub firms, more or less with their acceptance but without imposing much of a burden. (Gray et al., 1996). Many point to the wide range of economic conditions in which large firms still function and prosper, despite the proliferation of small firm networks. Examples range from the spatially concentrated network created by Toyota and its satellite of suppliers in Japan (Gray et al., 1996), to the core-ring system around Bosch in Germany (Sabel et al., 1987; Cooke and Morgan, 1993), to the agglomeration of small and medium aerospace suppliers around the large defence contractors in Southern California (Oden et al., 1996). Some scholars even argue that the core-ring system, with small firms organised around powered lead firms, is becoming the dominant trend in regional economic structure (Harrison, 1994; Gray et al., 1996). Growth in these economies is associated with the position and success of anchor organisations in their national and international markets and with their continued commitment to production and procurement within the district. (Gray et al., 1996).

In SEZ based clustering, the success would depend on the infrastructure, such as logistics (air and sea), comparative advantage such as cheap energy sources (Norway and UAE), and enhanced regulatory framework (Singapore and Norway), investment awareness & promotion (Singapore and UAE). The institutional capabilities become essential, such as science & technology

policies and programmes as in Singapore, investment in R&D, national and regional innovation systems as in Norway, and collaboration among various economic actors i.e. SOEs, LPEs, MNEs, SEZs and SMEs through dedicated organisations as in Singapore.

In the third form of self-generated clustering, the success would depend on the competitive business environment associated with free market forces, which represent the formal Italian industrial districts.

The clustering approach is pursued by countries to accelerate and advance their economies towards global technological frontiers. It is associated with the creation of complex products and industries that are unrelated to existing economic structure. “As the economy advances to the global technological frontier, the greatest potential for economic growth comes not from just catching up with the technological leaders through capital accumulation and imitation of their technology and growth strategies, but by investing in R&D and creating new technologies and products. Science and innovation policies at this stage are focused on the creation of new knowledge, through cutting-edge research at the frontier” (Koh, 2006). The case of biotech cluster in Singapore is an illustration of this approach.

In summary, new paths for diversification are created through indigenous creation, anchoring, branching, and clustering mechanisms. These are associated differently with accumulated knowledge and with relatedness and complexity of diversification outcomes. Indigenous creation is mainly driven by small-scale enterprises that generate a variety of low complexity products that are related to natural resources. The anchoring mechanism is pursued to create unrelated varieties to existing conditions, which are typically of simple accumulated knowledge and low complexity. Branching is driven by SMEs generating related varieties that could be of high complexity depending on the accumulated knowledge and institutional environment. Clustering is associated with a variety of unrelated products and industries that enable creation of high complexity industries once coupled with a high level of institutional capabilities,

in particular in collaboration amongst economic actors to accumulate and create complex knowledge.

1.4.6 Economic Actors

One of the salient findings is that different types of economic actors are associated differently with diversification mechanisms, relatedness & complexity of diversification outcomes, and in particular the institutional capabilities. In a sense, constructing the relationships between economic actors and these elements is another building block to theorise path creation. The fifth previous proposition is restated as follows

“Economic actors drive diversification mechanisms depending on institutional capabilities to create complex varieties of related and unrelated diversification outcomes”

(Thesis Proposition-5)

In this research, main economic actors that play a crucial role in regional development, include government organisations (policy making organisations, regional development agencies), state-owned enterprises, special economic zones, local private firms, multinational enterprises, small-medium size enterprises. Other organisations, such as universities, research and development organisations contribute, but do not directly influence regional diversification. This research restates the importance of understanding the roles of various economic actors e.g. policy makers, (Fornhal et al. 2012; Essletzbichler 2012), SOEs (OECD, 2013), “experienced entrepreneurs and diversifiers” (Boschma and Frenken 2009, 11), and others for harnessing, and matching regional assets to new market opportunities as part of path creation (Garud and Karnøe 2003). These include existing establishments and new establishments that either belong to existing firms, entrepreneurs, or originate from outside the region that act as agents of change (Neffke et al., 2014). This research further extends understanding on the role of the economic actors and their influence on diversification mechanisms and outcomes.

Table 5: Economic Actors

		Complexity of Diversification Outcomes	
		Simple Variety	Complex Variety
Relatedness of Diversification Outcomes	Unrelated Variety	Anchoring Mechanism SOEs LPEs	Clustering Mechanism SEZs SMEs MNEs
	Related Variety	Indigenous Creation Mechanism SOEs SMEs	Branching Mechanism SMEs

Thesis Proposition-5: *Economic actors drive diversification mechanisms depending on institutional capabilities to create complex varieties of related and unrelated diversification outcomes.*

The cases of Singapore, Norway, and the UAE further demonstrate that the role of economic actors differs, depending on the context, institutional capabilities, diversification mechanisms, and nature of pursued diversification outcomes. This in a way extends the discussions on existing literature that the scope of regional actors to develop and apply contextual policy interventions (Boschma 2009) are continually shaped by the political economy of the region (Mackinnon et al. 2009), particularly in peripheral regions, due to dependence on state intervention to stimulate adaptive capacity and growth (Martin, 2012). What is critically important is how these different economic actors are influencing diversification mechanisms and diversification outcomes.

SOEs are associated with anchoring capital intensive industries based on indigenous resources e.g. oil and gas as in UAE and Norway. SOEs are however increasingly associated with anchoring low complexity varieties of unrelated products and industries, as “new establishments are often set up in more unrelated activities, and hence induce more structural change” (Neffke et al., 2014). The institutional capabilities associated with SOEs are of low complexity, focused on institutional arrangement to govern and oversee these capital intensive investments.

LPEs are associated with high regional institutional capabilities that are mainly associated with low and high complexity of a variety of related products and industries as in the case of Norway. In the long-run, this role is increasingly assumed by new subsidiaries of existing firms” (Neffke et al., 2014) i.e. LPEs.

MNEs are associated with complex institutional capabilities and complex varieties of unrelated varieties, as in the case of Singapore. MNEs anchor high complexity unrelated industries. This in line with what Neffke et al., (2014) envisage that “radical structural change predominantly depends on non-local firms and entrepreneurs transfer new activities to the region” as “non-local firms and entrepreneurs generate most structural change” (Neffke et al., 2014).

SMEs are mainly associated with indigenous based industries, such as forestry and fishing as in Norway, and related varieties of products and industries such as marine technology also as in Norway, whereby institutional environment and institutional collaboration are crucial for their growth. The “growth, decline and industrial reorientation of existing establishments all tend to reinforce a region’s existing resource base” (Neffke et al., 2014). Moreover, SMEs or “entrepreneur-owned establishments (i.e., start-ups) induce most structural change in the short-run in industries that are related to the existing economic structure, but in the long-run, this role is increasingly assumed by new subsidiaries of existing firms” (Neffke et al., 2014) i.e. LPEs. However, the generation of complex related varieties through the branching mechanism by SMEs is conditioned by the degree of institutional capabilities, particularly institutional environment, e.g. ease of doing business and importantly the collaboration capabilities linking SMEs to SOEs and LPEs and to a lesser degree to MNEs around state funding, science & technology programmes, and innovation systems.

The creation of complex unrelated varieties by SMEs and MNEs is associated with clustering mechanisms which are often facilitated through the infrastructures provided by SEZs, but more importantly is enabled through the institutional capabilities e.g. business environment, and once again collaboration across various economic actors.

In a sense, economic actors drive diversification mechanisms, depending on institutional capabilities such as state funding and collaboration amongst different economic actors on research, development, and innovation to create complex varieties of related and unrelated diversification outcomes.

1.4.7 Institutional Capabilities

The primacy of institutional capabilities, particularly the collaboration capabilities, are remarkably emerging as key underlying factors for creating new paths for growth and diversification. These institutional capabilities are categorised into policy and strategy formulation, institutional environment, institutional arrangement, and institutional collaboration. Moreover, the underlying objective for institutional collaboration is the accumulation of knowledge.

This research further interprets and constructs a path creation matrix that establishes relationships between institutional capabilities and other elements of diversification mechanisms, relatedness & complexity of diversification outcomes (Table 6). The fourth previous proposition is refined to read as follows

“Institutional capabilities enable accumulation of knowledge, underpin diversification mechanisms and determine relatedness and complexity of diversification outcomes”

(Thesis Proposition-4)

Policymaking and strategic planning set the priorities and provide a platform to align different economic actors to march on achieving desired diversification outcomes as found in Singapore, Norway and UAE. Development strategies, industrial policies, national and regional innovation policies, science and technology policies, competitiveness policies are examples of policies and strategies.

However, the translation of these policies and strategies into actionable agenda implemented by economic actors is what matters most for transforming the structure of the economy.

Table 6: Institutional Capabilities

		Complexity of Diversification Outcomes	
		Simple Complexity Varieties	High Complexity Varieties
Relatedness of Diversification Outcomes	Unrelated Variety	Anchoring <ul style="list-style-type: none"> ▪ Industrial policies & strategies ▪ SOEs governance ▪ Infrastructure investment ▪ Promotion of industries 	Clustering <ul style="list-style-type: none"> ▪ Institutional collaboration ▪ High R&D investment ▪ Highly educated workforce relevant to clustered industries ▪ Science and technology programmes ▪ Government equity financing
	Related Variety	Indigenous <ul style="list-style-type: none"> ▪ Restructuring programmes ▪ Regional development agencies ▪ State funding ▪ External investment 	Branching <ul style="list-style-type: none"> ▪ Non-regional and international collaboration ▪ Low R&D investment ▪ High educated workforce

***Thesis Proposition-4:** Institutional capabilities enable accumulation of knowledge, underpin diversification mechanisms and determine relatedness and complexity of diversification outcomes.*

It directs SEZs to build the infrastructure to attract MNEs to concurrently anchor and cluster new high complexity unrelated industries as in Singapore. It directs SEZs to build the infrastructure and SOEs to create unrelated industries that are dependent on the comparative advantage offered by oil and gas industries as in the UAE. It mobilises regional development agencies as in Norway to restructure their economies, creating higher complexity of unrelated industries that are serving resource based industries.

The institutional environment is the outcome of government policies and strategies, in particular establishing the right business and competitive environment for business to thrive and grow. These include as an example, ease of doing business, laws and regulations, access to finance, and access to trade and logistics. The institutional environment provides the platform for SMEs and industries mainly to branch into related varieties, which is typically associated with free market economies as established in existing literatures. In the case of coordinated market economies as in Singapore and the UAE, it enables branching, but it is more associated towards clustering around anchor industries.

The institutional arrangement includes dedicated organisations, such as policy-making organisations, national development agencies, regional development agencies, investment awareness and promotion agencies, and of particular importance are institutions of collaboration that are actively directing, overseeing, and collaborating development and diversification efforts. For example, centralised agencies overseeing every aspect of national development, holding and governing SOEs, and state funding development as in Singapore. Other examples include SEZs that build the infrastructure to attract MNEs as in Singapore and the UAE. These institutional arrangements are associated with the anchoring of unrelated industries.

It is found in the case studies of Singapore, Norway and the UAE, that the institutional collaboration capabilities amongst government, SOEs, SEZs, MNES, LPEs and SMEs are notably emerging as the main underlying institutional factor that enable creation of high complexity related and unrelated

varieties; which Singapore has mastered. These institutionalised collaboration efforts are pursued through dedicated government organisations to coordinate development of industries, implement science & technology programmes, and oversee national and regional innovation systems, and orchestrating pathways to diversification. These institutional collaborations are found to enable accumulation of knowledge, consequently are associated with the creation of complex unrelated varieties, as with the biomedical cluster in Singapore.

The consolidated findings from the two empirical projects are six findings. First, institutional capabilities range from the simple form of formulating industrial policies as in the UAE, to the restructuring programmes of Norway, to the national and regional innovation systems of Norway, to the science and technology policies and programmes of Singapore, to the complexity of institutional collaboration capabilities of Singapore to coordinate the development of targeted sectors e.g. biotech cluster among local and international economic actors.

Second, the increased level of institutional capabilities is associated with increased complexity level of products and industries that demand complex varieties of knowledge.

Third, basic capabilities and knowledge are associated with indigenous industries that are created by SMEs and LPEs.

Fourth, anchoring diversification mechanisms are driven by SOEs and MNEs creating simple complexity of unrelated varieties of products and industries that are associated with simple capability and knowledge.

Fifth, branching diversification mechanisms are driven by SMEs to create complex varieties of related and unrelated products and industries that are associated with complex institutional environment capabilities and knowledge.

Finally, clustering by SEZs around SOEs and MNEs to create high complex varieties of unrelated industries is conditioned by high level of capabilities, in particular institutional collaboration capabilities to accumulate complex varieties of knowledge. In a sense, “institutional capabilities underpin diversification

mechanisms and determine relatedness and complexity of diversification outcomes”.

Table 7: Contribution to Practice: Strategic Pathways to Diversification

		Complexity of Diversification Outcomes	
		Simple Complexity Varieties	High Complexity Varieties
Relatedness of Diversification Outcomes	Unrelated Varieties	<p>Anchoring Strategy</p> <ul style="list-style-type: none"> ▪ Formulate industrial policies & strategies for targeted industries ▪ Establish robust governance of SOEs through boards or centralised agencies ▪ Invest in infrastructure i.e. ports, airports, telecom and utilities to attract MNEs to anchor capital intensive industries ▪ Promote anchor industries regionally and globally ▪ Pursue public private ventures for advanced industries to accumulate knowledge and capabilities ▪ Capitalise on comparative advantage of anchor industries e.g. energy sources ▪ Establish linkages between SOEs and SMEs through e.g. local procurement content ▪ Build innovate capabilities through centre of industrial excellence by anchor firms 	<p>Clustering Strategy</p> <ul style="list-style-type: none"> ▪ Invest in building the infrastructure including logistical hubs ▪ Invest in cluster based R&D and innovation programmes ▪ Develop highly educated workforce relevant to the clusters ▪ Formulate and implement science and technology programmes on the targeted or promising clusters ▪ Develop government equity financing ▪ Build highly effective institutional collaboration among economic actors to link R&D, innovation, science & technology programmes to maximise benefits
	Related Varieties	<p>Indigenous Creation Strategy</p> <ul style="list-style-type: none"> ▪ Restructuring programmes ▪ Exploit comparative advantage ▪ Training programmes to build knowledge of small firms ▪ Regional development agencies to support industries ▪ State funding of small businesses ▪ Promote external investment 	<p>Branching Strategy</p> <ul style="list-style-type: none"> ▪ Promote non-regional and international collaboration to increase R&D investment and research ▪ Enable access to finance ▪ Focus on competitive business environment

1.4.8 Strategic Pathways to Diversification

The prevalent argument in the propositions, elements, matrix and framework of this research is that economic diversification is a complex process. There are different pathways to diversification. These are dependent on regional context, economic actors, institutional capabilities and desired diversification outcomes. It is therefore suggested that 'integrated platform strategies' or as (Cooke, 2007; Cooke et al., 2007; Ashiem et al., 2011; Cooke, 2012) call these 'integrated platform policies' would be required for regional development. In this section, integrated platform strategies for the creation of new paths for growth and diversifications are presented below and summarised in Table 7. The objective is to provide policy-makers with a set of strategic pathways to diversification, based on the path creation model that integrates context, actors, factors, mechanisms, and outcomes. The aim is not to prescribe a specific strategy for a region, but rather, for regions or countries to pursue different and concurrent pathways for diversification, depending on the desired diversification outcomes to be achieved. It is moreover suggested that these strategic pathways to diversification are not only applicable to coordinated market economies, but as well as liberal market economies that desire for example to jump start new industries, or branch new related industries or clusters around large enterprises.

Indigenous creation strategy

In cases of regions that are endowed with abundance of natural resources, the creation of indigenous industries is one of the basic forms of economic development and growth. These regions may face a dilemma while these indigenous industries generate growth, the dependency on natural resources is high and the accumulated knowledge typically associated with natural resources is simple, moreover basic institutional capabilities are typically associated with such regions. Consequently, the creation of new complex varieties of knowledge and industries is difficult. There are limited options to be pursued in the absence of major economic transformation programmes. The restructuring of these indigenous industries for example to adapt new technologies in order to improve processes will increase efficiency and

productivity. Government may support small scale industries serving these indigenous industries. It may be sufficient to capitalise on the comparative advantage of these local endowed industries i.e. it offers cheap resources as an incentive for the creation of related products, rather than large scale industries. The establishment of regional development agencies to oversee restructuring programmes, fund, support, and promote related industries is essential. This is not only to enable growth, but also to set the foundation to accumulate knowledge and capabilities to branch complex varieties of related industries, as well as support the creation of unrelated industries that serve these indigenous industries. The collaboration among these small scale indigenous industries and new related industries, is particularly important for upgrading and branching related technology e.g. fishing, ship building, small engines firms and vessels manufacturing as the case of Norway. In a sense, in the context of path dependence on natural resources, and limited accumulated knowledge and capabilities of a region, governments may pursue restructuring programmes through regional development agencies that fund and support existing indigenous industries, and establish collaboration among small scale firms to create related knowledge, technologies and products serving ingenious industries.

Anchoring diversification strategy

However, regions evolve over time, while they do not abandon indigenous products, they add new products (Hausmann and Hidalgo, 2010) that are related and unrelated to path dependence conditions with varying degrees of complexity, through the deliberate actions of economic actors to anchor, branch and cluster new products and industries. In cases where capability is not present, and a region desires to transform the economic productive structure away from their path dependent capabilities towards new and complex products and industries, then, direct government intervention is essentially required to anchor new unrelated industries and coordinate the accumulation of associated knowledge and capabilities. The interventions undertaken by the government could include providing the platform to 'anchor' these unrelated varieties

through the establishment of SOEs as nucleolus of new low complexity unrelated varieties. The government could also support LPEs through for example enabling access to industrial lands, and local content procurement regulations to create mainly related, but in some cases, low complexity unrelated varieties. Moreover, building the infrastructure (utilities, telecommunication, transportation, and logistics services) is essentially required to attract MNEs to anchor high complexity of unrelated varieties. The range of institutional capabilities could include national and industrial development strategies and policies that define priorities and targeted industries. These should be coupled with the institutional arrangement that focuses on implementing these policies e.g. a single agency overseeing SOEs or a public-private board based governance of SOEs. This type of a region would typically be equipped with limited innovation capacity and if innovation capacity exists of some sort, it will be concentrated within the SOEs. This however should enable radical innovation within the targeted industry on availability of innovation capacity through the centre of industrial excellence established by anchor firms. These SOEs could alternatively pursue public private partnerships with MNEs to anchor and accumulate new knowledge and capabilities. The government could further capitalise on the comparative advantage offered by anchored capital intensive firms, particularly those that are related to natural resources e.g. offering cheap energy sources to support creation of industries related to the anchor firms. It is recognisable that government will focus on promoting products of anchor firms, however, the establishment of linkages between SOEs and SMEs through e.g. local procurement content is fundamental to the growth of anchored industries, for others, they become an island by themselves and vulnerable to fluctuation of global commodity prices. Consequently, the anchoring approach offers high growth potential, however, it introduces vulnerability to the economy due to high dependence on basic products. Moreover, it does not provide the thriving environment for SMEs to start up and branch related products and industries that sustain growth and enable diversification. In a sense, in the context of path dependence on natural resources, and limited accumulated knowledge and capabilities of a region,

governments may pursue the establishment of SOEs, support LPEs or attract MNEs to anchor new unrelated industries that are typically of low complexity. Success is dependent on capitalising on comparative advantages and accumulating innovation capacities within anchor firms and establishing linkages with SMEs to enable branching and clustering of industries around anchored firms.

Branching diversification strategy

The branching of new industries is the most recognised approach for growth and diversification in existing literatures as discussed above. The main argument in brief, is that “regional diversification will predominantly be related diversification” (Neffke et al., 2014), regions branch into related varieties or industries (Frenken et al., 2007) or related capabilities and knowledge (Hausmann & Hidalgo, 2010). Therefore, new paths emerge in the context of existing path dependence conditions and accumulated capabilities, which can be “existing structures, and paths of technology, industry and institutional arrangements” (Martin, 2008:186). Branching is one form of development that occurs through the self-organising process in liberal market economies, however, for some countries it is coordinated deliberately to trigger the branching of targeted industries as experienced in Singapore and Norway. This mechanism is highly conditioned by the business environment. Therefore, the institutional capabilities associated with the branching diversification are mainly focused on establishing the institutional environment for SMEs to grow and spinoff to generate complex varieties of related products and industries. These include laws and regulations, ease of doing business, access to finance, labour mobility, free trade agreements, and educated workforce. However, as these regions will be primarily driven by SMEs, they benefit from non-regional and international collaboration to increase the level of R&D investment and create linkages with research institutions outside the region. While self-organising of these firms into a form of cluster may evolve in time, such regions may opt to deliberately provide infrastructure and collaboration institutions to agglomerate into a cluster to extend the varieties and complexities of these industries.

Clustering diversification strategy

The clustering diversification strategy is becoming a dominant trend in many regions that provides higher opportunity value to generate complex varieties of related and unrelated products and industries. There are different forms of clustering. It could be formed around an anchor SOE, LPE or MNE, or triggered by infrastructure based SEZs, or through self-generating agglomeration of firms in a geographical location. In cases where embedded capability and knowledge is complex, a region can move into complex unrelated varieties of products and industries through clustering. It is found that the complexity of institutional capabilities is increased with the clustering mechanism to create complex varieties of unrelated products and industries.

The clustering around an anchor is an extension of the anchoring mechanism, and it is highly dependent on the success of the anchor firm, its innovation capacity and support and collaboration with SMEs. The binding local procurement requirements provide a platform for starting up SMEs, however, of crucial importance is the national and regional innovation system around the anchored industries. Therefore, the building innovation capacity within the anchor firm is critically important to stimulate the generation of the downstream complex variety of product industries. These efforts would need to be triggered and supported by policy-makers and government influenced funded research institutions. The provision of infrastructure through SEZs accompanied by comparative advantages and enhancement business environment to attract MNEs by itself is not sufficient. The institutional collaboration around science and technology programmes for targeted industries is essentially required to capitalise on the knowledge embedded in MNEs. In a sense, in the context of a region that anchored capital intensive industries through SOEs and LPEs or building infrastructure to attract MNEs to grow a targeted industrial cluster, government would be required to build a complex set of institutional collaboration capabilities to coordinate the creation of the cluster. Typically,

these collaborations are coordinated through dedicated organisations that link various economic actors, including research, development and innovation institutions. The clustering approach is mainly associated with the creation of complex products and industries that are unrelated to existing economic structure. It is also an approach pursued by countries to advance their economies towards global technological frontiers.

Regions evolve over time, they do not abandon their existing products, and instead, they create related products. However, as regions accumulate knowledge and capabilities, they anchor new unrelated products and industries, and as economy advances towards technological frontiers the highest opportunity value comes from investing in R&D and building innovation capacity that can be capitalized through establishing complex set of institutional collaborating capabilities that cluster firms, products, industries and institutions to generate complex varieties.

The application of the path creation model goes beyond government controlled economies. It can be applied to liberal market economies where a government may desire to develop new unrelated industries or an industry in a peripheral region. This in a way provides a guide for government to determine which diversification strategies to pursue to realise the desired outcomes, taking into consideration the accumulated knowledge and capabilities to be developed over time. The role of strategies and policies matter, however, what is crucial is that institutions for collaboration that create linkages, collaboration and coordination among economic actors to build knowledge and capabilities such as innovation capacity, are instrumental for creating new paths for growth and diversification.

1.5 Conclusions

This doctorate research explores the pathways to diversification. It follows the modular structure of DBA for Cranfield School of Management. It consists of three research projects and a linking document. First, the systematic literature review surveys and maps the research field of interest i.e. evolutionary economic geography, institutional economic geography, path dependence and path creation. It generates a set of preliminary theoretical propositions and a

basic model for path creation. Second, the single case study on the UAE is a rich case based dataset study that includes interviews and focus groups. It generates the first set of the empirical propositions and provides a conceptual path creation framework and matrix. Third, the qualitative research is extended to explore three cases of diversifications (Singapore, Norway and the UAE) through the synthesis of published cases. It generates the second set of refined propositions, framework and matrix that theorise and conceptualise the creation of new paths for growth and diversification. In this linking report, the findings of the three stages are summarised and integrated to construct the path creation model (Figure 10) composed of propositions, elements, a framework, and a matrix that provides new understanding on pathways to regional diversification. This research contributes to theory, methodology and practice as illustrated in Table 8 and summarized in the following sections.

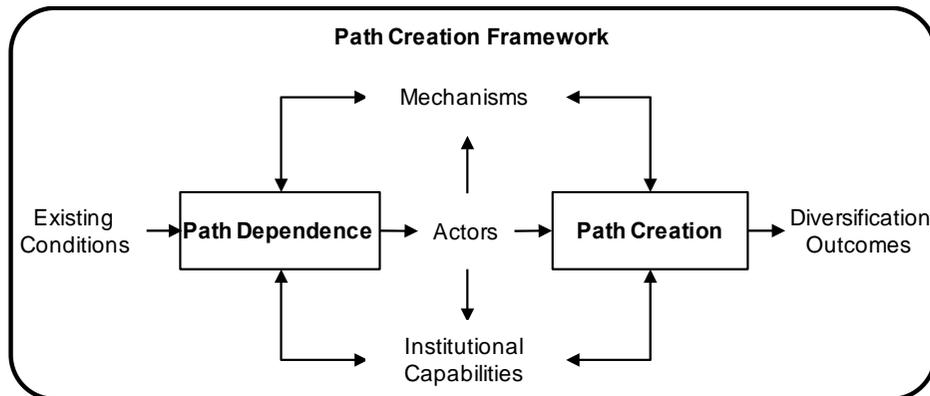
1.5.1 Contribution to Theory

This research contributes to theory in different ways. It builds on existing literature and integrates existing disparate theoretical foundations of evolutionary economic geography, institutional economic geography, path dependence, path creation, technological and industrial relatedness, and economic complexity into a unified path creation model that provides a better understanding on creating new pathways for regional diversification.

Table 8: Summary of Research Contributions

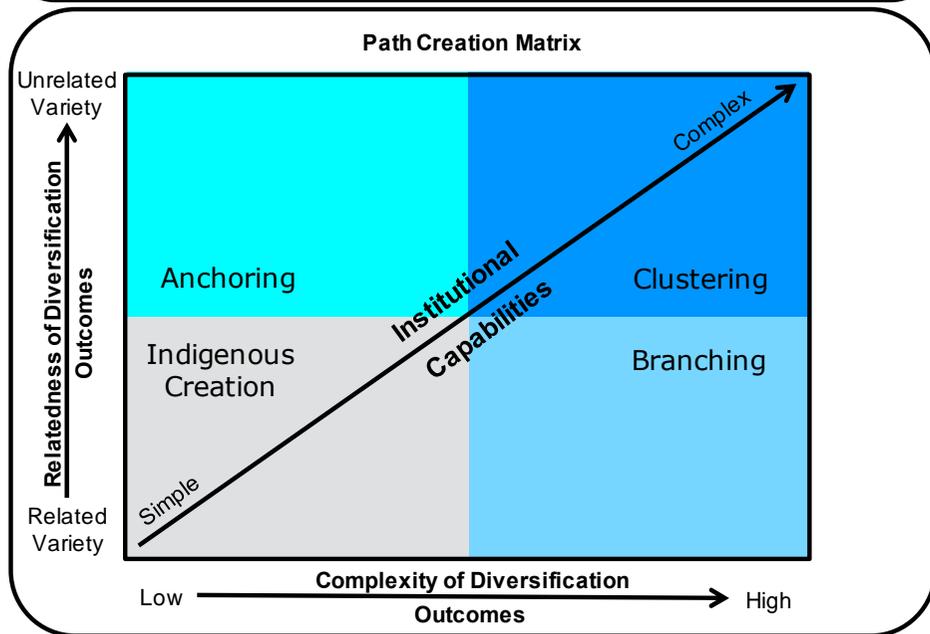
	Existing	Contributions
Theory	Existing literature on evolutionary economic geography is focused on path dependence and recently on relatedness and path creation	<p>This research contributes to evolutionary economic geography. It integrates path dependence, path creation relatedness and economic complexity into a unified framework.</p> <p>It formulates a set of propositions as follows:</p> <p>Proposition 1: The context of path dependence and existing conditions underpins the diversification mechanisms and impacts on the relatedness and complexity of diversification outcomes</p> <p>Proposition 2: New paths for diversification are created through indigenous creation, anchoring, branching, and clustering path creation mechanisms that are associated with the relatedness and complexity of diversification outcomes</p> <p>Proposition 3: Relatedness and complexity shape diversification outcomes</p> <p>Proposition 4: Institutional capabilities enable accumulation of knowledge, underpin diversification mechanisms and determine relatedness and complexity of diversification outcomes.</p> <p>Proposition 5: Economic actors drive diversification mechanisms depending on institutional capabilities to create complex varieties of related and unrelated diversification outcomes</p> <p>Proposition-6: Accumulated knowledge is an underlying factor for path creation</p> <p>It consolidates propositions into one overarching proposition that</p> <p>“In the context of path dependence and existing conditions of a region, economic actors undertake measures to influence the institutional capabilities, to accumulate knowledge and to trigger indigenous creation, anchoring, branching,</p>

	Existing	Contributions
		<p>and clustering diversification mechanisms, in order to create complex varieties of related and unrelated diversification outcomes”</p> <p>Moreover, institutional collaboration capabilities are found to be instrumental in the accumulation of regional knowledge and determining the relatedness and complexity of regional diversification outcomes</p> <p>Furthermore, it constructs a path creation matrix that establishes the dynamic interrelationships between elements of the framework</p> <p>These propositions, elements, framework and matrix constitute the constructs of the path creation model, shaping the pathways to diversification</p>
Methodology	Quantitative	This research suggests a methodological approach to analyse regional economic diversification, based on the constructed path creation model that integrates context, actors, institutional capabilities, mechanisms and outcomes
Practice	Existing literature calls for developing integrated platform policies for regional development	This research provides government organisations with different set of strategies based on the path creation model. The heart of the strategies are the institutional capabilities, in particular, institutional collaboration capabilities to create and accumulate knowledge consequently influencing economic growth and diversification towards complex industries



Main Path Creation Proposition

“In the context of path dependence and existing conditions of a region, economic actors undertake measures to influence the institutional capabilities, to accumulate knowledge and to trigger indigenous creation, anchoring, branching, and clustering diversification mechanisms, in order to create complex varieties of related and unrelated diversification outcomes”



Path Creation Elements

Context	Existing and Path Dependence Conditions
Economic Actors	Government, SOEs, LPEs, MNEs, SMEs
Strategies	The strategies and policies undertaken by government to pursue pathways to diversification
Institutional Capabilities	Policy Making, Institutional Environment and Institutional Arrangement, Institutional Collaboration
Mechanisms	Indigenous, Anchoring, Branching and Clustering
Outcomes	Relatedness & Complexity

Figure 10: The Path Creation Model

The Path Creation Model

The propositions, elements, framework, and matrix generated in the three projects are consolidated into a unified path creation model (Figure 10). It conceptualises regional diversification and provides a new understanding on creating new pathways to diversification. It significantly augments existing evolutionary economic geography thinking on theorising the complex and heterogeneous nature of emergence and evolution of regional economies. It articulates six propositions and one overarching proposition that integrates the elements of the path creation framework and theorises regional diversification (Table 8). It theorises on the creation of new paths, stating that “In the context of path dependence and existing conditions of a region, economic actors undertake measures to influence the institutional capabilities, to accumulate knowledge and to trigger indigenous creation, anchoring, branching, and clustering diversification mechanisms, in order to create complex varieties of related and unrelated diversification outcomes”.

The Path Creation Elements

This research defines key elements for the creation of new paths for growth and diversifications i.e. context, actors, institutional capabilities, strategies, mechanisms, relatedness of diversification, and complexity of diversification that constitutes the model, framework and matrix for path creation (Table 9). The research moreover defines four categories of underlying institutional capabilities for the creation of new paths for growth and diversification. These are policy-making, institutional environment, institutional arrangement and institutional collaboration. The institutional collaboration capabilities are found to be instrumental in accumulating knowledge and determining the pathways to diversification.

Table 9: Path Creation Elements

Elements	Description
Context	Existing conditions and path dependence conditions
Actors	Government, State Owned Enterprises, Large Private Enterprises, Small-Medium Enterprises, Multinational Enterprises
Strategies	The strategies and policies undertaken by government to pursue pathways to diversification
Institutional Capabilities	The institutional arrangement, institutional environment and institutional collaboration
Diversification Mechanisms	Indigenous creation, anchoring, branching and clustering mechanism to create new paths for growth and diversification
Outcomes	The relatedness and complexity of diversification

Path Creation Framework

This research interprets and constructs a path creation framework for economic diversification. It significantly extends existing frameworks in literatures that theorise regional development, which are solely based on path dependence towards a path creation framework. The framework addresses the context of path dependence conditions and integrates economic change (Figure 10). This includes path creation, the actors that make the change, the mechanisms of change, and the institutional capabilities that are instrumental for enabling the change. It further recognises that these elements are interrelated and are in continuous interplay determining the different pathways to diversification.

Path Creation Matrix

One of the salient contributions is the development of a path creation matrix that establishes the relationships between relatedness & complexity of

diversification outcomes and other elements of the path creation framework. The relatedness and complexity defines the diversification outcomes which are associated proportionally. The heart of the matrix is a set of institutional capabilities that shape the pathways to diversification, depending on the diversification mechanisms and diversification outcomes pursued by regions. It suggests that as the complexity of institutional capabilities increases, the complexity of related and unrelated varieties of products and industries generated are increased. It also suggests that the different diversification mechanisms generate different diversification outcomes, depending on the complexity level of the institutional capabilities.

1.5.2 Contribution to Practice

This research contributes to the practice of policy-making and strategizing economic diversification. The path creation model sets a foundation for the formulation of integrated platform strategies on pursuing strategic pathways to diversification, taking into consideration regional context, institutional capabilities, complex varieties of related and unrelated products and industries to be achieved. These in a way embrace an integrated and collaborative approach towards mobilising various economic actors on building institutional capabilities, such as investment promotion, science & technology programs, research & development, state funding, innovation capacity that are instrumental for determining the pathways to diversification.

1.5.3 Contribution to Methodology

Existing literatures on evolutionary economic geography are predominately based on quantitative research. In this qualitative research, the resulting path creation model with its propositions, framework, matrix, and elements provides a methodological tool that can be pursued by researchers to explore regional development. It is suggested that the constructs of the path creation framework are applied as a methodological approach to synthesise regional development. The prescriptive knowledge of linking context, actors, factors, mechanisms and outcomes can be extracted from previously published research of regional cases. The logic is as follows: “in the context of path dependence and existing

conditions of a region, economic actors undertake measures to influence the institutional capabilities to accumulate knowledge and to trigger indigenous creation, anchoring, branching, and clustering diversification mechanisms, to create complex varieties of related and unrelated diversification outcomes". The aim would be both to understand historical regional diversification pathways and design a set of strategies to pursue future pathways to diversification.

1.5.4 Opportunities for Further Research

The main limitation of this research is that it does not include countries or regions that represent market-coordinated economies. However, the main goal for this research is to inform policy makers of government-coordinated economies on the strategies to create new paths for growth and diversification, thus building the institutional capabilities to coordinate economic development. Yet, despite distinct differences between coordinated market economies and liberal market economies, the synthesised knowledge of this research can be utilised for different types of economies to create new paths for regional development e.g. anchoring new industries in peripheral regions and clustering of industries around large private enterprises.

The path creation model opens up opportunities to explore the different pathways to diversification, pursued by not only coordinated market economies but also liberal market economies. The institutional collaboration capabilities and its underlying objective to accumulate knowledge and determine diversification outcomes emerge out as a new research area to be explored further within evolutionary economic geography. The typology of institutional collaborations could be defined to enhance our understanding on their application to different contexts of regional economies. Moreover, typology of knowledge, such as architectural, and component knowledge though was briefly surveyed in SLR, it could be further examined to establish the relationships between institutional collaboration and knowledge that determine the different pathways to diversification.

2 PROJECT-1 SYSTEMATIC LITERATURE REVIEW

2.1 Abstract

A fundamental research question in regional economic development is "Why are some countries able to diversify into new products, new industries and new clusters, while others continue to face challenges to diversification?" This research provides a critical review of the emergence and evolution of regional economies from the theoretical perspectives of evolutionary economic geography, institutional economic geography, knowledge-based view, path dependence, and path creation, as five essential foundation concepts to understanding the diversification of regional economies. Capability, knowledge, proximity, relatedness, and variety are presented as underlying factors for the emergence and evolution of regional economies. Further, the importance of capability and knowledge is threefold; first, it determines path dependency; second, it defines diversity; and third, it conditions the creation of new growth paths. However, regional economies undertake different pathways in transforming the structure of their economies depending on existing accumulated capabilities and knowledge that are embedded within institutions, firms, products and industries. Therefore, the nature and mobility of knowledge embedded within a regional economy, e.g. component or architectural, embodied or disembodied, simple or complex, determines the branching mechanism of firms, products and industries hence the emergence and evolution of regional economies. The role of institutions matters in establishing the path dependence phenomenon and conditioning creation of new paths for diversification of regional economies; however, the specific role and mechanism remain unanswered in the literature. This paper concludes by pronouncing the implications for policy makers and a future research agenda that focuses on the role of institutions in the creation of new paths for growth diversification that have not been addressed yet by existing literature.

2.2 Introduction

A fundamental research question in regional economic development is "Why are some regional economies able to diversify their economies into new products, new industries and new clusters, while others continue to face challenges to diversification?" The

study of regional development is a challenge due to the complex dynamics and mechanisms, diversity of actors, and wide range of factors that shape the development trajectories of different regions. Consequently, the answer to the fundamental research question has been attempted from different perspectives. Literature on modern economic development is dispersed through fields of economic geography, clusters, institutions, products, industries, competitiveness and innovation; although commonalities are shared among these fields, they are entrenched in different ontological and epistemological propositions that do not offer a unified framework for the evolution of economic development, which explains the difficulty of theorizing the evolution of regional economies. In order to articulate the different trajectories of regional economies, a heterodox economics approach would need to be applied taking into consideration the interplay between various factors and actors shaping regional economies.

The main interest of this doctoral research is the role of institutions in the emergence and evolution of industrial clusters, in particular the creation of new paths for regional economic growth. There are three challenges to be addressed in this research agenda. First, an alternative presentation of change in the regional economic system is needed whereby firms, institutions, services, products, industries and clusters emerge and evolve concurrently, while factors such as capability and knowledge, proximity & relatedness, and diversity & variety are underlying drivers for change that determine path dependence and condition path creation. Second, regional economies undertake different pathways in transforming the structure of their economies, depending on the accumulated capabilities and knowledge that are embedded within firms, products and industries; thus the process and mechanism of diversification and creation of new growth paths would need to be pronounced in order for policy makers to understand their implication for regional development plans. Third, the role of institutions (of particular interest is state-owned institutions and enterprises) would need to be articulated and framed in order to accentuate their impact on shaping new growth paths within the context of some regional economies.

This systematic literature review (SLR) of the role of institutions in the diversification of regional economies is based on evolutionary economic geography, institutional

economic geography, diffusion and mobility of capability and knowledge, path dependency, and path creation as five essential theoretical foundations to understand the diversification of regional economies. This research paper is structured within five sections. First, theoretical positioning is discussed. Second, the methodology and process of SLR are presented. Third, descriptive findings are analysed, including characteristics of selected articles based on distribution of papers by journals, and key factors, actors, concepts and themes. Fourth, conceptual findings are detailed where theoretical foundations, underlying factors for economic change, and the role of institutions are explored. Fifth, the conclusion, policy implications and future research agenda are presented.

2.3 Theoretical Positioning

Human civilizations grew from domesticating plants and animals, to making garments, to manufacturing and electronics, where new products emerge and evolve over time. However, countries have followed different paths to navigate through the product space, exploiting what is available and creating new products that did not exist earlier. “As countries become more complex, they become more diversified; they add more products to the export mix without really abandoning the products they started with” (Hausmann & Hidalgo, 2010). However, only advanced economies and a few developing countries have been able to transform their economic productive structure over the past four decades (Hidalgo, 2009). A fundamental research question in economic development is then “Why are some regional economies able to diversify into new products, industries and clusters while others continue to face challenges to diversification?”

The answer could rest on the new paradigm of evolutionary economic geography (Martin & Sunley, 2006; Boschma & Frenken, 2011) as a foundation concept where the emergence and evolution of clusters are central to theorizing the changes of regional economies. However, the approach is challenging; as there is no clear analytical framework for developing theory around evolutionary economics (Dopfer & Potts, 2004:195) but rather various approaches and concepts around evolutionary economics (Martin & Sunley, 2006:396). On the other hand, evolutionary economic geography is

about “the uneven distribution of economic activity across space” (Boschma & Frenken, 2011:296) that results from specific contextual, spatial, and historical activities of a location which, in a sense, provides a general theory of change within a specific context, space and time (Boschma & Frenken, 2011:295). The complexity and dynamics of regional economic development have resulted in researching it through different perspectives and fields due to the diversity of actors, and wide range of factors that influence and shape development trajectories of different regions. The perspectives of firms, products, and industries, and the fields of industrial districts, clusters, technological change, and innovation systems, stand out among other research agendas, such as institutions addressing regional development trajectories, but the different perspectives and body of fields remain fragmented and do not converge into one theoretical framework.

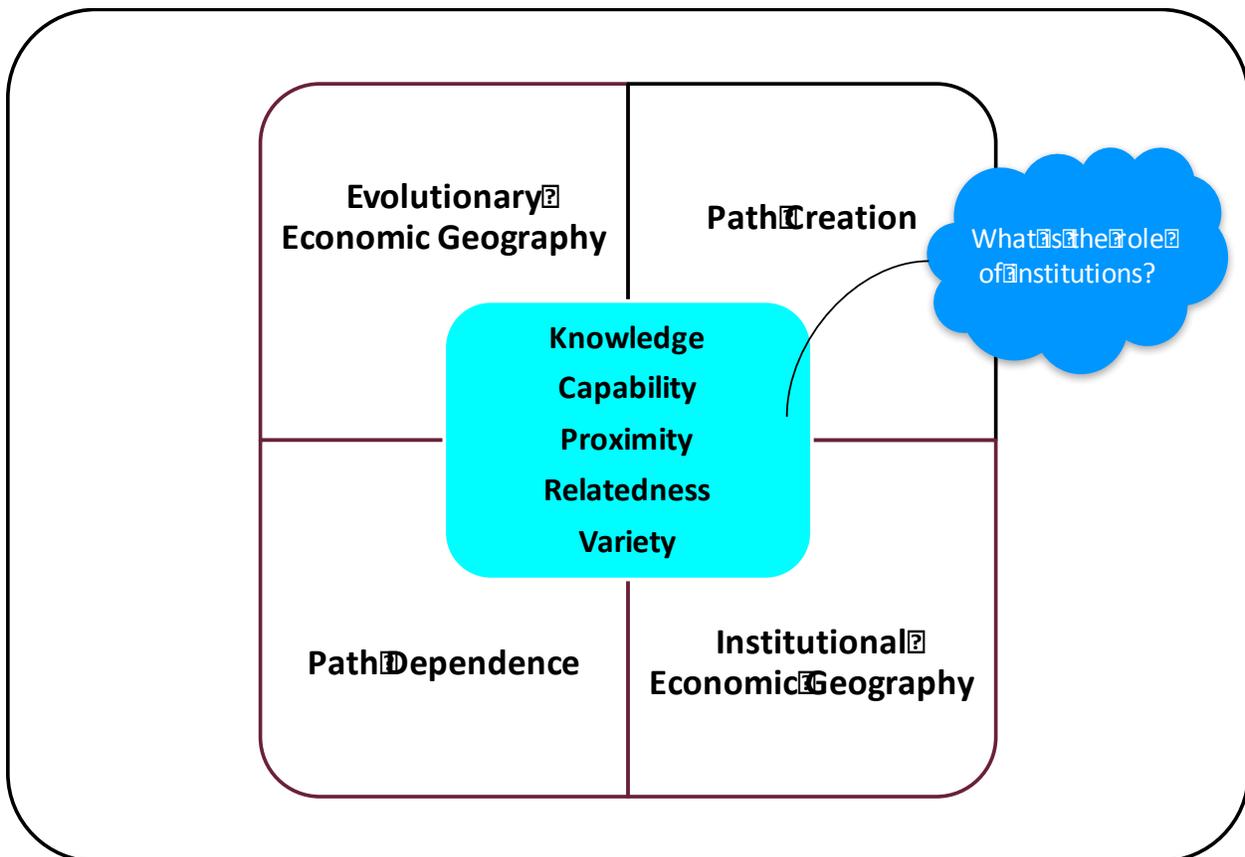


Figure 11: Project-1 SLR Literature Domains

The underlying argument of this research is that economic action is a process, situated in time and place (Martin, 1999; Bathelt & Gluckler, 2003) undertaken by economic

agents embedded in societies that influence trajectories of regional economies, particularly the emergence and evolution of institutions, firms, products, services, industries and clusters. The role of institutions as one of key agents in economic change matters for regional development as "there was nothing natural about laissez-faire; free markets could never have come into being merely by allowing things to take their course. Laissez-faire was planned; planning was not" (Polanyi, 1944:139-140 in Gertler, 2010). Further, building on the 'neo-Schumpeterian' school of evolutionary economic theory, "capitalism is an evolutionary process driven by technical and organizational innovation, a process in which social institutions other than market play a major role" (Morgan, 1997). Hence the primacy of institutions and their influence on shaping the trajectories of regional economies make institutions an essential research agenda to be explored in depth. The role of institutions in the emergence and evolution of industrial clusters is navigated through evolutionary economic geography, institutional economic geography, path dependence and path creation, where knowledge, particularly diffusion of capability and knowledge are central underlying factors for change of regional economies, and are the five foundational concepts addressed in this paper, as illustrated in Figure 11.

2.3.1 Industrial Clusters

Ironically, the importance of clustering to evolutionary economic geography is hampered by the loose definitions of clusters. Industrial districts or clusters are considered to be a form of economic development (Piore & Sabel 1984 in Barabel et al., 2007:595). There are different definitions for clusters in the literature depending on the unit of analysis (i.e. firms, industries, regions, industries), and probably ontological and epistemological biases that are beyond the scope of this paper. It is defined as "small territories in which a high concentration of specialized independent companies within the same sector embark upon long-term cooperation, often on a fairly informal basis, founded on relationships of solidarity and trust between the members within the district and with the support of local institutions such as universities, industry, politicians, or trade associations" (Dei Ottai, 1994; Pyke, Becattini & Sengenberger, 1990 in Barabel et al., 2007:595). Additionally industrial clusters are characterized by an "abundance of local productive knowledge, strong institutions, and a culture that facilitates cooperation

leading to enhanced information flow and lower transaction costs" (Whitford, 2011:41 in Barabel et al., 2007:597), and "considerable gains in productivity typically flow to firms from this localized concentration of many different suppliers and buyers" as "geographical concentration lowers the costs of transactions, raises the probability of successful matching for all parties and allows for the establishment of mutual confidence between partners in business relationships" (Scott and Storper, 2003:583 in Barabel et al., 2007:597). "Social networks and proximity create a dense atmosphere for the diffusions of role models that lead to a self-reinforcing process (Barabel et al., 2007:597), "they facilitate the transfer of tacit and specialized knowledge" (Lechner and Dowling, 1999 in Barabel et al., 2007:597). This research takes the view that the definition of clusters should reflect the adaptive and complex nature of a cluster system (Martin and Sunley, 2011), and different levels of existence. Therefore, clusters are defined herein as a group of firms located in close proximity to each other in a geographical location that are networked across products (the product space of Hidalgo et al., 2007) and industries (industrial districts, or industry space of Neffke et al. (2011 a & b) where technologies (technological district), innovation (innovation milieu), and institutions play underlying roles in shaping the development of regional economies. In a sense, regions are composed of institutions, firms, products and industries; this paper distinguishes between four types of space, i.e. institutional space, firm space, product space and industry space which collectively are called herein a "regional economic system". Further, an industrial cluster is a level of existence that is composed of its own institutions, firms, products and industries.

The concept of 'Industrial Districts' pioneered by Alfred Marshall (1920) and Becattini (1990) which evolved into 'Industrial Cluster' by Michael Porter (1990), provided the foundation for understanding regional development. Marshall (1920) introduced the concept of industrial districts based on agglomeration economics or a concentration of firms where firms take advantage of the externalities of being located in a geographical location and in close proximity to other firms to expand their knowledge base through access to human resources by recruitment, access specialized suppliers and exchange of technical knowledge. The Marshal-Arrow-Romer (MAR) developed further the 'knowledge spillovers' by observing that the proximity of firms within a location enables

knowledge spillovers among firms compared to firms located outside the geographical location. In a sense, proximity of firms generates 'untraded interdependencies' (Storper, 1995) which explains the emergence of 'knowledge spillovers' as an underlying factor for innovation and competitive capabilities hence the growth of industrial clusters and cities. Jacobs (1969) further expands the discussion to introduce the 'economies of cities', underscoring the importance of cities to provide the platform for labour mobility and innovation, thus enabling growth. However, the approaches of the agglomeration of firms, inter-firm relationships and untraded interdependencies have critical limitations. First, the agglomeration of firms creates a locked-in environment to related knowledge and technology accumulated and embedded within products and services generated within a geographical location; hence, firms may find it difficult to deal with external changes, such as radical technical change (Grabher, 1993; Molina-Morales, 2005), that generate unrelated knowledge, hence new products and services. Second, it cannot account for creating or adopting radical technological and innovation changes by institutions and enterprises that are unrelated to existing and accumulated knowledge. Third, it cannot explain the different trajectories for regional development where economic agents other than firms such as institutions influence the mechanism of economic change.

Having said that, Economic Geography, which represents the thinking of industrial districts, agglomeration economics and clusters, has created a major paradigm shift in economic thinking out of mainstream economics to explain regional economic development. The field of economic geography has been subjected mainly to three different theoretical paradigms; these are New Economic Geography (NEG), Institutional Economic Geography (IEG) and Evolutionary Economic Geography (EEG), which make these fields multidirectional and multidisciplinary. It would therefore be a difficult task to systematically review and synthesize these fields entirely; hence, the focus of this paper is on linking NEG, IEG and EEG to the economic development of regions through a knowledge-based view, path dependency and path creation.

2.3.2 New Economic Geography

NEG is the application of neoclassical micro-economics theory of equilibrium models in economic geography, which aims to explain regional or geographical changes from an

optimizing agent approach whereby rational decisions on utility maximization are undertaken by individual agents or the 'representative agent' (Boschma & Frenken, 2006), and as such place is neutral to regional differences. More specifically, NEG attempts to explain why economic activities are concentrated in certain areas while others remain relatively underdeveloped (Acs & Varga, 2002:134). The answer from the perspective of NEG lies in the general equilibrium model (Krugman, 1993, 1996, 2011; Fujita et al., 2003; Acs & Varga 2002:134) which explains the spatial concentration of economic activities within the interrelations of three parameters: increasing returns to scale in manufacturing production, transport cost, and demand for manufacturing goods, which require passing certain threshold values before any kind of geographic concentration emerges. Further, the location of new firms reinforces these externalities and will attract further manufacturers to the region (Acs & Varga, 2002: 135). Trade cost represents a central theme within NEG as it determines the concentration of firms and workers as local interaction, general scale economies while it increases trade cost between local and far away economies (Martin & Ottaviano, 1999). Further, as trade cost is reduced, labour mobility become yet another essential factor in NEG that influences factors of production and hence the competitiveness of firms.

Storper (2011) further highlights that NEG is principally concerned with production; it considers spatial concentration of economic activity as an endogenous part of the economic process and hence is not dependent on 'first nature geography', such as the uneven distribution of natural resources, climate or proximity to coasts and rivers. Consequently, NEG cannot explain the causality of change as many of the assumptions "are driven by requirements of theoretical consistency rather than from what occurs in the real world" (Storper, 2011:335).

Not only does NEG neutralize the role of place, it abstracts economics from its wider social, political and cultural context (Martin, 1999; Cumbers et al., 2003b); further, institutions play no role in neoclassical models, or do so only in a loose or implicit sense (e.g. relating to particular parameters in the model) (Olsen, 2002). Local institutional and cultural factors are left out of the analysis, because these are not regarded as essential to an economic explanation and should therefore be 'best left to the sociologists', (Martin, 1999).

2.3.3 Institutional Economic Geography

Polanyi (1944:139-140 in Gertler, 2010) states that 'there was nothing natural about laissez-faire; free markets could never have come into being merely by allowing things to take their course. Laissez-faire was planned; planning was not'. In other words, the trajectories of self-regulating markets or economies were influenced by state interventions or 'economic practices shaped by a set of socially produced structures one might call rules' (Gertler, 2010) or set of institutions. In a sense, 'institutions are the rules of the game in a society' (North, 1991); that shape and constrain the behaviour of economic agents (Gertler, 2010); consequently, economic action is shaped by social context (Cumbers et al., 2003b) that influences the trajectories of regional economies. The institutional approach within economic geography calls for the broadening of the field to include institutional, cultural, social factors, and processes in order to understand the economic evolution of regions (Essletzbichler & Rigby, 2007). However, there is a tendency in the literature to neutralize the role of institutions as a result of the neoliberalism paradigm where utility maximization matters most for economies, and a lack of clearly articulated conceptual or theoretical framework of institutions within economic geography (Gertler, 2010), which in effect undermines the impact of institutions on shaping the development of regions. Consequently, economic geographers such as Martin and Sunley (2010) and Boschma and Frenken (2006) introduced the role of institutions or 'institutional turn' in economic geography, where other scholars call for reconstituted institutional economic geography as a field by itself to accommodate interactions among different actors, such as individuals, firms and institutions (Gertler, 2010).

2.3.4 Evolutionary Economic Geography

Societies, regions, institutions, industries, firms, products and services evolve and co-evolve over time due to internal and external forces and factors, and as a result of interlay and interaction between actors. Neither NEG nor IEG can explain the dynamics of change of regions or institutions, from the perspective of utility maximization, as both are of a static nature and what we need is to understand the change or evolution of regions over time; for that an alternative theoretical paradigm is needed. Evolutionary Economic Geography (EEG) that was coined by Nelson and Winter (1982), and Arthur

(1989) may provide a desirable framework as it explains regional economic development from the dynamics of structural change at the level of firms (micro), sectors & networks (meso) and institutions (macro) at multiple territorial levels (Boschma & Frenken, 2006). Further, it is concerned with the process of dynamic transformation of regional economics, where it assumes economic actions are contextual in which it is a satisficing agent approach that puts primacy on the micro-routines of organizations as the actual behaviour and location are determined by accumulated organization routines over time (path dependency) which influence the evolution of real places (Boschma & Frenken, 2006). Hence, EEG reconciles views of NEG and IEG by considering spatial evolution as a dynamic co-evolution process, transforming neutral space into real places including institutions, firms, products and industries. Therefore, the evolutionary economic geography perspective provides a promising pluralist and heterodox platform interpreting evolution of nations and regions. However, EEG is still at the early stage of development and "the central problem of evolutionary economics at present is the lack of a clear analytical framework for evaluating, integrating and developing theory" (Dopfer & Potts, 2004:195) because there is no single, generally agreed or coherent body of evolutionary economics, but rather several different forms and approaches, with different emphases and different conceptual foundations (Martin & Sunley, 2006).

2.3.5 Knowledge-Based View

The diffusion of capability and knowledge is the third foundation concept and sits at the heart of the emergence and evolution of regional economies comprising institutions, firms, products, and industries. The firm space rests on the agglomeration economics of firms in a geographical location. It is constructed around the proximity and relatedness of skilled labour, technical and commercial information, and knowledge spillovers (Porter, 1998, 2003; Ter Wal & Boschma, 2011). Capability (knowledge) is central to cluster theory (Ter Wal & Boschma, 2011), which is embedded in the network of firms and determines changes of clusters. However, only recently, economic geographers attempted to answer the question why some regions diversify and other do not. The evolutionary perspective on clusters is based on the entry and exit of firms in regions (Boschma & Frenken, 2011) and there is very little known on the emergence

and evolution of clusters over time. Further, the role and impact of government institutions, including State-Owned Enterprises (SOEs), on the emergence of new industries is of particular importance but has gained little attention in the literature; however, empirical research on the impact of SOEs on the emergence of industrial clusters is not evident from the literature read so far.

In contrast to firm-based cluster theory; Hidalgo and Hausmann (Hausmann et al., 2007; Hidalgo et al., 2007, Hidalgo, 2009) answer to why countries diversify while others do not; is devised from the productive structure of countries. The product space and economic complexity are conceptual models constructed by Hidalgo and Hausmann (Hidalgo et al, 2007; Hausmann & Hidalgo, 2011; Hausmann et al., 2011), which subsequently led them to the conceptualization of their capability theory (Hidalgo, 2009). The "product space" is a network of clustered products whereby products are highly connected into communities or clusters of products through the proximity and relatedness of capabilities embedded in each product (Hidalgo et al., 2007). The diversity, collectively and multiplicity of knowledge or "capability" embedded in the productive structure determine the "economic complexity" of a country (Hidalgo & Hausmann, 2009), which can be thought of as specific building blocks of economic complexity (Dopfer & Potts, 2004, 2010; Hidalgo, 2009). In a sense economic complexity is a proxy outcome measure for the level of diversification, proximity, and relatedness of a country; further, capability is the main driver for the structural transformation of economies.

On the other hand, Neffke et al. (2011a) approached the question of how do regions diversify from an agglomeration externalities perspective based on industry relatedness. The unit of analysis is an "industry space" whereby a group of manufacturing plants form a "technological cluster" or "clusters of industries" (Boschma et al., 2011, 2012 within a region, that are connected through technological relatedness and technological complementarities. The differential element is that the industry space brings together manufacturing plants and products into one space where capability is embedded in the network of manufacturing plants.

Capability and knowledge matters and the different trajectories undertaken by regional economies could be attributed to innovation capacity (Morgan, 1997); in other words, learning, innovation, and the role of institutions in regional development (Cooke & Morgan, 1994; Amin & Thrift, 1994) become essential factors for understanding the emergence and evolution of regional economies.

2.3.6 Path Dependence

The fourth foundation concept is path dependence theory which rests on heterodox evolutionary and institutional economic geography. It is a critical realist approach that is considered as a "major building block of a new interpretative or epistemological paradigm" (Martin & Sunley, 2006; Martin, 2010). On ontological grounds, path dependence can be used as explanans (that which explains) rather than explanandum (that which has to be explained) (Notteboom et al., 2013) as it is "primarily concerned with uncovering its substantive underpinning mechanisms and empirical instances" to explain regional economic development.

Path dependence is defined by Martin and Sunley (2006:402) as "a probabilistic and contingent process in which at each moment in historical time the suite of possible future evolutionary trajectories (paths) of a technology, institutions, firms or industry is conditioned by (is contingent on) both the past and the current states of the system in question". While the concept of path dependence is plausible, gaps remain unanswered in the literature, i.e. the different types and degrees of path dependence, the meaning of 'lock-in', the role of actors in establishing path dependence, and the phenomenon of creating new paths (Martin & Sunley, 2006:404).

Martin and Sunley (2006) explain that path dependence in economics is framed as a technological 'lock-in' where small, chance events that occurred in the past validate a particular path and condition the future paths of economic technologies, organizations, and systems. This argument is based on dynamic increasing returns resulting from large fixed, initial and set-up costs or dynamic learning effects or coordinating effects or self-reinforcing expectations (Martin & Sunley, 2006); and institutional hysteresis whereby both formal and informal institutions; change slowly over time and are path dependent (North, 1990; Setterfield, 1993). The plausibility of path dependence is

undermined by its lock-in feature, which defines an economic condition that is fixed and inflexible, hence endogenous change is muted; thus, for change to occur, exogenous forces are the only hope for economics to escape the lock-in state (Martin & Sunley, 2006:406) of products and technologies. This argument is, however, problematic in the absence of defining types and degrees of path dependence and that change occurs because of chance events; this paper therefore, takes a different theoretical positioning for this research project.

Grabher (1993) defined three types of lock-in: functional, cognitive and political. Functional lock-in refers to the dominant relations within an industry of economy where specific products and production methods become dominant in an industry. Cognitive lock-in refers to individual and social mechanisms that prevent learning. Political lock-in refer to the institutional and political administration thickness and stickiness that are difficult to change or are slow to change over time.

This paper takes a knowledge and capability-based view of path dependence, and a role or agency-based path dependence approach. Can regard path dependence as the accumulated knowledge and capability embedded in a regional economy where economic agents establish the conditions for path dependence and the creation of new paths for growth and development. In a sense, path dependence explains why certain regions have lock-ins into certain development trajectories due to accumulated knowledge and capability within institutions, firms, products and industries, which condition the creation of new knowledge because of absorption capacity (Cooke, 2002) and the complexity of existing knowledge and capability.

Path dependence is therefore considered to be an underlying factor that conditions the creation of new paths. The current state of regional economies matters in economic development (Hidalgo, 2009) because "at any point in time the state of the economy depends on the historical adjustment path taken to it" (Martin and Sunley, 2006: 400) for that "once a particular pattern of socio-economic development is established, it can become cumulative and characterized by a high degree of persistence or 'path dependence'" (Martin & Sunley, 2003:27; 2006; Martin & Simmie, 2008). Further, the process of economic diversification and branching out into new products, clusters, and

industries is conditioned by path dependence factors, i.e. pre-existing capability, proximity and relatedness (Hidalgo, 2009; Neffke et al., 2011a). The theorizing of path dependence by Martin and Sunley (2006; 2008) is supported by the works of Hidalgo (2009) and Neffke et al. (2011a) that provide empirical evidence on the underlying hypothesis that the current position of countries and regional economies in the product space and industry space determines their future position.

The "knowledge and capability based path dependence" views path dependence as a condition that accumulates a specific set of embedded knowledge and capability that either inhibits or enables the creation of new related or unrelated knowledge and capability, or in other words creates new related or unrelated paths for growth and development. It might be helpful to think of lock-in as one type of path dependence where the degree of path dependence is extremely high due to simple accumulated knowledge and capability, which make it difficult to make a change from within, and thus inhibit novelty and the creation of new paths. On the other hand, regions that are on a path of development that have accumulated complex knowledge and capability are able to create and branch out into new paths for growth and development that are either related or unrelated to existing knowledge and capability by the deliberate actions of economic agents such as firms and institutions as well as globalization and internationalization. The "knowledge and capability based path dependence" is therefore, an alternative building block that interprets and theorizes the emergence and evolution of regional economies.

2.3.7 Path Creation

The conceptualization of path dependence to answer the question, "Why are some regional economies able to diversify into new products, industries and clusters while others continue to face challenges to diversification?" should extend to conceptualize path creation, where the role of economic agents such as institutions and firms become essential for the emergence and evolution of regional economies.

Path creation is a topic that has recently been introduced into the economic geography, which could provide a promising foundation to theorize the emergence and evolution of regional economies, particularly the creation of new related and unrelated capabilities

and knowledge within the context of a particular geographical location as a result of the deliberate action of economic agents such as firms and institutions. In other words, the "knowledge and capability based path creation" could answer why some regions are able to diversify into a new related and unrelated variety of products and industries, how new paths are created, what is creating new paths and where new paths are coming from.

2.4 Methodology and Process

2.4.1 Why a Systematic Literature Review?

The research question for this SLR is "What is the role of institutions in the diversification of regional economies?" The SLR will be conducted based on the theoretical research dimensions of evolutionary economic geography, agglomeration economics, path dependency, path creation, and knowledge-based view. The aim of the SLR is to survey existing literature to identify what are the key theories, concepts, and ideas; what are the key epistemological and ontological grounds for the field; what are the main questions and problems that have been addressed; and identify gaps in knowledge that determine the research question for further research experiments (Tranfield et al., 2003). The SLR is an evidence-based, transparent, unbiased approach that focuses on a main research question in order to identify, appraise, select and synthesise relevant and quality literatures in a defined area (Tranfield et al., 2003).

2.4.2 The Systematic Literature Review Process

The SLR process includes the following

- Forming an SLR panel
- Surveying and identifying the literature through a systematic search methodology that includes strategy, selection criteria, and evaluation quality criteria
- Mapping the field of study by breaking it down into its constituent parts, e.g. research dimensions of evolutionary economic geography, institutional economic geography, path dependency and knowledge-based view; domain factors, e.g. capability and knowledge; and economic agents of change, e.g. institutions

- Evaluating the literature: this includes applying Wallace and Wray's (2011) methodology by addressing questions such as Why am I reading this? What type of literature is this? What is being claimed that is relevant to my research question? To what extent is there backing for claims? How convincing is what the authors are saying? How adequately does any theoretical orientation support claims? To what extent are claims supported or challenged by others' work? In conclusion, what is the summary evaluation of the text in relation to the question and what use can this research make of this?
- Extracting and synthesizing data: this includes 1) extraction of the main data such as citations, context, descriptive information, methodological information, main emerging themes and concepts, and main contribution; and 2) synthesizing across the literature by reframing, reconciling, and representing (Tranfield et al., 2003) the emergence and evolution of regional economies, i.e. products, industries and clusters; and framing the role of institutions in the transformation of underlying factors of diversification, i.e. capability and knowledge, proximity, relatedness, and variety.

2.4.3 The SLR Panel

The SLR panel consists mainly of the research supervisor, systematic review expert and subject matter expert from Cranfield School of Management. Refer to Table 10 below for details.

Table 10: SLR Panel Members

Panel Members	Title & Institution	Role
Professor Mark Jenkins	Cranfield School of Management	Supervisor
Professor. Patrick Reinmoeller	Cranfield School of Management	Panel Chair
Dr. Andrew Angus	Cranfield School of Management	Subject expert and scoping study panel member
Dr. Jonathan Lupson	Cranfield School of Management	Systematic Review Specialist

2.4.4 Search Strategy

The search strategy comprises identification of main themes, key works, search strings and subsequently articles across research theoretical dimensions of agglomeration economics, economic geography, evolutionary economics, institutional economic geography, and paths including clusters and industrial clusters. The databases selected for the SLR are ABI/ProQuest, EBSCO, and Web of Science. Additional sources used mainly included World Bank and OECD (Organization for Economic Co-operation and Development). The search process included the following:

- First, identify keywords and define search strings
- Second, search for articles in data bases (ABI/ProQuest, EBSCO, and Web of Science)
- Third, review title and abstracts and filter relevant articles
- Fourth, conduct content analysis in NVivo 10 and identify keywords, themes, concepts, actors and factors
- Fifth, review full text and apply quality assessment criteria and select relevant articles

Table 11: SLR Keywords and Search Strings

	Keywords	Search Strings	Rationale
Base Literature Domains	Agglomeration Economics, Regional Economics and Evolutionary Economic Geography	"economic agglomeration" OR "economic geography" OR "evolutionary economic" OR "spatial economic" OR "industrial district" OR "business cluster" OR "industrial cluster" OR "local milieu" OR "national innovation system" OR "regional innovation system"	The main field of research is the emergence and evolution of regional economies hence agglomeration economics and evolutionary economic geography are the starting point for generating the base research articles
Institutions, Government and Policy	Institutions, Government, State and Policy	'institution' OR 'government' OR 'state' or 'polic*'	The object of this search string is to identify articles that cover institutions, government and policies within the base search leading to identifying the role of institutions within regional economies
Change of Regional Economies	Diversification change, Transformation, Emergence, Evolution of regional economies	'chang*' OR 'transform*' OR 'reform' OR 'emerg*' OR 'evolution*' OR 'branch*' OR 'divers*' OR 'spillover*' OR "create path*" OR 'learn*'	The main objective is to identify articles that address diversification of regional economies including change, emergence, evolution, development, etc.
Institutional Economics	Institutional Economics	"institutional economics"	This research string is to identify other articles within the field of institutional economics beyond economic geography

Notes

What does diversification mean? A diversification is a measure of economic outcomes which typically refers to the variety and diversity of products and industries. Recently the complexity of export products as articulated by Hidalgo and Hausmann (2009) and the concept of related and unrelated variety, and skills' relatedness are measures of diversification outcomes of regional economies; the common elements among these concepts are capability and knowledge.

Why is innovation included? "Evolutionary thinking has been applied to define and improve existing theoretical concepts in economic geography, such as regional innovation systems (Cooke, 2004) and clusters (Menzel and Fornahl, 2009), to reflect on its implications for regional policy and to explain spatial evolution in new industries" (Hassink et al., 2014).

2.4.5 Search Results

The search strings illustrated in Table 11 were then applied to the three selected databases, which generated the number of articles shown in Table 12. The second search string for institutions, state, government, policy generated 2,403 articles while the third search string produced 2,754 which, when combined, resulted in 3,887 unduplicated articles; in a sense, both fields of knowledge do not share some theoretical dimensions. The total number of articles processed through the SLR including cross-references are 6,537.

Table 12: SLR Search Results

	ABI/ ProQuest	EBSCO	Web of Science	Total (no duplicates)
Base Literature Domains	2086	1460	4650	5845
Base AND Institution	708	689	1754	2403
Base AND Change	992	643	2187	2754
Articles for Reviews				3887
Institutional Economics	747	974	1399	2579
Total Articles for SLR				6438
Cross Referenced				99
Total Articles				6537

2.4.6 Selection Criteria

The selection criteria for articles for inclusion in the SLR are illustrated in Table 13.

Table 13: SLR Selection Criteria

Criterion	Inclusion	Exclusion	Rationale
Publication Type	Scholarly journals	All others	In order to ensure high quality review
Publication Date	All	None	
Journal Ranking	Journals ranked 3 star and above	Journals ranked 2 and below	Many articles on regional economies are generated by local based journals associated with local institutions that may not ensure the quality of research adopted by international associations
Language	English	All others	English is the universal language
Theoretical and Literature Domains	Agglomeration economics, Economic Geography, Evolutionary Economic Geography, Industrial Districts, Cluster Theory, National and Regional Innovation Systems, and Institutional Economics	Social welfare Trade and trade cost Income disparity Environment Housing Income Inequality Poverty Immigrants Markets Population Tax	Emergence, evolution, reform, transformation, growth of regional economies and industries products, as well as role of institutions as the focus of the SLR
Research Type	Theoretical and Empirical	None	All are relevant as a source for body of knowledge
Methodology	Qualitative and Quantitative	None	All methodologies will be considered for the review

2.4.7 Evaluation and Quality Appraisal

The selected papers resulting from the search strategy will be evaluated based on modified quality assessment criteria conducted on SLRs (Denyer, Tranfield & Aken, 2008; Denyer and Tranfield, 2009) as illustrated in Table 14. Articles are scored as low (3), medium (5) and high (9).

Table 14: SLR Quality Assessment

Criterion	Low	Medium	High
Literature Review	Literature review is inadequate	Basic understanding of the issues around the topic being discussed	Excellent review of previous literature
Contribution	The paper adds little to the body of knowledge in this area	Contribution to knowledge is trivial in importance and significance	Significant addition to current knowledge and fills an important theory gap
Theory	No underlying theory base	Theoretical base is not well articulated	Strong theoretical basis
Methodology	The idea of study is poorly executed with inappropriate methods	Justified research design but not fully executed	Strong research design and solid methodological execution
Data Analysis	The data sample is insufficient. Inconclusive findings and weak connection between results and theory	Limited data sample. The results relate to the theoretical framework.	Adequate data sample. Well-explained results and linkage to theory. Includes limitation analysis

2.4.8 Selected Articles

The selection process consists of three main steps. First, the articles resulted from the search strings, amounting to 6,537, were subject to a title and abstract review that generated 457 articles (refer to Appendix-A for a full list of these articles). Second, these articles were processed through NVivo 10 for content analysis; the outcome of content analysis is 225 articles, as summarized in Appendix-A, indicating key actors, factors and themes for each article. Third, applying evaluation and quality assessment

criteria along with content analysis resulted into 112 selected articles (Table 15 & Table 16) and listed in Appendix-A.

Table 15: SLR First Selection Process

Criterion	Number of Articles	Examples of articles
Total Articles for SLR and others	6,537	<ul style="list-style-type: none"> ▪ Hausmann, Hidalgo_2010_Country diversification, product ubiquity, and economic divergence ▪ Neffke, Henning_2014_Skill Relatedness and Firm Diversification ▪ Dale_2002_An Institutional Approach to Local Restructuring The Case of Four Norwegian Mining Towns ▪ Perez-Aleman_2005_Cluster formation, institutions and learning the emergence of clusters and development in Chile
Outcome of titles and abstract assessment	457	<ul style="list-style-type: none"> ▪ Camisón, Forés_2011_Knowledge creation and absorptive capacity The effect of intra-district shared competences ▪ Martin, Sunley_2003_Deconstructing clusters chaotic concept or policy panacea ▪ Harris_2011_Models of regional growth: past, present and future
Outcome of content analysis	225	<ul style="list-style-type: none"> ▪ Lall_2003_Reinventing industrial strategy The role of government policy in building industrial competitiveness ▪ Salvador, Ramirez_2004_The relevance of new industrial policy thinking ▪ Peck, Theodore_2007_Varieged capitalism ▪ Lin, Milhaupt_2013_We are the (National) Champions Understanding the Mechanisms of State Capitalism in China
Outcome of full text review and quality assessment	112	<ul style="list-style-type: none"> ▪ Ter Wal, Boschma_2011_Co-evolution of Firms, Industries and Networks in Space ▪ Camuffo, Grandinetti_2011_Italian industrial districts as cognitive systems Are they still reproducible ▪ Boschma, Minondo, Navarro_2011_Related variety and regional growth in Spain

Table 16: SLR Second Selection Process

Criterion	Examples of excluded articles	Examples of inclusion articles
Outcome of content analysis	Kinnear, Ogden_2014_Planning the innovation agenda for sustainable development in resource regions A central Queensland case study	Steen, Karlsen_2014_Path creation in a single-industry town The case of Verdal and Windcluster Mid-Norway
Literature review	Silva, Klagge_2013_The Evolution of the Wind Industry and the Rise of Chinese Firms From Industrial Policies to Global Innovation Network	Martin, Sunley_2006_Path dependence and regional economic evolution Boschma, Frenken_2006_Why is economic geography not an evolutionary science Towards an evolutionary economic geography
Theoretical foundation	Dixon_2010_Variegated Capitalism and the Geography of Finance Towards a Common Agenda	Gertler_2010_Rules of the game the place of institutions in regional economic change Notteboom, De Langen, Jacobs_2013_Institutional plasticity and path dependence in seaports interactions between institutions, port governance
Methodological soundness	Cahoon, Pateman, Chen_2013_Regional port authorities leading players in innovation networks	Neffke, Henning, Boschma_2011a_How Do Regions Diversify over Time Industry Relatedness and the Development of New Growth Paths in Regions Hassink, Klaerding, Marques_2014_Advancing Evolutionary Economic Geography by Engaged Pluralism
Contribution to knowledge	MacKinnon_2012_Beyond strategic coupling reassessing the firm-region nexus in global production networks	Martin_2010_Roepke Lecture in Economic Geography-Rethinking Regional Path Dependence Beyond Lock-in to Evolution Essletzbichler_2009_Evolutionary Economic Geography, Institutions, and Political Economy
Quality of data analysis	Karlsen, Dale_2014_From regional restructuring to regional renewal Cases from Norway	Sydow, Lerch, Staber_2010_Planning for Path Dependence The Case of a Network in the Berlin-Brandenburg Optics Cluster

2.4.9 Process for Data Extraction and Synthesizing Information

The process for data extraction and synthesis included the criterion illustrated in Table 17 while summary examples of synthesis are shown in Appendix-B.

Table 17: SLR Data Extraction and Synthesis

Criteria	Data Extracted
Bibliographic information	Title, source (journal, website, working paper), journal star ranking (if relevant), date of publication, issue/volume, month, page(s), number of citations
Content information	Frequency of word, concepts, factors, and actors; and citations
Theoretical Information	Theoretical foundation; keywords, concepts, themes, factors and actors
Type of Research	Theoretical, empirical, literature review, report
Methodology	Qualitative, quantitative, unit of analysis, and basis of data
Main Arguments	What are the main discussions? What is being claimed?
Contribution to Knowledge	What are the contributions being made to theory and practice?
Main outcome of research	Model, concept, proposition
Quality Assessment	Literature review, theory, methodology, contribution to knowledge, data analysis, and future research

2.5 Descriptive Findings

This section discusses the main characteristics of selected articles based on the distribution of papers by journals, themes and keywords or topics.

Regional Studies, Economic Geography, European Planning Studies, Journal of Economic Geography, Research Policy, Papers in Human Geography, Environment and Planning, Journal of Evolutionary Economics, and European Urban & Regional Studies generate the majority of articles amounting to 43.4% of the total articles where the remaining 56.6% of other articles are generated by roughly 250 different journals (Table 18).

Table 18: SLR Distribution of Articles by Journals

Journals	Number of Papers	%
Regional Studies	57	12.4
Economic Geography	27	5.9
European Planning Studies	26	5.7
Journal of Economic Geography	23	5.0
Research Policy	23	5.0
Progress in Human Geography	12	2.6
Environment and Planning	11	2.4
Journal of Evolutionary Economics	10	2.2
European Urban and Regional Studies	10	2.2
Entrepreneurship & Regional Development	8	1.7
Economic Development Quarterly	7	1.5
International Regional Science Review	6	1.3
Industry and Innovation	6	1.3
International Journal of Technology Management	5	1.1
Growth and Change	5	1.1
Industrial and Corporate Change	5	1.1
Others	224	49.0
Total	465 (457)	

The SLR directs researchers to the process of mapping the field; however, specific analytical tools are not provided. As the research field being studied is diverse, representing different perspectives, the identification of relevant articles becomes a challenge. The author resorted to content analysis of selected articles coming out of the review of titles and abstracts through NVivo 10. Content analysis attempts to capture the complexity of qualitative data represented in the research articles; however, instead of commencing with predefined codes, keywords and themes emerge from the analysis, in a way following the approach of grounded analysis (theory), and the structure of the research field is derived from the content of the research articles (Easterby-Smith et al., 2012:166). Content analysis, through mapping of ideas is about identifying what has

been in a research field and what the keywords, themes and concepts addressed by researchers are, thus providing a structured overview of the topic without having a bias over the research subject (Hart, 1998:145). The cluster mapping of words and themes inform us of the linkages and organization between factors and themes, hence acquiring a declarative knowledge about the research field which is followed by acquiring a procedural knowledge about the relationships between ideas and themes that make up the knowledge of the research topic (Hart, 1998:145).

Table 19: SLR Distribution of Articles by Theoretical Themes and Factors

Themes and Factors	Frequency of Word	Number of Papers
Evolutionary Economic Geography	1,370	152
Institutional Economic Geography	205	57
Path Dependence	1,340	104
Path Creation	164	21
States & Government	5,616	377
Institutions	9,983	376
Firms	11,197	380
Industry	25,771	415
Products	3,649	330
Knowledge	12,654	372
Capability	4,597	333
Routines	796	147
Proximity	2,365	226
Relatedness	4,560	377
Variety & Diversity	3,597	328
Growth	9,495	395
Policy	14,233	394
Calculation is based on the frequency of words stated in articles		

The analysis of the frequency of keywords and themes is illustrated in Figure_Apx 1 to Figure_Apx 4 and Table 20 and Table 19 that effectively represent actors, factors, and concepts addressed in the field of research.

Firms and institutions share similar words and coding, indicating fitting into the same research field, in particular addressing knowledge, capability and routines, and are associated with growth, industry and policy. States (& government) are mainly associated with industry and policy. and are linked to development but are inadequately associated with growth, relatedness, variety & diversity. [Refer to Figure_Apx 1 to Figure_Apx 4]

In summary, institutions, variety & diversity, and path creation are three elements of the research project that are residing in different research fields that can be linked through routines, capability and knowledge.

Table 20: SLR Word Frequency within Articles

Word	Count	Weighted Percentage (%)	Word	Count	Weighted Percentage (%)	Word	Count	Weighted Percentage (%)
economic	20536	0.68	learning	4864	0.16	European	2650	0.09
innovation	15768	0.53	technological	4776	0.16	district	2642	0.09
regional	14946	0.50	networks	4555	0.15	support	2607	0.09
knowledge	14342	0.48	capital	4524	0.15	variety	2506	0.08
development	12637	0.42	institutional	4426	0.15	employment	2479	0.08
industrial	11136	0.37	state	4295	0.14	Cranfield	2420	0.08
industry	10638	0.35	products	4123	0.14	sectors	2386	0.08
growth	10420	0.35	evolutionary	4042	0.13	markets	2380	0.08
local	10157	0.34	government	3934	0.13	capabilities	2366	0.08
policy	9611	0.32	economies	3896	0.13	proximity	2365	0.08
technology	8291	0.28	related	3828	0.13	competition	2364	0.08
university	7928	0.26	world	3774	0.13	space	2364	0.08
firms	7558	0.25	science	3735	0.12	services	2321	0.08
cluster	7254	0.24	network	3704	0.12	investment	2315	0.08
geography	6817	0.23	product	3545	0.12	actors	2302	0.08
social	6267	0.21	spatial	3416	0.11	manufacturing	2275	0.08
industries	6145	0.20	sector	3390	0.11	agglomeration	2265	0.08

Word	Count	Weighted Percentage (%)	Word	Count	Weighted Percentage (%)	Word	Count	Weighted Percentage (%)
clusters	5982	0.20	international	3384	0.11	competitive	2260	0.08
regions	5885	0.20	trade	3379	0.11	innovative	2245	0.07
economy	5849	0.19	country	3343	0.11	costs	2241	0.07
national	5652	0.19	processes	3312	0.11	technologies	2239	0.07
countries	5625	0.19	public	3261	0.11	models	2234	0.07
production	5444	0.18	activities	3231	0.11	location	2189	0.07
market	5385	0.18	global	3195	0.11	human	2187	0.07
institutions	5367	0.18	small	3125	0.10	factors	2186	0.07
model	5352	0.18	evolution	2961	0.10	dynamics	2183	0.07
change	5305	0.18	management	2911	0.10	variables	2172	0.07
system	5181	0.17	policies	2848	0.09	given	2170	0.07
region	5119	0.17	urban	2828	0.09	cities	2141	0.07
process	5088	0.17	value	2761	0.09	labour	2133	0.07
systems	5081	0.17	political	2751	0.09	china	2126	0.07
business	5050	0.17	performance	2700	0.09	companies	2117	0.07
economics	5025	0.17	structure	2681	0.09	geographical	2115	0.07
			resources	2651	0.09			

2.6 Conceptual Findings

A fundamental research question in regional economic development is "Why are some regional economies able to diversify into new firms, new products, and new industries while others continue to face challenges to diversification?" The answer to regional economic development could rest on the new paradigm of evolutionary economic geography (Martin & Sunley, 2006; Boschma & Frenken, 2011) as a foundation concept where the emergence and evolution of institutions, firms, products and industries are central to theorizing the changes of regional economies. The primacy of institutions as key economic agents for shaping regional development is the underlying argument of this research project. The role of institutions in the emergence and evolution of industrial clusters within regional economies is the focus of this SLR through the perspectives of evolutionary economic geography, institutional economic geography, path dependency and path creation theories. The influence and impact of institutions are investigated through the emergence and evolution of firms, products, and industries within a region or industrial clusters.

The main findings of the literature review are fourfold. First, neither neoclassical growth theory in a neutral space, nor specific institutions in a region, nor clustering or agglomeration of firms in a real space, nor region or geography alone provide a sufficient explanation for regions undertaking different development trajectories and achieving varying degrees of economic growth. Second, the evolution of space or region comprising institutions, firms, products and industries can be reconciled in evolutionary economic geography thinking by viewing the emergence and evolution of institutions, firms, products and industries as a dynamic process. Third, pre-existing accumulated capability and knowledge embedded within institutions, firms, products and industries determine the development trajectories of regions. Fourth, the creation of new capability and knowledge in shaping new paths for development is a complex economic process undertaken by economic agents such as institutions and firms.

The outcome of this SLR is discussed as follows. In the first section, evolutionary economic geography is positioned as a promising theoretical domain for explaining the emergence and evolution of institutions, firms, products and industries within regions.

The second section provides an overview of institutional economic geography. The third section expands the discussion on the underlying factors that shape path dependence, and the emergence and evolution of new paths for growth, i.e. capability, knowledge, proximity, variety and diversity through lenses of institutions, firms, products and industries. The fourth section discusses the role of institutions in the emergence of industrial clusters comprising firms, products and industries.

2.6.1 Evolutionary Economic Geography

Neither neoclassical growth theory in a neutral space, nor specific institutions in a region, nor clustering or agglomeration of firms in a real space, nor region or geography alone provide a sufficient explanation for regions undertaking different development trajectories and achieving varying degrees of economic growth. However, the evolution of a space or a region can be reconciled in evolutionary economic geography thinking by viewing the emergence and evolution of a space or a region comprising institutions, firms, products and industries as a dynamic and a complex process undertaken by economic agents such as firms and institutions. The prominent scholars for this school are Boschma and Lambooy (1999), Essletzbichler and Rigby (2007), Boschma and Frenken (2006), Martin and Sunley (2006); Frenken & Boschma (2007); Grabher (2009); Hassink, 2010; Essletzbichler (2009); and Henning et al. (2013). Collectively these scholars take a heterodox economic view where firms, institutions, political and societal actors and factors are in continuous interplay shaping diffusion and growth of economies.

The main argument is fourfold, contextual, methodological, role-based and theoretical. **First**, the explicit evolutionary economic geography presents an alternative approach to understanding the complexity and dynamics associated with the processes of uneven development of regional economies and growth (Frenken and Boschma, 2007). It is concerned with dynamics and changes in the economics landscape and economic growth (Nelson & Winter, 1982) of regions and nations at the macro level; industrial evolution (Boschma & Lambooy, 1999) and technological change (Frenken et al., 2007; Rigby & Essletzbichler, 1997, 2005) through the underlying industrial dynamics of firms (Boschma & Frenken, 2009) and co-evolution of firms, technologies, and local or

regional institutions at sector or meso level; and the decision-making and location behaviour of firms at the micro-level (Hassink et al., 2014)

Second, on the methodological dimension, EEG is a self-declared heterodox approach (Martin & Sunley, 2006:396). It includes different theoretical interpretations, perspectives, concepts and metaphors from the Darwinian biological evolutionary thinking on variety, selection and heredity (Essletzbichler & Rigby, 2007); evolutionary theory of firms (Nelson & Winter (1982), complexity theory (Martin & Sunley, 2007); path dependence (Boschma & Lambooy, 1999; Martin & Sunley, 2006); variety and diversity of regions as a result of habits, norms and practices (Grabher, 1993); and organizational routines for regional development and adjustment (Boschma & Lambooy, 1999). Further, it adopts methodological pluralism as it employs both inductive appreciative theorizing and deductive formal modelling (Nelson & Winter, 1982; Scott, 2004). Consequently, the heterodox approach of EEG represents a challenge as it lacks a clear analytical framework for evaluating, integrating, and developing theory (Dopfer and Potts, 2004 in Martin and Sunley, 2006:3); nevertheless, the empirical research of EEG has focused mainly on the evolution of clusters, path dependence, specialization and diversification and recently on the role of institutions, specifically their capacity to co-evolve with change (Boschma and Frenken, 2011) though neglecting the role of institutions in the creation of regional paths (Pike et al., 2009; Hassink et al., 2014). In a sense, EEG offers a promising methodology to explore the trajectories of regional economies taking into consideration the role of various economic agents that would need to be conceptualized into EEG.

Third, a central assumption embedded within evolutionary thinking is that economic action is a process, situated in time and place (Martin, 1999) undertaken by economic actors such as firms and institutions to shape the trajectories of regional economies. However, the main arguments of EEG particularly on path dependence and lock-in are mainly focused on the micro level of firms, specifically the organizational routines that shape organizational learning that limit consolidating new routines to enable change and solve problems (Boschma & Lambooy, 1999:416). It focuses on the dynamic processes that jointly influence the behaviour of firms and the environment in which they operate (Nelson, 1995,2008), and the dynamic interplay between the structure and

agency and co-evolution over time (Boschma & Lambooy, 1999). In a sense, it frames the actions of economic agents and the paths of regional developments within space and time (Boschma, 2004). Further, evolutionary economics while it focuses on firms and industries, it also pronounces regional development policy and the institutional environment of firms and industries affect the dynamism and adaptability of regional economies (Hassink, 2010:2). Therefore, the role of various economic agents would need to be integrated into EEG thinking.

Fourth, it provides a general theory of change within a specific context, space and time (Boschma & Frenken, 2011:295) while at the same time it accounts for complexity and is applicable empirically to the place and time-specific development process (Martin, 1999; Frenken & Boschma, 2007:635) in situations of bounded rationality (Nelson, 1995). It reconciles views of NEG and IEG by considering spatial evolution firms, industries, networks, cities and regions as a dynamic and complex evolution process (Frenken & Boschma, 2007), transforming neutral space into real places in which the evolution of regions is central to evolutionary thinking through the deliberate actions undertaken by various economic agents. Therefore, EEG provides a promising platform to explain the dynamic and evolution of 1) regions, clusters and industries; 2) institutions; 3) firms; 4) products and services (Boschma & Frenken, 2006) where accumulated and embedded routines, capability and knowledge influence the evolution of a neutral place to a real place through actions undertaken by economic agents. In a sense, it provides genuine new explanations for the emergence and evolution of firms, technologies and institutions in a spatial system (Boschma & Frenken, 2006) over time and within space. In the following paragraphs, the firm, institution, product and industry dimensions are discussed within the EEG perspectives.

Evolutionary approaches start from organizational routines at the firm level where evolutionary scholars put primacy on micro-routines of organizations. Organizational routines are specific to each firm, providing a micro-context that results from the past experience and activities of the firm. Hence, firms are not only victims of their history in time and space: routines can be changed by innovation and relocation. Conversely, many firms have multiple sites in different territorial contexts, yet these sites share corporate routines, even if some routines may be adapted to local contexts (Kogut &

Zander, 1993; Cantwell & Iammarino, 2003). Accordingly, as routines are place-specific, some regions may be characterized by a strong degree of homogeneity in routines, while others may not; thus, it is the dynamic interplay between structure and agency that produces the evolution of real places. More specifically, it is the interplay between the process of knowledge evolution and its underpinnings that make up the core of evolutionary geography (Maskell & Malmberg, 2007). Routines effectively represent knowledge and capability and thus used interchangeably in this paper.

On firm space, EEG aims to explain the emergence of and changes in economic landscapes by the underlying industrial dynamics of firms (Boschma & Frenken, 2009) through routines that are central to EEG which shape the behaviour of firms at the micro-level. Within time and space, an economy comprises a population of firms characterized by diversity in knowledge sets and techniques of production, labour demands, routines and organizational forms (Hodgson, 2009); where entry, growth, exit, and relocation of firms form an obvious technique for analysis and firms become the unit of analysis within agglomeration economies that provide alternative techniques for analysis driving the distribution of organizational routines in a population of firms over time (Frenken & Boschma, 2007). Taking into consideration that knowledge accumulates, is embodied, and embedded over time within firms' routines and procedures (Nelson & Winter, 1982), the entry and exit of firms, including spin-offs, provides a measure for the evolution of routines over time. In a sense, EEG adopts a dynamic and out-of-equilibrium analysis perspective that could go beyond the entry and exit of firms to emergence, evolution and co-evolution of firms, products and industries' institutions from a knowledge-based view that is central to the theorizing emergence and evolution of regions. The emergence and evolution of regions from the perspectives of firms could be viewed from an accumulation of similar or complex knowledge that is related to existing knowledge and through the creation of new complex knowledge that is unrelated to existing knowledge. Hence, the variety and diversity of knowledge determines the variety and diversity of regional economies.

On institutional space, the view of institutions varies across space. Within economic geography generally, institutions matter for regional development (Gertler, 2010; Rodriguez-Pose, 2013), particularly within institutional economics (North, 1990).

However, the evolutionary theory of economic change of Nelson and Winter (1982) argues that actors are bounded rationally and that industrial change occurs through waves of 'creative destruction'; it assumes that actors, such as individuals and firms, are limited in their ability to gather and process information relevant to economic decision as they act under conditions of uncertainty within a given institutional context (Foxon, 2011), while at the same time it emphasises organizational routines at the micro level of firms, thereby "privileging the firm as an initiator of economic change and neglects the importance of other actors" (MacKinnon et al., 2009:139). First, these viewpoints relegate the role of institutions to industrial dynamics as they assume that institutions co-evolve with industries to meet industrial requirements, where differences in institutional frames would not sufficiently explain the intra-regional variety of local networking activities or the replication of the same routines across national institutional boundaries (Hassink et al., 2014); second, they under-conceptualizes social agency and power (Pike et al., 2009 in Hassink et al., 2014) and strip firms from the social context; third, they recognize that institutions have some impact on sectors and regions (Hassink et al., 2014) in a way neglecting the linkages between micro, meso and macro factors that are in interplay to shape regional development. In contrast, many applications of evolutionary theory have emphasized the importance of institutions (Cooke et al., 1998), but institutions seem to be too widely available in space to explain adequately the evolution of new industrial regions (Boschma & Frenken, 2009:155; Boschma & Lambooy, 1999:423) as they have a durable effect compared to organizational routines (Essletzbichler, 2009). However, "If institutions play a role, it will be more often in an endogenous manner as entrepreneurial firms, consumers and government officials engage in collective action to establish new institutions" (Boschma & Frenken, 2009:5). On the other hand, if organizational routines shape the learning of regions and industries (Boschma & Lambooy, 1999:416), it should not be restricted to firms, as regional development paths and regional learning take place within a wider social context not only with creating technologies and organizational innovations, but with creating wider institutions whereby economic agents adjust industrial economic structures and resources to adopt to changes. From the perspectives of socioeconomic practices, institutions are "settled habits of thought" (Essletzbichler & Rigby, 2007) that perform similar functions as routines at the firm level which guide innovation and

adaptations; in other words, regions accumulate different institutional environments (Boschma, 2004:1005) within a given space and time. On the other hand, the socioeconomic organization perspective, which views institutions as real entities, has a profound effect on the embedded technologies within regions (Essletzbichler & Rigby, 2005), as institutions exploit available knowledge and explore new knowledge, which explains the work of national and regional innovation (Lundvall, 2007) and learning regions (Maskell & Malmberg, 1999). Consequently, the variety and diversity of firms, products and industries that inform us about the different development trajectories of regions are influenced by the institutional environment and arrangement within which they operate. Further, institutions affect the capacity of regions to upgrade, transform or restructure specific organizations and institutions required for the development of new activities (Boschma, 2004:1005).

It is therefore argued here that a broader approach to institutions is needed, one that emphasizes its strong impact on individual agency (Hodgson, 2009), expands beyond the firm level and acknowledges the impact on individual agency (Hodgson, 2009), and expands beyond the firm level and acknowledges the entanglement of various scales instead of conceptualizing an almost linear relationship between organizational routines and institutions (MacKinnon et al., 2009:140; Pike et al., 2009:179).

On product space, EEG permits taking 'product' as a unit of analysis. Hence, it offers a theoretical framework that defines change and growth within firms, industries and regions from a product perspective (Frenken & Boschma, 2007:636), which makes variety and diversity of technological change integral to the evolutionary economic thinking that results from habits, norms and practices (Grabher, 1993). In other words routines, capability and knowledge which determine branching out into products from within the same product group or creating new products by firms and industries. In a sense, variety and diversity of products are outcome proxy measures for the nature and complexity of accumulated capability and knowledge (routines) embedded in products, making knowledge-based view (routines, capability and knowledge) a theoretical concept within EEG.

On industry and sector space, EEG applies to the spatial system as a whole. The economic development of cities and regions can be analysed as an aggregate of sectors, clusters, industries and networks in a region. Regions undertake different paths for development and growth, depending on accumulated capabilities and knowledge, hence path dependence; however, regions that are capable of generating capabilities and knowledge will experience growth, while regions that are locked into existing capabilities and unable to accumulate new knowledge will experience decline. The renewal of accumulated capabilities and knowledge becomes essential, which in a way is impacted on by the role of institutions that influence the creation of new paths for growth.

EEG is, however, at an early stage of development and the approach is challenging as there is still no clear analytical framework for developing theory around evolutionary economics (Dopfer & Potts, 2004:195); rather there is still a collection of various approaches and concepts around evolutionary economics (Martin & Sunley, 2006:396). Some of its fundamental concepts, such as routines (knowledge and capability) and path dependence need more careful elaboration, both theoretically and empirically (Martin & Sunley, 2003). Moreover, path creation, which represents the essence of regional economic change and evolution, is still not being addressed within the literature on evolutionary economic geography.

On path dependence, "the processes of economic development are path dependent", which refer to the ways in which the evolution of particular firms, technologies and territories are structured by certain trajectories of development as a consequence of past decisions (Cooke & Morgan, 1994). The EEG perspective views path dependence as a source for lock-in and irreversible spatial patterns due to agglomeration economics and specialized industrial regions that are endowed with particular resources, competencies and institutional structures, and infrastructures, that are difficult to adapt to changes (Boschma & Lambooy, 1999:418; Martin & Sunley, 2006:409). In a way EEG attempts to explore how economic actors respond to the wider process of economic change (MacKinnon, 2009:499) and establishes path dependence conditions for regional economies.

On path creation, the creation of related and unrelated varieties of capability, knowledge and routines, conditions the new paths for economic growth as it determines the variety and diversity of related and unrelated products generated by regions, industries and firms. Related knowledge is generated through incremental innovation that enables the branching out into new related products as firms typically diversify into products that are technologically related to their existing products.

On the other hand, a new unrelated variety of knowledge is generated as firms combine existing routines and knowledge or acquire new knowledge and routines through radical innovation and learning (Essletzbichler & Rigby, 2005:49; Frenken & Boschma, 2007:637).

In conclusion, the merits of evolutionary economic geography thinking are threefold. First, it provides a heterodox economics framework that explains the emergence and evolution of institutions, firms, products, industries, and firms where knowledge and routines are underlying factors for path dependence and creation of new paths of growth, thus the diversification of regional economies. A plurality of paradigms in economics and social sciences in general is not only an obvious fact but also a necessary and desirable phenomenon in a very complex and continually changing subject (Dobusch & Kapeller, 2012). EEG would need to embrace engaged pluralism, as a way to bring together the different perspectives that enrich economic geography (Hassink et al., 2014). Heterodox economics is a collection of different, non-neoclassical schools of thought which are neither fully consistent nor easily definable. It views, ontologically, social reality as being multi-faceted, and thus requires a variety of perspectives if it is to be adequately described and explained, where the basic epistemological argument is attempting to differentiate between better and worse explanations, while still acknowledging that all explanations are principally fallible (Dobusch & Kapeller, 2012). Second is its methodology; it is far easier for researchers to choose an appropriate strategy from among a broad set of existing methodological blueprints, instead of starting afresh with every new research project (Dobusch & Kapeller, 2012). Third, it is open for different research approaches, including case studies, where the emergence and evolution of institutions, firms, products and industries can be explored empirically within space and time.

Table 21: SLR Conceptual Findings: Summary of Theoretical Domains

	New Economic Geography	Institutional Economic Geography	Evolutionary Economic Geography
Theory	<ul style="list-style-type: none"> ▪ Neoclassical micro-economics theory of equilibrium models in economic geography ▪ Economies of production and location 	<ul style="list-style-type: none"> ▪ Institutions are embedded in society 	<ul style="list-style-type: none"> ▪ Regional economies are complex and dynamic systems ▪ Uneven economic development and growth ▪ Economic actions are time and place dependent
Methodology	<ul style="list-style-type: none"> ▪ Deductive and formal modelling 	<ul style="list-style-type: none"> ▪ Inductive appreciative theorizing 	<ul style="list-style-type: none"> ▪ Heterodox economics including path dependence, locking in, locking out, Darwinian evolutionary thinking, variety & diversity of regions, and organizational routines ▪ Combines appreciative theorizing (inductive) and formal modelling (deductive) ▪ Variety of approaches including case studies
Unit of Analysis	<ul style="list-style-type: none"> ▪ Transportation Cost 	<ul style="list-style-type: none"> ▪ Socioeconomic institutions ▪ Socioeconomic practices ▪ Institutional arrangement ▪ Institutional environment ▪ Structures, rules, norms, procedures and routines 	<ul style="list-style-type: none"> ▪ Single industry ▪ Organization routines at the firm level

Context	<ul style="list-style-type: none"> ▪ Place is neutral ▪ Optimizing agent approach ▪ Relates microeconomic factors such as price differentials and transport cost to macroeconomic outcomes 	<ul style="list-style-type: none"> ▪ Place dependence specific – "real place" ▪ Macro contextual perspective ▪ Rule-following agent approach that relates microeconomic behaviour of firms to macro dimension of institution in a region ▪ Economic actions are instituted process 	<ul style="list-style-type: none"> ▪ Neutral place to place dependence ▪ Micro contextual perspective that assumes economic actions are contextual, in which it is a satisficing agent approach that puts primacy on the micro-routines of organizations as the actual behaviour and location are determined by accumulated organization routines over time (path dependency) which influence the evolution of a neutral space to a real place ▪ Economic decisions are guided by existing routines and rules. ▪ Macro spatial orders emerge from complex interactions between economic actors
Measures	<ul style="list-style-type: none"> ▪ Equilibrium analysis ▪ 	<ul style="list-style-type: none"> ▪ Static analysis on case studies and comparative studies ▪ 	<ul style="list-style-type: none"> ▪ Out of equilibrium analysis ▪ Dynamic birth and death of firms
Capability & Knowledge	<ul style="list-style-type: none"> ▪ Not addressed 	<ul style="list-style-type: none"> ▪ Routines 	<ul style="list-style-type: none"> ▪ Capability and knowledge are embedded within organizational routines
Proximity & Relatedness	<ul style="list-style-type: none"> ▪ Not addressed 	<ul style="list-style-type: none"> ▪ Geographical 	<ul style="list-style-type: none"> ▪ Cognitive, organizational, social, institutional and geographical

Variety & Diversification	<ul style="list-style-type: none"> ▪ Not addressed 	<ul style="list-style-type: none"> ▪ Marginal impact on industrial dynamics 	<ul style="list-style-type: none"> ▪ Related and unrelated varieties
Path Dependence	<ul style="list-style-type: none"> ▪ Not addressed 	<ul style="list-style-type: none"> ▪ Condition path dependence ▪ Stickiness and slow change of institution 	<ul style="list-style-type: none"> ▪ Accumulated organizational routines
Path Creation	<ul style="list-style-type: none"> ▪ The essence of capitalism is change in its fundamental technologies and business organization, although utility maximization positions change within the productive efficiency of the existing mix of the resources adopted technology of business organizations 	<ul style="list-style-type: none"> ▪ Economic and social change ▪ Slow institutional change ▪ Institutional plasticity ▪ Routines and rules ▪ Binding constraint 	<ul style="list-style-type: none"> ▪ New paths (routines, knowledge, technology, products) are generated from existing paths ▪ Related and unrelated variety of capability, knowledge, routines, products, firms and industries ▪ Dynamics of structural change at sector, network, institution, and regional levels ▪ Co-evolution of firms, organizations and institutions
Synthesis	<ul style="list-style-type: none"> ▪ It cannot explain economic growth, technological change, industrial evolution, diffusion of knowledge and role of institution 	<ul style="list-style-type: none"> ▪ Focuses on institutions and cannot explain diversification and evolutions of regional economies 	<ul style="list-style-type: none"> ▪ Provides a framework to integrate institutions, firms, products, services, industries, clusters and knowledge, where actors and factors products are co-evolving over time.

2.6.2 Institutional Economic Geography

The different development trajectories undertaken by regions create a dynamic process that cannot be explained only by utility maximization of neoclassical theory or by geography alone; rather, the creation of new capability and knowledge shaping new paths for development is a complex economic process that should be explored through different lenses of economic agents that shape and generate diversification outcomes. Institutions, as economic agents, matter for regional economic development. In this section, 1) context, and 2) methodology and theoretical foundation of institutional economic geography are discussed; then 3) the role of institutions on shaping and changing regional economies is navigated through economic geography.

First, the underlying contextual argument is that economic action is an instituted process (Polyani, 1957), situated in time and place; (Martin, 1999) undertaken by economic agents that influence trajectories of regional economies, particularly the emergence and evolution of firms, products, services, industries and clusters. It is a macro and place dependent contextual perspective; in which it is an agent-based approach that relates the microeconomic behaviour of firms to the macro dimension of institutions within regions. Therefore, the primacy of economic agents should be underlined and the role of institutions, as one form of economic agent, should be understood and articulated to theorize their role in shaping regional economies.

The primacy of institutions in literatures is, however, navigated through two different perspectives. Institutions are mainly categorized either as socioeconomic organizations or as a process of institutionalization of socioeconomic practices (Amin, 1999). The former represents the institutional arrangement while the latter represents the institutional environment. Socioeconomic organizations are real entities, such as formal regulations, legislation, policy-making, and economic systems (Martin, 2000 in Notteboom et al., 2013), that provide stability and inertia, and guide individual action (Essletzbicher, 2007:557) including firms, cooperative networks, and state-owned institutions and enterprises, such as research institutions, development agencies, and special economic zones. On the other hand, institutions refer to a wide range of informal routines and norms within "systems of established and prevalent social rules

that structure social interactions" (Hodgson, 2006) that shape, influence, and regulate the behaviour of economic actors (Amin & Thrift, 1994; Morgan, 1997; Gertler, 2004:7-8), hence govern the socioeconomic organizations.

Notwithstanding the different forms of institutions, and even though institutions are embedded within society (Amin & Thrift, 1994), the environment and arrangement are interrelated, hence economic geographers have typically focused their attention on formal types of institutions as organizations, such as regional development agencies, business associations, and local authorities' development (Amin & Thrift, 1994; Morgan, 1997). These institutional arrangements collectively support and promote regional economics and define the system of rules that shape the attitudes, values, and expectations of individual economic actors (Gertler, 2004:7-8). In other words, institutions are responsible for producing and reproducing the conventions, routines, habits, and 'settled habits of thought' that, together with attitudes, values, and expectations, influence actors' economic decisions. In a sense, an individual agency can play a major part in producing a variety of responses within the same sector, region, and nation-state (Gertler, 2004:7-8), thus influencing the economic trajectory of a region.

In contrast to the above discussion, many authors have argued that the role of institutions (territorial arrangement) is marginal as their impact on industrial dynamics is weak (Boschma & Frenken, 2006, 2009), is durable and slow changing (Essletzbichler, 2009). Moreover, institutions are viewed as binding constraint because of the institutional structure that establishes lock-in and path dependence conditions in regions, e.g. infrastructure, technology (Boschma & Lambooy, 1999:418; Martin & Sunley, 2006:409).

However, institutions remain to challenge scholars as expressed in the different institutional turns addressed by the literature. Jessop (2001) in Cumbers et al. (2003b) identifies three types of institutional turn: a thematic turn through a focus on institutions as a key research issue or theme; a methodological turn in terms of using institutions as a point of entry from which to investigate certain aspects of the capitalist space economy; and a more radical ontological turn which emphasizes that institutions provide

crucial underpinning to the operation of economic processes across space, as implied in Polanyi's notion of the economy as an instituted process (Polanyi, 1982).

Second, on a methodological and theoretical foundation, the main focus of this research is on the ontological turn where institutions as economic agents play an important role in conditioning path dependence, and shaping the trajectories, emergence and evolution of regional economies. Hence, institutions represent a key research agenda within evolutionary economic geography, rather than a separate field by itself within economic geography.

New Economic Geography (NEG) tends to follow mainstream economics in neutralizing the role of place and in abstracting 'the economic' from its wider social, political and cultural contexts (Martin, 2000, Cumbers et al., 2003b). Institutional Economic Geography (IEG) is different from NEG, while mainstream economics assumes that the economy is rationally and transaction cost driven, and oriented towards equilibrium through utility maximization, IEG takes another turn by emphasizing the role of social rules, norm and routines in development. It draws attention to the ways in which a region's internal characteristics or 'social infrastructure' (Storper, 1995; Cumbers et al., 2003b) can help or hinder economic growth and its purpose is to articulate the different trajectories undertaken by regional economies through the analysis of how institutions change along a path dependent trajectory (Martin, 2000, 2010, 2012). IEG dismisses the use of formal modelling and econometric specifications; instead, it calls for anti-reductionist qualitative methodologies, it applies an inductive, often, case-study research approach in depth, singling out the local specificity of 'real places' and to appreciate the complex and multi-faceted nature of regional development. However, it is much narrower than Evolutionary Economic Geography (EEG), which promises a heterodox perspective that encompasses the emergence and evolution of institutions, firms, products and industries within regions. Therefore, EEG will benefit from bringing the institutional thinking of IEG into theorizing the emergence and evolution of regional economies.

IEG provides important perspectives on how social and institutional conditions shape regional development prospects (Martin, 2000 in Cumbers et al., 2003b). First,

institutions are place dependence in a macro context to regions. The main objective of institutional analysis is to understand the effect of the local specificity and context on economic development, which is mainly attributed to place-specific institutions, analyses of how place-specific institutions affect local economic development. Second, as Cumbers et al. (2003b) explain, the institutionalism perspective emphasizes the importance of social and cultural conditions within regions in shaping economic development trajectories, and treats localities and regions as active participants in economic development, rather than as passive arenas for capital accumulation. Third, it relates the micro behaviour of agents, i.e. firms, to the macro dimensions of institutions in a region where the interaction of actors across different levels enables to 'recombine and convert or reinterpret institutions for their new objectives or transfer institutions to different contexts' (Strambach, 2010:412; in Notteboom et al., 2013). Fourth, as economic processes are grounded in social relations that influence economic behaviour, the economy is stabilized through a broader set of social rules and norms (Amin, 1999). Fifth, in a way it explains the differences in economic behaviour that are primarily related to differences in institutions (Boschma & Frenken, 2006); as "institutions exert a pervasive influence on the evolution and character of regional economies" (Gertler, 2010); where it takes a place-specific or place-dependency contextual perspective in which an institutional agent influences the trajectories of a specific region or geography.

In summary, the institutional turn in geography is viewed as "the successful development of the program of institutionalism, which had little success within the boundaries of the economics profession" (Boschma & Frenken, 2006) as "the form and evolution of the economic landscape cannot be fully understood without giving due attention to the various social institutions on which economic activity depends through which it is shaped" (Martin, 2000). Further, the adoption of institutionalist ideas can be seen as part of a wider shift in economic geography, which has placed increasing emphasis upon the social and cultural dimensions of economic life (Cumbers et al., 2003b). Moreover, institutional change or "institutional plasticity" becomes essential for adapting to a changing environment; while existing institutional arrangements do not correspond well to the demands of the external environment and act as a barrier to

developing or accommodating new routines (Notteboom et al., 2013), embracing institutional plasticity would enable a dynamic institutional arrangement and environment facilitating institutions to play an active role in shaping regional economies.

However, the theorizing of institutional economic geography is a challenge as it is still a vague concept that cannot be accurately measured (Markusen, 1996) and lacks rigour and hypothesis testing (Martin, 2003:36), which explains why "there is not yet a fully articulated institutional economic geography" approach (Martin, 2000; Boschma & Frenken, 2006) or that "institutional economics" as a result has never developed into a coherent, systematic paradigm (Hodgson, 1998), consequently its impact on regional development can be determined and tested (Markusen, 1996). Therefore, institutional economic geography can be best described as a collection of approaches that share common concepts and interests in explaining particular phenomena (Samuels, 1995). It is, however, the insights of IEG that can be integrated into the thinking of EEG in order to embrace the role of various factors (specifically capability, knowledge and routines) and actors (institutions in this instance) that shape the trajectories of regional economies.

Third, on institutional space and the role of institutions; the role of states and institutions have already been established by Polanyi (1944:139-140 in Gertler, 2010) stating that 'there was nothing natural about laissez-faire; free markets could never have come into being merely by allowing things to take their course. Laissez-faire was planned; planning was not'. In other words, the trajectories of self-regulating markets or economies were influenced by state interventions or 'economic practices shaped by a set of socially produced structures one might call rules' (Gertler, 2010) or a set of institutions. In a sense, 'institutions are the rules of the game in a society' (North, 1991:3), that shape and constrain the behaviour of economic agents (Gertler, 2010:3); consequently, economic action is shaped by social context (Cumbers et al., 2003b), which influences the trajectories of regional economies. That the "behaviour of individual economic agents is governed by a universally shared pursuit of economic rationality is one of the fundamental concepts of neoclassical economics, where the natural state of affairs under capitalism is for economic resources to be allocated by market exchange" (Gertler, 2010); however, "economies that are recognizably capitalist

in orientation nevertheless evolve along distinctive paths that are shaped by their own particular constellations of institutional structures – their own distinctive institutional architectures" (Gertler, 2010:3). Economic behaviour is better understood as being rule-guided as differences in economic behaviour are primarily related to differences in institutions (Boschma & Frenken, 2006). In some sense institutions can simultaneously influence and restrict economic behaviour (North, 1991), hence impact on change in regional economic development as institutions create a basis for mutual communication, collective learning, and joint problem-solving, without which a technical and social division of labour and economic interaction would not be possible (Hodgson, 1988 in Bathelt et al., 2003). Martin (2000:76) highlights that "the form and evolution of the economic landscape cannot be fully understood without giving due attention to the various social institutions on which economic activity depends through which it is shaped"; further, not only agents are bounded rationally and rely heavily on the institutional framework in which they operate, guiding their decisions and actions – "institutions exert a pervasive influence on the evolution and character of regional economies" (Gertler, 2010). These explanations attempt to frame the behaviour of individual economic agents or institutions as important because they link 'the economic' and 'the social' through a set of habits, practices and routines but without providing a conceptual framework for how institutions shape the trajectories of regional economies and what make institutions change their habits, practices and routines. Further, there is a tendency in the literature to neutralize the role of institutions as a result of the neoliberalism paradigm in which utility maximization matters most for economies, and there is a lack of clearly articulated conceptual or theoretical framework of institutions within economic geography (Gertler, 2010), which in effect undermines the impact of institutions on shaping the development of regions. Consequently, economic geographers, such as Martin (2000) and Boschma and Frenken (2006), introduced the role of institutions or the 'institutional turn' in economic geography where other scholars call for reconstituted institutional economic geography as a field by itself in order to accommodate interactions among different actors, such as individuals, firms and institutions (Gertler, 2010). It should be highlighted that the contributions of institutional approaches in economic geography have thus been, most importantly, theoretical, by suggesting new explanations and mechanisms underlying regional development, and in

terms of policy implications, by opening up new discourses on the cultural meaning and heritage of places and the limited transferability of locally rooted economic production. It is thus necessary to accommodate interactions among different actors, such as individuals, firms and institutions, on future empirical research agendas in order to understand the differences in the economic trajectories of regions.

Gertler (2010) defines what he calls "a second-generation reconstituted institutional economic geography" in four ways. First, it should provide sufficient analytical room for the agency of individuals and organizations. Second, it needs to incorporate processes of institutional evolution and change over time. Third, it must account for the interaction between institutional architectures at different scales; i.e. to illuminate the processes by which institutions are produced and reproduced at a number of spatial scales, from the local to the national to the global, as well as promoting one's understanding of how these institutions shape and constrain (but do not determine) economic action. Finally, it would profit from adopting comparative methodologies. However, taking into consideration the complexity of economic regions and the multiplicity of factors and actors that are in interplay shaping path dependence and trajectories of regional economies, a heterodox framework would be needed that institutional economic geography cannot provide. Instead the reconstituted institutional economic geography can be integrated into the evolutionary economic geography to augment the evolutionary thinking on theorizing the complex and heterogeneous nature of the emergence and evolution of regional economies through the deliberate acts of economic agents, mainly firms and institutions.

In conclusion, this research particularly interested in providing a perspective on the role of government owned institutions and enterprises on the diversification of regional economies. This perspective has an underlying assumption that government agents have a transformation capacity that shapes the trajectories of regional economic development through deliberate strategic action pursued by government institutions and enterprises. In a sense, government owned institutions and enterprises pursue new routines to break out of the existing path dependency development and create new paths for growth and development. Therefore, institutional context or place-specific institutions, institutional plasticity (Strambach, 2010), institutional and enterprises

routines, path dependency, and forces of agglomeration are central to theorizing regional economic development. In other words, the thinking of IEG and EEG form a promising foundation for theorizing regional economic development.

Table 22: SLR Summary Analysis of Literatures

	Institutional Space	Firm Space	Product Space	Industry Space
Literature Domains	Institutional Economics Institutional Economic Geography	Economic Geography Agglomeration Economics	Economic Development Structural Transformation	Economic Geography Agglomeration Economics
Unit of Analysis	Region	Cluster of Firms at a Geographical Location	Cluster of Products at Country Level	Industrial and Technological Clusters within a region
Methodology		Agglomeration of firms	Network connecting export products Empirical validation on various countries	Network of industries connecting through technological relatedness Empirical validation on Swedish manufacturing plants and Linköping's industrial transformation
Measures	Not addressed	Geographical correlation of employment across traded industries	Co-occurrence of products in a country (related number of capabilities shared by a pair of products) based on Revealed Comparative Advantage	Co-occurrence of products in the portfolio of manufacturing plants based on 'Revealed Relatedness Method'
Capability &	Routines	Capability is	Capability is embedded	Capability embedded

Knowledge		<p>embedded in network</p> <p>Individual and collective</p> <p>Tacit and explicit</p> <p>Individual and collective</p> <p>Component and architectural knowledge</p>	<p>in products</p> <p>Simple to complex knowledge and capability</p>	<p>in industrial network</p>
Proximity and Relatedness	Not addressed	Proximity of firms in geographical location	Proximity and relatedness of capability in product space	Proximity of industrial skills
Path Dependence	Not addressed	<p>Macro-level (cluster) emerge out of micro-level interactions among firms thus network evolution determines evolution of clusters</p>	<p>Pre-existing accumulated capabilities embedded in existing products and proximity to nearby products determine future products</p>	<p>Pre-existing industries determine future industries because of technological relatedness which underlines path dependence in diversification of economics</p>
Path Creation	Not addressed	<p>MAR externalities where firms benefit from labour pooling and specialization, input-output relations, knowledge spillover, joint innovation efforts</p> <p>Spinning off firms determined by market conditions, factor costs and knowledge</p>	<p>Capability spillover</p> <p>Branching out into products that are within proximity and related to existing capabilities</p>	<p>Jacob's externalities where firms benefit from inter-industry linkages and industry diversity to combine knowledge across industries</p> <p>Branch out into industries that are technologically related to pre-existing</p>

		Firms diversify into areas that require similar accumulated skills		industries in the region
Mechanism	Not addressed	Component or technical knowledge flows across firms within cluster Acquiring other firms Stocks of cluster-level architectural knowledge will enhance the transfer, absorption, and application of component knowledge across firm boundaries within the regional cluster and retard flows of component knowledge across cluster boundaries	Inter-industry knowledge diffusion based on geographical proximity Accumulating new capabilities Tacit knowledge in neighbouring countries Migration of skilled labour forces	Acquiring human resources
Barriers	Institutional change and pace of change	Different and competing sets of architectural knowledge between organizations or clusters act as isolating mechanisms to slow the movement of component knowledge across	Path dependency Knowledge diffusion is weaker for complex products Geographical proximity as knowledge diffusion is weaker for longer distances	Path dependency Labour mobility

		boundaries Marginal cost of knowledge		
Policy Implications		Clusters can be created regardless of existing capabilities	Products that are distanced from existing capabilities will be difficult to produce	Difficult to attract technologically unrelated new industries and limited justification for targeted industrial policy
What is missing?	Focuses on institutions and cannot explain diversification and evolutions of regional economies	How are clusters evolving? Linking firms to products	What is the mechanism of branching out into new products? Linking export products to firms, manufacturing plants and industries	What is the mechanism of branching out into new industries?

2.6.3 Path Dependence and Path Creation

Path creation is a topic that has recently been introduced into economic geography and evolutionary economic geography, which could provide a promising foundation to theorize the emergence and evolution of regional economies, particularly the creation of new related and unrelated capabilities and knowledge within a context of particular geographical location as a result of the deliberate action of economic agents such as firms and institutions. In other words, understanding where (location), when (time), who (agents), and how (mechanism) paths are created could answer why some regions are able to diversify into new related and unrelated varieties of products through the deliberate action of economic agents. The discussion on path creation hereafter is fourfold: contextual, theoretical positioning, mechanism, and role based.

First, the contextual dimension of research addressing path dependence and path creation is limited to old industrial regions (Hassink & Shin, 2005), single industry town (Dale, 2002) or single industry regions (Chapman, 2005). In a way, geographical location matters for the path dependence of regional economies and the emergence of new industries. Natural resource endowments, proximity to ports, weather, functional, cognitive, and political aspects, are all factors that condition the development trajectories for regions.

Second, the main theoretical argument in the literature is that new paths of development are created from existing trajectories. Therefore, regions that are endowed with limited heterogeneous resources, accumulated simple knowledge and capabilities (Hidalgo & Hausmann, 2009), dominated by a single large firm or single industry, are prone to locked-in conditions thus are difficult areas in which to initiate new activities (Steen & Karlsen, 2014), create new knowledge and capabilities, produce new products and services, in a sense are difficult for the creation of new paths for growth and development due to path dependence conditions.

Path dependence is a place-dependence phenomenon (Martin & Sunley, 2006) and a core concept in evolutionary economic geography where historical trajectories are shaped by past incidents, decisions, and events (Boschma & Frenken, 2006; Martin & Sunley, 2006; Essletzbichler & Rigby, 2007). It is where one or several events trigger a non-stationary process that gains momentum and keeps itself alive along a particular track (Sydow et al., 2010). Path dependence is enabling, rather than constraining, which implies that the generation of novelty is a generic feature of path-dependent evolutionary processes (Martin, 2010) which is supported by recent empirical studies that document how the qualitative change of regional economics over time is traceable to regionally embedded knowledge genealogies (Neffke et al., 2011a) and that new paths typically branch off from existing ones (Frenken et al., 2007). However, the type of embedded knowledge matters; if accumulated knowledge is complex then new knowledge can be branched off (Hidalgo & Hausmann, 2009), hence, path dependence cannot be generalized as an enabling factor for the generation of novelty.

Regions are subject to decisions, events, shocks, and accidents that may influence the development trajectories; however, scholars have contested their impact on the creation of new paths. Krugman (1991) argued that the process of industrialization in the United States has been characterized by small accidents that have led, via processes of localized increasing returns and cumulative causation, to the establishment of persistent centres of production. However, the origins of the UK motor sport cluster cannot be adequately explained in terms of Krugman's 'historical accident' model but can be traced to a set of local historical legacies (Pinch & Henry, 1999). Further, external shocks combined with local historical legacies that trigger the response of economic agents (Steen & Karlsen, 2014 – case of Norway) shape regional trajectories. In other words, historical incidents and external shocks occur over time; however, these should not be considered as irrational (Steen & Karlsen, 2014) but rather as events triggered by actions and factors within a region unless these events are natural phenomena, such as natural disasters. In short, "to regard path creation as an accidental, adventitious, or serendipitous

event is not particularly revealing" (Martin, 2010); on the other hand, to regard path creation as a causal process whereby factors and actors are in interplay with the condition trajectories of regional economies is revealing.

In a sense, path creation is not a random process, as contextual and causal processes matter, even for events that may appear to be random, as these events trigger the birth of new technological and industrial trajectories in some regions but do not in other regions. This is evident from the growth of some regional and national economies, such as China, South Korea, Indonesia, Malaysia and Taiwan in the east, and Ireland and Finland in the west, that cannot be explained by random and chance events. The outcomes achieved by these economies are influenced by contextual conditions (may include historical events) and large elements of strategic purpose and deliberate actions pursued by policy makers and the mindful deviation of strategic agents (Steen & Karlsen, 2014) and entrepreneurs (Isaksen, 2011) reacting and adapting to external influences (Steen & Karlsen, 2014) or responding to critical incidents or shocks (Martin & Sunley, 2006) that are critical in the transformation of a single industry town (Steen & Karlsen, 2014) or established local conditions for the 'new path creation' (Steen & Karlsen, 2014) in regions. These strategic agents and entrepreneurs continuously attempt to exploit knowledge and explore new opportunities, services and products, fuelling the evolution of regional economies mainly by incremental change (Martin, 2010) onto a new path, are factors for path creation (Steen & Karlsen, 2014). In a sense, both public and private agents develop capabilities that adapt to challenges and opportunities (Steen & Karlsen, 2014). Thus, the strategic decisions made by policy-makers, including the nation-state, have to be examined if we are to properly understand regional path creation (Steen & Karlsen, 2014). The role of key firms, particularly large firms, crucially condition new paths of development for a region, as is the case of the Cambridge high-tech cluster in the UK which can be traced back to the existence of Cambridge Instruments (a specialist aeronautical instrument firm) or the local agro-chemical industry in the 1930s, or the establishment of Cambridge Consultants in 1960, or the establishment of a science park in Trinity College in 1970.

The opportunities to create new paths in a region not only are actor and factor dependent but also are time dependent, where regions and industries enjoy moments of enhanced locational freedom called 'windows of locational opportunity' (Scott & Storper, 1987 in Martin & Sunley, 2006) when a region experiences a "selection environment" of a new technology or industry (Boschma & Frenken, 2003). However, while location and context provide an environment; what matters most is that actors and factors within the location and context are in continuous interplay to create new paths for growth.

In summary, path dependence and path creation models that resort only to random and chance events do not provide a causal explanation for regional development, particularly the emergence of industries, clusters, and products. Instead, actors and factors that condition path dependence and create new paths of growth within a region should be conceptualized, modelled, and researched empirically to understand and underline the causal importance of regional development and the creation of new paths as well as the mechanism for creating new paths.

Third, the mechanism of path creation is barely addressed in the literature. It is mainly confined to a few attempts that view new path creation as including indigenous creation, diversification, transplantation, and upgrading (Martin & Sunley, 2006) through 'layering', 'conversion', and 'recombination' mechanisms (Martin, 2010) or through adjustment (cost reduction) and renewal (innovation and diversification) (Cho & Hassink et al., 2009) where the line between adjustment and renewal is thin (Grabher, 1993; Boschma & Lambooy, 1999; Todtling & Trippl, 2005), whereby institutional resistance to restructuring influences the opportunities and nature of locking out through modernizing existing production facilities or creating new industries (Cho & Hassink 2009).

The main form of path creation is through the restructuring of regional economies through related variety or unrelated variety (Frenken et al., 2007) or in other words related or unrelated knowledge and capabilities (Hidalgo & Hausmann, 2009). The notions of 'related variety' and 'unrelated variety' refer to the proximity and relatedness of knowledge and capabilities to existing

knowledge and capabilities (Hidalgo & Hausmann, 2009), "where unrelated variety is the portfolio of a region protecting it from external shocks" (Cho & Hassink, 2009); these point to the idea that neither too little nor too much diversity in regional economic structures provides beneficial conditions for knowledge spillovers and collaboration across and between sectors (Steen & Karlsen, 2014).

Fourth, the deliberate action of economic agents in shaping regional economies matters greatly, as knowledge cannot create itself; it is deposited within individuals, firms, and institutions. Sydow et al. (2010) suggest that a theory of agency and structure is needed to accommodate the possibility that actors purposively create and sustain path dependence that they control, at least partially, rather than merely react to it. The structuration process theory provides an analytical tool for studying path dependence across all phases of the development of clusters and relevant levels of analysis, while accounting for both lock-ins and discontinuities. The structuration concept of "reflexive monitoring" suggests that "knowledgeable agents" (Giddens, 1984) actively monitor and influence structuration processes, although they normally cannot fully control them; and this helps unpack historical processes by showing how the stabilization of institutions occurs and how self-reinforcement mechanisms operate in specific circumstances. This is in contrast to economic geography, ignore the role of actors and the creative capacity of economic agents (Boschma, 2004), as is evident in the growing concern for the micro-foundations of economic geography related to social learning, networking, and so forth. Sydow et al. (2010) go beyond economic geographers by suggesting that agents are not merely individuals who are capable of actively monitoring their situation, making "real" decisions, and shaping agendas.

2.6.4 The Role of Institutions on Path Creation

In this section, the contextual, theoretical and methodological dimensions of a research framework underpinning the role of institutions on path dependence and path creation of regional economies are discussed.

Context of Institutional Space

First, contextually regions that are endowed with limited heterogeneous resources and simple accumulated knowledge and capability are prone to lock-in conditions that limit their ability to create new knowledge and capabilities hence new paths for growth and development. Therefore, in order for change to occur, economic agents such as firms and institutions, particularly state-owned institutions and enterprises, would need to act deliberately to create new paths for growth and development. However, the literature scarcely addresses the specific role of state-owned institutions and enterprises and how they go about creating new paths for growth and development.

Economic agents, such as firms and institutions, are the main drivers for the emergence and evolution of regional economies, including industrial clusters where they accumulate capabilities, knowledge, and routines over time that condition path dependence and determine the creation of new paths. However, institutions are different from firms, as not only do they create institutional environments and routines that firms operate within but also determine the institutional arrangements that influence development trajectories, hence the nature of capabilities and knowledge, and variety of products within regions and firms. The primacy of institutions is evident as "extraordinarily high growth rates witnessed over past decades are associated with rapid structure transformation particularly industrialization" and "the most successful economies have not been the ones with the least state intervention" (Rodrik, 2013). In a sense, state institutions and interventions such as industrial policies and programmes represented by the institutional environment and institutional arrangement, play an important direct role in the economic development, transformation and modernization of the economic structure, particularly industrialization, as in the case of Asian economies and an indirect role, as in the case of Western economies (Hvidt, 2013).

Theorizing the Role of Institutions on Path Creation

Second, the theoretical positioning is founded on evolutionary economic geography embracing heterodox economics where path dependence, path creation, capability and knowledge are underlying factors for regional economic

development determined by the deliberate act of economic agents, such as Government Owned Institutions, SOEs, Firms and Multinational Enterprises (MNEs) as constructed in the Path Creation Framework.

The continuous changes in the productive structure of regional economies and nations shape a phenomenon that is interwoven between evolutionary economic geography, path creation, and path dependence theories as discussed above. The observed changes of product space, industry space and cluster space support path dependence theory; however, countries undertake different branching out pathways, depending on their existing capabilities, although "little is known about why it is that some regional economies become locked into development paths that lose dynamism, whilst other regional economies ... seem able to reinvent themselves through successive new paths" (Martin & Sunley, 2006) which makes theorizing the emergence of industrial clusters a challenge and may explain why the process of creating new pathways is weakly addressed in the literature. The cluster, products, industries, proximity, relatedness and path dependence, treated in isolation, are not sufficient to explain the co-emergence and co-evolution nature of the changes. Foster & Metcalfe (2012) argues that there is a need to "shift towards a fundamentally new ontology that recognizes, explicitly, the dissipative nature of economic structure". Therefore, there are three challenges to be addressed in future research. First, an alternative representation of changes in the regional economic system is needed whereby firms, clusters, products and industries emerge and evolve concurrently while capability, proximity, relatedness and variety are underlying factors for change. Second, the process and mechanism of branching and creation of new paths would need to be pronounced in order for policy makers to understand their implication for regional development plans. Third, the role of economic agents including state-owned institutions and enterprises, firms and MNEs would need to underline their role and impact on shaping new paths for growth and development, while noting that the focus of this research project is on the role of institutions.

Ablowitz (1939:2) defines the theory of emergence as "the whole is more than the sum of its parts" which declares that there are different levels of existence where "units of one kind combine to constitute units of a new kind with more complex combination and new qualities". However, the combination of units of one kind could result in a sum of the same kind; Ablowitz (1939:3) states "every resultant is either a sum or a difference of the co-operant forces and every resultant is clearly traceable in its components because these are homogeneous and commensurable". Emergence, however is different as it is "unlike its components insofar as these are incommensurable, and it cannot be reduced to their sum or their difference" (Lewes, 1875 in Foster, 2012), while "evolution is a process of continual emergence of successfully higher levels of existence, and each of these levels manifests something new in the universe and novelty constantly emerging" Ablowitz (1939:3). In summary, there are different levels of existence and "the theory of emergence accounts for the transformation of quantity into quality" (Ablowitz, 1939:4) while the theory of evolution accounts for the continuous transformation of quality and generation of novelty.

Therefore, we differentiate between emergence and evolution as separate states; hence, resultant, emergence and evolution are three different levels of existence that can be applied to the nature of economic development. This is because the evolutionary perspective is not precisely an accurate generalization as not all economies are evolutionary in nature, as is evident from existing empirical works in literatures that mainly demonstrate "economic emergence" whereby new products and industries are continuously emerging from existing products and industries with different degrees of sophistication and complexity, while novelty is not addressed in their works. Furthermore, their works lack an explanation of path creation, e.g. jump-starting new capabilities; new clusters of products and new industries. Lastly, agents of change, i.e. firms and institutions that carry knowledge and capabilities, are not addressed in their framework.

On the other hand, taking into consideration that regional economies are composed of products, industries and clusters as well as firms and institutions

that themselves are at different levels of existence that emerge and evolve concurrently, the theory of emergence as depicted above offers only a partial framework for understanding the pathways undertaken by countries to transform their economic structure. Ter Wal and Boschma (2011:929) propose in their framework that "patterns of spatial clustering in an industry co-evolve with three entities, with the firm at the micro-level, with the industry and technological properties at the macro-level, and with the network that describes the patterns of interaction among firms of industry". Therefore, a unified framework is needed to explain the concurrent emergence and evolution of products, industries, clusters, firms, and institutions along with capability, proximity and relatedness within regional economic systems. The Path Creation Framework (Figure 7) attempts to conceptualize actors, factors and outcomes that shape the emergence and evolution of regional economies hence it is presented herein as a framework for a research agenda, although the focus of this research project is on the role of institutions.

The second challenge is the emergence of new growth paths that has received little attention by scholars. However, recent research contributions (Hidalgo et al., 2007; Hausmann & Hidalgo, 2010; Frenken & Boschma, 2007; Boschma & Frenken, 2011; Neffke et al., 2011a) demonstrate a path dependence process in which the existing industrial and productive structures of a country determine the future state of a country, hence offer a stepping stone into new path creation. Martin and Sunley (2006:420) define different ways of breaking out of particular paths, i.e. "indigenous creation such as emergence of new technologies and industries; heterogeneity and diversity of local industries and technologies; transplantation from elsewhere such as the importation of industry or technology; diversification into related industries; and upgrading of existing industries".

Path dependence is a profound concept in institutional economics and evolutionary economics (Martin & Sunley, 2006; Martin, 2010). It explains the path dependence or lock-in phenomenon for regions undertaking different development trajectories and generating varying degrees of economic growth;

however, it does not inform us about where (location), when (time), how (mechanism) and who (agents) create new paths of growth. The main argument is threefold, i.e. based on historical, embeddedness, and knowledge perspectives. First, economic development is a 'path-dependent' process (Amin, 1999; Maskell et al., 1998), in which the evolution of particular firms, technologies and territories are influenced by previous trajectories and past decisions, hence "history matters in the process of institutional change as the decisions made in the past shape expectations of actors for the future" (North, 1990). Therefore "if institutional path dependence matters, it matters in different ways in different places: institutional-economic path dependence is itself place dependent" (Martin, 2000). Second, as economy is socially embedded (Amin, 1999 in Cumbers et al., 2003b), and institutions are embedded within a society (Amin & Thrift, 1994), embeddedness influences social and institutional factors that shape the processes of economic development in particular places (Amin & Thrift, 1994; Cumbers et al., 2003b) whereby the institutional arrangement or real institutional entities condition a state of self-locking mechanism into a particular institutional arrangement which in turn locks-in regions into certain development paths regardless of the development outcomes due to the "persistence of institutional arrangement" (Hodgson, 1993). Third, pre-existing capabilities, knowledge, routines and technologies accumulated and embedded within regions, industries, institutions, firms and products, condition development trajectories (Nelson & Winter, 1982; Arthur, 1989; Porter, 1998, 2003; Frenken et al., 2007; Hidalgo, 2009, Hidalgo & Hausmann, 2009; Boschma & Frenken, 2011; Asheim et al., 2011; Neffke et al., 2011a) because of "untraded interdependencies" (Storper, 1997) between firms and institutions that determine the creation of new paths for growth.

In summary, institutions are not only both path and place dependent but also create their own lock-in situations that determine the degree of persistence of certain routines, capabilities, and knowledge which make the co-evolution of institutions with firms a difficult process consequently locking-in regions to specific development trajectories.

Underlying Factors and Mechanism for Path Creation

EEG, as discussed herein, provides a promising platform to explain the dynamics and evolution of 1) regions, clusters and industries; 2) institutions; 3) firms; 4) products and services (Maskell, 2001; Boschma & Frenken, 2006) where accumulated, embedded, related and variety of routines, capability and knowledge are underlying factors that influence the evolution of regions through actions undertaken by economic agents (Figure 13). However, capability and knowledge are defined and measured differently; on the other hand, their implications for the emergence of industrial clusters are similar, whereby they form underlying factors for path dependence and creation of new paths. In this section, nature, proximity, relatedness, diffusion and emergence of knowledge and capability within and across institution space, firm space, product space, and industry space are discussed.

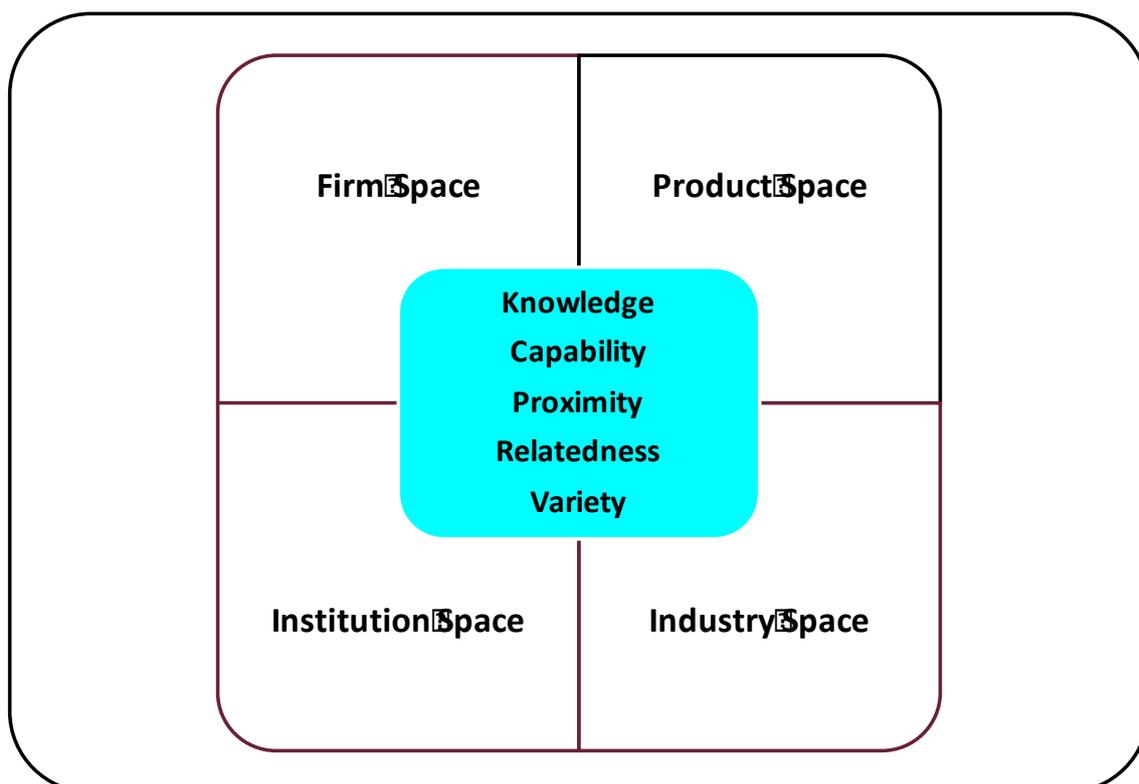


Figure 13: Project-1 Factors for the Creation of New Paths

The cluster theory focuses on proximity and interrelatedness between firms and institutions based on Marshall-Arrow-Romer (MAR) externalities where firms

benefit from labour pooling and specialization, input-output relations, knowledge spillover, and joint innovation efforts. It is measured on the geographical correlation of employment across traded industries (Porter, 2003); however, it falls short in defining the nature of proximity and does not inform about the interrelatedness of products that firms are producing. Capability, through a cluster space lens, is embedded in the network while at a firm level it is embedded within firms. On the other hand, the proximity and relatedness of the product space is an estimate of the relative number of capabilities shared by a pair of products (Hidalgo & Hausmann, 2009) and based on the probability that a country develops comparative advantage in two products (Boschma et al., 2011); however, it is missing the proximity of firms and industries. The key difference to firm space is that capability in the product space is embedded in the product rather than the network of firms. However, a concise definition of capability is not given; instead, capabilities are defined as inputs that are not internationally tradable, such as tangible capabilities (e.g. infrastructure assets of bridges, ports and highways) and intangible capabilities (e.g. norms, skills and institutions) (Hausmann & Hidalgo, 2010). In contrast to the product space, the proximity and relatedness of the industry space (Neffke et al., 2011a&b) is based on Jacob's externalities, where firms benefit from inter-industry linkages and industry diversity to combine knowledge across industries and stabilize demand conditions for resources, services and infrastructure. Similarly, to product space, measurement is based on the co-occurrence of products. The method used to measure proximity and relatedness in the industry space is the "Revealed Relatedness" that measures the revealed existence or co-occurrence of products in the portfolio of manufacturing plants between two industries (Neffke et al., 2011a); however, it does not address the proximity and relatedness of firms. Similarly, to the cluster theory, capability within the industry space is embedded in the network. What is not clear from the above works is how countries go about changing their capability and structurally transforming their productive structure.

The importance of the capability, proximity and relatedness concept is threefold; first it determines path dependence, second it defines diversity and third it

conditions new path creation. Existing capabilities determine the economic complexity (diversity) of a country which conditions future capabilities and consequently shapes changes in the economic structure and branching out into related or nearby products that are in close proximity to pre-existing capabilities (Hidalgo et al., 2007:482). Martin and Sunley (2006) identify relatedness among the components of the production process, i.e. firms, institutions and skills, as a force that reinforces a particular economic structure inherited from the past. Boschma and Frenken (2011) underline the importance of diversity as a driver of regional evolutionary branching out, establishing that economic development is not only a path dependent process but also a place-dependent process. The process of branching out is defined as the creation of new industries through the recombination of related pre-existing technologies in the region (Frenken & Boschma, 2007; Boschma & Frenken, 2011). Related (or unrelated) variety or diversification in a sector, region or nation is "a key concept in evolutionary economy geography" as it integrates knowledge, proximity and relatedness to economic renewal, new growth paths and regional growth (Asheim et al., 2011). Therefore, diversification into products, branching out into industries, and firms' spin-offs are all path dependent (Boschma & Frenken, 2011; Neffke et al. 2011a); further, capability, proximity, relatedness and variety are underlying factors for path dependence and path creation; however, the literature is weak on explaining the mechanism of branching out. The nature and diffusion of capability and knowledge across different spaces are discussed below.

There are different theorizing models on the nature of knowledge, for example ranging from tacit to tangible, individual to collective, simple to complex, component to architectural (Ambrosini et al., 2009), embodied to disembodied knowledge (Keller & Yeaple, 2012). The tacit to explicit is based upon the actual characteristics of the knowledge; the individual to collective is based on the location of knowledge; the architectural to component addresses the focus of the knowledge, whether it is part of a product or encompassing an entire system; embodied to disembodied knowledge is focused around the mobility of knowledge in traded intermediates or direct communication; these different knowledge models are elaborated below.

Ambrosini et al. (2009) explain that tacit knowledge is untradable, inimitable and not easily transferable (Polanyi, 1962), hence is a source of competitive advantage for firms. Tacit knowledge is understood as knowledge about how to do things, it is procedural (Ambrosini, 2009), related to action (Brockmann & Anthony, 2002), context specific (Polanyi, 1962), and not codified (Spender, 1994). In contrast explicit knowledge refers to knowledge that can be structured, codified, into a series of categories, classifications (Boisot, 1983 or rules (Kogut & Zander, 1992; Nelson & Winter, 1982), therefore, is tradable, imitable and transferable, hence can be communicated, stored, retrieved and exploited by other firms.

Individual knowledge is valuable and intangible, and considered to be a critical part of a firm's intellectual capital. On the other hand, collective knowledge refers to knowledge that is shared across individuals and is readily available to anyone in the firm (Hansen et al., 1999). It is embedded in organizations, and stored in collective practices, routines and procedures (Spender, 1994); further, collective knowledge is a dynamic concept in that it is not only held collectively, but also both generated and applied collectively (Spender, 1994) as Ambrosini et al. (2009) elaborate.

Component knowledge is concerned with specific knowledge resources, skills, and technologies that relate to identifiable parts of an organizational system rather than to the whole organizational system (Pinch et al., 2003; Tallman et al., 2004:264); further, it relates to physically distinct aspects of a product that embody a core design concept and perform a specific function (Clark, 1985 in Ambrosini et al., 2009). Hence component knowledge tends to be a tangible kind of knowledge therefore, is tradable, imitable and transferable, therefore can be communicated, stored, retrieved and exploited by other firms. In contrast, architectural knowledge is holistic in nature; it relates to an organization as an entire system concerned with routines, structures, systems, cultures, which become embedded in practices and procedures, task distribution, relations, and communication channels (Henderson & Clark, 1990; Pinch et al., 2003; Balogun & Jenkins, 2003; Ambrosini et al., 2009), that connect and integrate different

components for systems and organizations to be able to function (Balogun & Jenkins, 2003) into patterns for productive use and for developing new architectural and component knowledge (Tallman et al., 2004:265). Therefore, architectural knowledge becomes path dependent which limits the absorbing capacity of firms (Pinch et al., 2003), as it is untradeable, inimitable and not easily transferable.

Architectural and component knowledge categorization provides a sound framework to theorize the mobility of knowledge at firm, product and industry levels compared to other knowledge models; further, tacit, tangible, individual, collective, simple and complex knowledge types are embedded in the concept of architectural and component knowledge. Contrary to most knowledge models that assume core-knowledge is bounded to its originating location, leading to sustainable competitive advantage for firms within cluster (Lawson, 1997) or knowledge convergences among firms in a region due to isomorphic pressures that limit radical and breakthrough innovations (Tallman & Jenkins, 2012:4, Jenkins and Tallman (2012:3). It suggests that the movement of both architectural and component knowledge at both the firm and cluster level underpins shifts in competitive advantage through innovation, spillovers, re-combination of ideas, and migration of knowledge from one location to others, often through active intervention by multinational firms, rather than stagnate or lose value through inter-regional imitation. This is particularly relevant in the emergence and evolution of industrial clusters where mobility of capability and knowledge becomes an underlying factor within and across a firm's level, product's level, and industry's level, as discussed below.

Institutions and Capability within product space

Capability and knowledge is embedded within products exported and traded across countries (Hidalgo & Hausmann, 2009). Further, diversity and ubiquity of capability (Hausmann et al., 2011), embodied and disembodied knowledge (Keller & Yeaple, 2012) and architectural and component knowledge (Henderson & Clark, 1990; Pinch et al., 2003; Balogun & Jenkins, 2003; Ambrosini et al., 2009; Jenkins & Tallman, 2012) are embedded within tradable

products. The diversity, ubiquity, complexity, embodiedness and intensity of knowledge or "capability" embedded in the productive structure determine the "economic complexity" of a country, which is derived from the diversity of products a country produces and ubiquity of products, which is the number of countries to which a product is connected (Hidalgo & Hausmann, 2009). The literature proposes that the productive structure of countries is determined by the local availability of highly specific capabilities, which can be thought of as specific building blocks of economic complexity, and economic complexity is a result of the complex structure of knowledge and capability (Dopfer & Potts, 2004; Hidalgo, 2009). Countries are endowed with a set of capabilities, whereas products require specific capabilities and the sophistication of a product is related to the number of capabilities that the product requires; whereas the complexity of a country's economy is related to the set of capabilities it has locally available (Hidalgo, 2009). In a sense, accumulated capability and knowledge determine national competitive advantage, as countries may have capabilities to make some component products (ubiquitous) e.g. car tyres but do not have diverse set of capabilities, i.e. architectural capability, to manufacture the whole assembly of a car (less ubiquitous).

Hidalgo and Hausmann's (2009) theory of capabilities demonstrates through empirical evidence the path dependency of trajectories undertaken by countries and that the economic development path of a country is determined by its capacity to accumulate the capabilities required to produce more sophisticated products that are related and in close proximity to existing conditions. The theory of capabilities in a sense theorizes the path dependence and path creation of knowledge and capabilities from an outcome-based product space perspective. It informs us that proximity, relatedness and complexity of existing capability embedded in products are underlying factors for path dependence and path creation. New paths emerge in the context of existing capabilities, which can be "existing structures, and paths of technology, industry and institutional arrangements" (Martin & Simmie, 2008:186). It does not inform us about the nature of accumulated knowledge and capability, how (mechanism) paths become dependent and created, and who (economic agents, e.g.

institutions and firms) establishes path dependence and creates paths in a region or a nation. The mechanism through which new knowledge and capability in intra-industry knowledge diffusion happen requires further research. Finally, it is inferred that for nations and regions to diversify their economies through related variety would need to build complex related knowledge; however, the literature is silent on the role and impact of state-owned institutions and enterprises in the emergence of products and industrial clusters.

Institutions and Capability within firm space

The main argument is twofold: (1) embeddedness of knowledge, (2) co-evolution of firms, clusters and knowledge.

First, capability and knowledge are embedded in firms. The nature of knowledge, i.e. whether it is transferable, tradable and imitable, conditions the competitive advantage of firms. Therefore, the nature of knowledge, i.e. whether it is component or architectural, influences the evolution and emergence of knowledge within clusters and industries. Component knowledge provides short-term competitive advantage to firms within a cluster while it remains private, and component knowledge that is public only within the cluster provides short-term competitive advantage to the cluster as a whole (Tallman et al., 2004). In contrast, architectural knowledge or "firm specific architectural knowledge" (Jenkins & Tallman, 2012:15) is complex, intangible and tacit, organization specific, causality ambiguous, and private because of its path dependency, organizational embeddedness, holistic and evolutionary nature (Tallman et al., 2004:265). It provides differential competitive advantage to firms within a regional cluster, despite shared component knowledge (Tallman et al., 2004:268), therefore it limits flow across firms or cluster boundaries (Jenkins & Tallman, 2012:5). Therefore, the knowledge flows between firms in regional clusters are composed primarily of component knowledge (Tallman et al., 2004:264). Further, components' knowledge flows are enhanced within a firm or cluster by common cluster-level architectural knowledge (Jenkins & Tallman, 2012:5) which is created out of the fabric of untraded interdependencies, sense

of common interest, and geographical identity of the component firms (Tallman, 2004:269). Cluster-level architectural knowledge that is tied to geographical collocation is common to members of the cluster and unavailable to non-members (Tallman et al., 2004:266). This will enhance the transfer, absorption, and application of component knowledge across firm boundaries within the regional cluster and retard flows of component knowledge across cluster boundaries (Tallman et al., 2004:266) while different and/or competing sets of architectural knowledge between organizations or clusters act as isolating mechanisms to slow the movement of component knowledge across boundaries (Pinch et al., 2003). In summary, firm and cluster specific architectural knowledge condition and sustain the competitive advantage of firms within clusters.

Second, what is claimed in the literature is that "clusters undergo quite different forms of evolution, some of which need not entail a change in the identity (specialism) of the cluster, and others that involve the replacement of the cluster by another of a different specialism"; further, clusters are characterized by emergence, where macro-scale (cluster-wide) emerge out of micro-scale behaviours and interactions of systems' components that make up the system of clusters (Martin & Sunley, 2011). However, the change of identity and specialization, along with process of change is not clearly articulated in the literature. On the other hand, Boschma and Frenken (2011) note "from an evolutionary perspective clusters are analyzed by tracing entry and exit patterns over time ... more successful firms produce more and more successful spinoffs" and clusters emerge once a single firm or a few successful firms start to create a successful spin-off which in turn, creates successful spin-offs themselves. The spinning off, entry and exit of firms could resemble path dependence in principle; however, these are not essentially evolutionary phenomena that generate new products, industries or novelty associated with economic evolution. Further, theorizing path dependency and path creation of agglomeration of firms is weakly supported with empirical evidence in the literature. It could be because capability in cluster theory is embedded in the network of firms, while proximity and relatedness are not precisely defined,

which makes the geographical proximity of firms that excludes linkages with products difficult to be measured and experimented on.

Knowledge can be found in different specialized geographical clusters locations, specialized regions, industrial districts (Porter, 1998) hence firms will tap into these different sources of knowledge within and beyond their geographical proximity (Jenkins et al., 2012).

Jenkins et al. (2012) further suggest that not only are the knowledge of firms and knowledge of clusters interrelated, there is a symbiotic relationship between clusters and firms' external networks, which allow the development of new knowledge, and capability within clusters. In a sense, firms, in particular MNEs (carefully generalizing it to SOEs), operating across countries influence the development of knowledge beyond their home base geographical location as knowledge moves over geographical space in different forms, e.g. component or architectural (embodied or disembodied form, as suggested by Keller & Yeaple, 2012). Therefore, MNEs proactively implement strategies to access location-tied knowledge competencies by choosing to locate operations in specific clusters or alternatively by creating networks outside their home clusters (Jenkins & Tallman, 2012:20). MNEs (and SOEs) can indeed expect to benefit competitively from sourcing cluster-tied knowledge and combining it with other knowledge in remote locations, as noted by Jenkins and Tallman (2012).

Although, knowledge, as an intangible, seems ideally suited to overcoming spatial frictions, there appear to be limits and barriers to the transfer of knowledge because of knowledge transfer costs (Keller & Yeaple, 2012:4) i.e. associated disembodied and embodied knowledge transfer costs that shape the knowledge content of international trade. Products that require high knowledge transfer cost will be produced at home (embodied knowledge transfer), while products that demand lower transfer cost (disembodied knowledge transfer) will be produced abroad (Keller & Yeaple, 2012:5). Thus, "even in the world of the internet we find that spatial barriers to disembodied knowledge transfer are large" and "the spatial organization of firms depends critically on the spatial barriers to disembodied knowledge transfer, and as spatial barriers to

disembodied knowledge transfer fall, vertical links between firms will be increasingly invisible as there is less embodied knowledge transfer and more disembodied transfer" (Keller & Yeaple, 2012:28). The dynamics of MNEs and SOEs are, however, different and it would be interesting to understand how SOEs manage the transfer cost of knowledge compared to MNEs.

Institution and Capability within Industry Space

Knowledge and capability is embedded across the industry where component knowledge is normally tied to the technology of the industry (Tallman et al., 2004:264); industry is tied to component knowledge which has originated within the cluster and remains there, moving among member firms, but is greatly restricted in moving to non-member firms that do not share the cluster's architectural knowledge (Tallman et al., 2004:268) that manifest itself in a variety of products generated by regional economies.

The main argument on path creation supported by empirical research in industries is founded on industry relatedness, skills relatedness and diffusion of knowledge. First, as noted by Boschma et al. (2013), the study by Neffke (2011a) is the only piece of work that "has provided systematic evidence that regions are more likely to expand and diversify into industries that are closely related to their existing activities"; thus, regions are more likely to branch out into industries that are technologically related to the pre-existing industries within regions (Neffke et al., 2011a) because, "the rise and fall of industries is strongly conditioned by industrial relatedness" whereas technological relatedness determines path dependences in the diversification process of regional economies that is conditioned by "skill relatedness" (Neffke & Henning, 2013). Second, Neffke and Henning (2013: 298) theorize that both labour flows and firm diversification follow patterns that reflect a latent structure that connects different economic activities (i.e. industries) through their skill relatedness. Moreover, skill relatedness reveals a complex web of inter-industry linkages that spans the industry space, thus, suggesting skill relatedness as a space that not only connects industries but also products and firms. Subsequently, Neffke and Henning (2013) concluded that firms would

diversify into areas that require similar accumulated skills. It is an extension of the product space (Hidalgo et al., 2007) whereby new variety (industries) arises from technologically and capability related products and industries in regions. Third, on diffusion of knowledge, Bahar et al. (2012) postulate that making a product requires varying amounts of specific tacit knowledge, therefore countries that can make a product that they did not invent must have acquired the requisite knowledge from somewhere. Bahar et al. (2012:8) find that countries are predominantly similar to their geographic neighbours in terms of the composition of export baskets and that similarity diminishes sharply with distance, consistent with the local spread of knowledge diffusion. Thus, diffusion of knowledge is more of a local rather than a global phenomenon, hence much of the technology is not embodied in materials or products, but takes the form of tacit knowledge that is not codified and therefore cannot be traded and transferred. This means knowledge diffusion requires more direct forms of human interaction, which limits its scope to more localized, or idiosyncratic settings as suggested by Arrow (1969). In a sense, the capacity of regions to accumulate knowledge and move into new export products is conditioned by the connectivity and availability of tacit knowledge in neighbouring regions (Bahar et al., 2012:6), and mobility of labour. This is suggestive of intra-industry knowledge diffusion (Bahar et al., 2012:31) based on geographical proximity; however, there are other proximity dimensions such as cognitive, organizational, social and institutional, that influence the diffusion of knowledge within regions and across nations, clusters and industries (Boschma, 2005). Further, geographical proximity may act as a barrier to the transfer of knowledge because of the locking in phenomenon.

There are two main points inferred from above discussions. First, the branching mechanism of regions into related and unrelated firms, products and industries, is highly dependent on the accumulation and diffusion-ability of knowledge (capability) that is determined to the extent that knowledge is component or architectural, embodied or disembodied, simple or complex. Second, not all traded products are immediately available for reproduction due to varying degrees of capability among countries and the barriers associated with diffusion

of capability and knowledge across geographical locations. These barriers relate to the architectural, intensity, complexity, embodiedness and path dependency of the nature of knowledge as well as the associated knowledge transfer costs (Henderson & Clark, 1990; Pinch et al., 2003; Tallman et al., 2004; Jenkins et al., 2012; Keller & Yeaple, 2012).

It can be concluded that as regional economies are depositories of knowledge and capability through various economic agents i.e. government institutions, specialized government agencies, SOEs, private firms, and multinational firms, those economic agents would need to adopt strategies to overcome these barriers to build their knowledge base. This would enable path creation into related and unrelated knowledge and capabilities, consequently a variety of products that achieve diversification in regional economies.

The product-based theory of capability, along with the skill relatedness and related and unrelated varieties, provide a promising explanation of the diffusion of knowledge across products, industries, firms, hence diversification of regional economies; however, the institutional elements would need to be integrated into the theory in order to understand the role of institutions in the transformation of regional economies, particularly on their influence over underlying factors for path dependence and path creation. The role of state-owned institutions and enterprises are not elaborated on when theorizing path dependence and path creation for regional economies. Boschma and Frenken (2009) argue "institutions can be integrated into evolutionary economic geography if institutions are treated as conditioning, rather than determining firm behavior and regional development". However, there is very little empirical research on the role of institutions on diversification of regional economies. It could, however, be understood from the above discussions that diversification of regional economies is a complex process, thus regions would need to adopt integrated platform diversification policies that address the diffusion of knowledge across institutions, firms, products, and industries, whereby key economics agents, such as state-owned institutions and enterprises, play an active role in creating integrated industries.

The Role of Institutions on Path Creation

The main takeaways from the discussions above are threefold: definition and measure of diversification, embeddedness of knowledge and capability, and role of institutions creating new paths for economic growth.

Diversification is an outcome measure of regional economies that can be defined as complexity, variety and relatedness of knowledge and capability that can be measured through related and unrelated varieties of products.

Knowledge is embedded within institutions, firms, products, and industries. There is a reciprocal and interdependent relationship between institutions and firms, and knowledge and capability of economic regions. Macro patterns emerge from micro behaviours and interactions (Foxon, 2011) of firms, whereby new paths emerge in the context of existing capabilities, which can be "existing structures, and paths of technology, industry and institutional arrangements" (Martin & Simmie, 2008:186). In a sense, institutions, firms, products, and industries co-evolve through the interaction of institutions and firms within the regions, thus capability and knowledge converge over time. Moreover, both institutions and firms are effectively shaping the emergence and evolution of firms, products, and industries, thus determining the economic capability of regions. However, the specific role of institutions in the creation of capability and knowledge in regional economies is yet to be articulated through empirical research.

The role of institutions is not elaborated in the literature but is mainly deduced from a case study for a single industry, which cannot be generalized taking into account the differing context of regions and countries; however, the main functions of institutions can be summarized as follows:

Coordination: Regional economies are complex and dynamic systems thus are viewed as 'complex adaptive systems' (Foxon, 2011) made up of heterogeneous economic agents, lacking perfect foresight but able to learn and adapt over time (Foxon, 2011) where the interactions of macro (institutions) and micro (firms) levels create novelty (Foxon, 2011). Therefore, the role of

institutions is around coordination and interaction with other economic agents to create novelty.

Structuration: Institutions influence path dependence and path creation through coordination and structuration process. Sydow et al. (2010) suggest that the role of actors is evident not only in following existing paths but also in the implicit and explicit mindful actions of agents that plan both for creating or maintaining path dependence. Moreover, Sydow et al. (2010) show through the case study of development of the optical technologies cluster in the German region of Berlin-Brandenburg, that agents have a role in the structuration process (Giddens, 1984 in Sydow et al., 2010). This occurs at and across multiple levels, particularly in the coordination of a network within this emerging regional cluster and agency turns coordination into a self-reinforcing mechanism that can accelerate the cluster's development and keep growth on the intended track while at the same processes can also lead to negative lock-in. The role of institutions in providing incentives or barriers to particular types of environmental behaviour has long been an important part of ecological economics (Foxon, 2011). In a sense, institutions play a key role in the structuration process of regional economies to generate new paths for growth.

Rules of the Game: Institutions act as a binding constraint and as a path creator through manipulation of institutional environment and institutional arrangement. Sydow et al. (2010) in their study of path dependence in the development of a cluster, emphasizes institutions as being a set of binding constraints leading to outcomes such as institutional "stickiness" (Markusen 1996) or "hysteresis" (North 1990). Institutions set expectations and impose rules, creating structures that reduce uncertainty and improve accountability. They represent ordered interaction sequences, often leading to consistency, coherence, and stability. But institutions also imply ongoing activity, which involves more or less potent actors, competing logics, and resources that support change. In other words, institutions set the rules of the game for shaping the trajectories of regional economies.

Instrumenting dynamic capability: The institutional environment and institutional arrangement play an important role in path de-locking or path creation that influence the development trajectories through the deliberate action and flexible interpretation of these arrangements by actors (Notteboom et al., 2013), such as firms and institutions through the accumulation and creation of routines, capabilities and knowledge. Institutions influence regions over time; or as Hodgson (2000) puts it "institutions have the potential not merely to constrain behavior, but to cause and transform behavior via the notion of re-constitutive downward causation". These institutional environments and arrangements are generated, degenerated and distinguished (Hodgson; 2001); and "reproduced over time" (Nelson & Winter, 1982; Notteboom et al., 2013) thus routines, capabilities, knowledge, firms, and institutions within regions emerge, evolve and co-evolve over time. Therefore, the transformational capacity of institutions is essential for understanding the evolutionary nature of regions (MacKinnon et al., 2009). It can be concluded that regions that can build a stock of complex capabilities and knowledge where institutional environment enables "institutional plasticity" (Scrambach, 2010) or changing existing institutional arrangements will develop a capacity for creating new paths for growth. This institutional approach offers a more dynamic and relational perspective that views economic development as an open-ended and contested process operating across different geographical scales" Cumbers et al. (2003b) where regions are produced and reproduced as a result of the actions of various economic agents (Nelson, 1995). Institutional differences explain the regional development trajectories and the process of technological innovation and industrial dynamics (Nelson, 1995). The prevailing institutions constrain the innovation and adoption of new technologies, and the economic benefits of new technologies are only fully realized when institutions – modes of organizing work, markets, laws and forms of collective action – evolve and adapt to these new technologies (Nelson & Sampat, 2001). In a sense, institutions as firms would need to develop "dynamic capabilities" in order to manipulate internal and external institutional environments that enable the creation of new paths for economic growth.

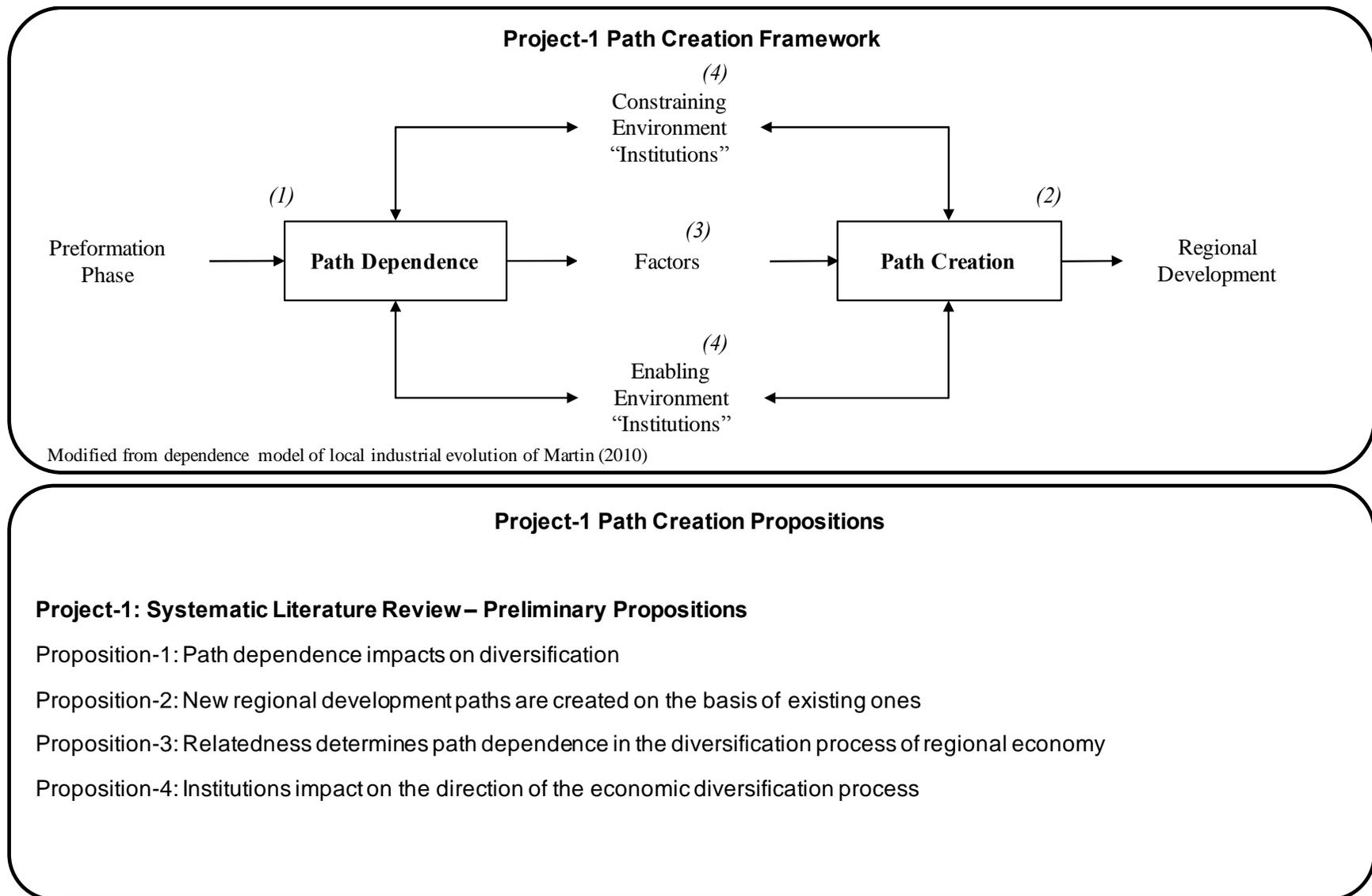


Figure 14: Project-1 SLR Propositions and Framework for Path Creation

2.7 Conclusions of SLR

This research generates a set of findings, four propositions and a basic framework for path creation (Figure 14). The main findings of the literature review and associated policy implications are sevenfold. First, economic regions are composed of different macro, meso and micro factors; as a result, new pathways result from the interplay between these factors and actors which make the system complex, thus demanding a network and heterodox economic approach to theorizing regional economies. Therefore, neither neoclassical growth theory in a neutral space, nor institutions in a real space or a region, nor clustering or agglomeration of firms in a real space, nor region or geography alone can provide a sufficient explanation for regions undertaking different development trajectories and achieving varying degrees of economic growth.

Second, the evolution of space or region comprising institutions, firms, products and industries can be reconciled in evolutionary economic geography thinking by viewing the emergence and evolution of institutions, firms, products and industries as a dynamic process. The co-evolution of institutions, firms, products and industries create novelty over time, which is an essential conceptual framework to be studied in order to understand the path dependence and path creation of regional economies. It provides a framework for analysing the mutual causal influences between systems, including factors and the roles of structure and agency. The evolutionary economic geography, path dependence and path creation are promising foundation concepts to understand the evolution of regional economies.

Third, path dependence matters greatly to the evolution of regional economies, although policy makers would like to assume that new growth paths and clusters could be created regardless of existing capabilities and knowledge. Hence, understanding the accumulated and embedded capability and knowledge in the economic structure, and the mechanism of branching out into related and unrelated capability and knowledge, is essential for shaping future growth and development.

“Path dependence impacts on diversification”

Project-1 SLR Proposition-1

Fourth, new region development paths are created on the basis of existing ones (Martin, 2010). Moreover, pre-existing accumulated and embedded capability and knowledge in the variety of products generated by regional economies determine the development trajectories of regions. Therefore, related and unrelated products that are distanced from existing capabilities and knowledge will be difficult to produce, and it will also be difficult to attract new industries that are technologically unrelated to pre-existing industries.

“New regional development paths are created on the basis of existing ones”

Project-1 SLR Proposition-2

Fifth, the creation of new capability and knowledge shaping new paths for development is a complex economic process undertaken by economic agents such as institutions and firms. The concepts of "building blocks of economic complexity" (Hidalgo & Hausmann, 2009; Hidalgo, 2009), "related and unrelated variety" (Frenken et al., 2007; Boschma & Frenken, 2011), "industry relatedness" (Neffke & Henning, 2008, 2014; Neffke et al., 2011a) and "differentiated knowledge base" (Asheim & Gertler, 2005; Asheim & Coene, 2005; Asheim, 2007), that form the building blocks for theorizing the mechanism of branching process and path creation (Martin & Sunley, 2006; Frenken & Boschma, 2007; Martin, 2010; Neffke et al., 2011a), remain unanswered in the literature and essentially inform scholars and policy makers on the importance of product variety and diversity as determining factors for the evolution of regional economies and hence should be an element of policy setting, particularly industrial policies. The mechanism of branching out into new clusters, industries and products, and the implications of institutions and policy making in the creation of new paths are areas of interest to be researched.

Furthermore, Neffke et al. (2011) provide empirical evidence that “the rise and fall of industries is strongly conditioned by industrial relatedness” whereas

technological relatedness determines path dependencies in the diversification process of regional economies. Therefore, new paths emerge in the context of existing capabilities, which can be “existing structures, and paths of technology, industry and institutional arrangements” (Martin & Simmie, 2008:186). Regions branch out into related varieties or industries (Frenken et al., 2007) or related and knowledge and capabilities (Hausmann & Hidalgo, 2010). In a sense, the variety and interrelatedness of pre-existing capability, knowledge, products and industries in a regional economy determine the path creation mechanism and trajectories of regions.

Relatedness determines path dependence in the diversification process of regional economy

Project-1 SLR Proposition-3

Sixth, the main argument laid out is the need to integrate institutions, firms, products and industries into one unified framework to understand the emergence and evolution of regional economies, whereby capability, knowledge, proximity, relatedness and variety are underlying factors for the creation of new paths for diversification and growth through the actions undertaken by economic agents. Moreover, the complexity of the economic system would require integrated "platform policies" (Cooke, 2007, 2012; Asheim et al., 2011) that take into consideration the variety of factors and actors that shape the emergence and evolution of institutions, firms, products and industries.

Finally, while both firms and institutions are instrumental in shaping the trajectories of regional economies, the role of institutions in establishing path dependence conditions and creating new paths of regional economies remains under-researched in the literature thus presenting an area of interest for a future research agenda.

“Institutions impact on the direction of the economic diversification process”

Project-1 SLR Proposition-4

The overarching research question that has puzzled many scholars for decades is "why some regions are able to diversify into new products and industries while others continue to face challenges in diversification?" The role of institutions matters for economic development however it remains under researched in literature as explored in the SLR. The author is particularly interested in the role of institutions specifically in the creation of new paths for economic diversification.

The proposed empirical research question is

What is the role of institutions in the diversification of regional economies?

This empirical research question is much more prudent for some countries, such as UAE, for three main reasons. First, contextually UAE over the past four decades have witnessed high economic growth on the back of oil and gas revenues but continue to experience tremendous difficulties to structurally transform and diversify their economies beyond natural endowments, i.e. oil and gas and related products and industries. UAE and GCC countries have moved from a near zero industrial base 40 years ago to petrochemicals, fertilizers, and base metals, such as steel and aluminium; in addition, vast current developments in services, including banking, shipping, logistics distribution, airports, real estate etc. have taken place (Hvidt, 2013). In other words, the main trajectories of economic development for UAE resemble path dependence phenomena with a few cases of creating new paths for growth. Second, the economy is structured around simple and energy-dependent products and clusters that require limited capabilities and knowledge, which make these economies difficult to upgrade into more complex and sophisticated products, industries and clusters. Third, government institutions and agencies, in many instances are the main economic agents and are effectively the anchor of industries and clusters that drive the economic growth, which offers a different context on the emergence and evolution of regional economies.

The proposed research project will contribute to knowledge in four ways. First, nurturing uncultivated knowledge, as the literature is silent on whether institutions establish path dependence, support structural transformation of regional economies, and create new paths for growth, consequently achieving economic diversification. Second, the discussions above on the role of institutions, capability and knowledge, proximity and relatedness, diversity and variety, barriers to diffuse and accumulate knowledge and capability, and strategies to mitigate these barriers, would need to be integrated into a framework that helps us understand the interplay between actors, factors and diversification outcomes. Third, the role of state institutions on shaping trajectories and the diversification of complex and dynamic economic systems should be subjected to sound empirical research methodologies to understand their imperatives and policy implications. Fourth, this research is particularly crucial in the context of UAE and other similar countries that have received eager coverage in the literature, whereby state institutions play a key multifaceted role as the main economic agents for the development of regional economies that set the rules of the game, and influence institutional arrangements and the environment.

The most appropriate means to investigate the research question is through mixed methods, which could include qualitative research through surveys and interviews, qualitative research of various case studies on the role of state institutions, comparative research on diversification policies, and quantitative research on the evolution of complexity and variety of related and unrelated products (outcome proxy measures for capability and knowledge) generated over a period of time.

3 PROJECT-2: THE CASE OF UAE

3.1 Abstract

A fundamental research question in regional economic development is “why some regions are able to diversify into new products and industries while others continue to face challenges in diversification?” The role of institutions matters in establishing path dependence phenomena and influencing the creation of new paths for regional diversification. However, the specific role of institutions and path creation mechanisms remain unanswered in the literature. This research explores how do institutions influence the diversification of regional economies? It is investigated through a qualitative case study on UAE that includes semi-structured interviews and focus group discussions. The research questions are based on theoretical propositions of the systematic literature review. This research generates propositions, constructs a framework and develops a matrix for path creation composed of path dependence, actors, mechanism, institutional capability and diversification outcomes. It suggests that new paths for regional diversifications are created through indigenous creation, anchoring, branching, and clustering mechanisms. Economic actors are found to drive diversification mechanisms and influence institutional capabilities to achieve related and unrelated varieties of industries. This research further provides strategies to guide policy makers on setting up the pathways to regional diversification.

3.2 Introduction

A fundamental research question in regional economic development is “why some regions are able to diversify into new products and industries while others continue to face challenges in diversification?” The role of institutions matters in establishing path dependence phenomena and conditioning the creation of new paths for regional diversification; however, the specific role of institutions and path creation mechanisms remain unanswered in the literature. The purpose of this research is to explore how do institutions influence the diversification of regional economies?

This research paper first highlights theoretical propositions resulted from the systematic literature review (Project-1) that generates the research questions for this Project-2. Second, it

illustrates the applied grounded analysis methodology for the qualitative research including data collection, sampling for interviews, instrument design, and method of data analysis. Third, it analyses the outcomes of interviews and focus groups through content and cluster analysis that generates initial propositions. Fourth, it further conducts an integrated analysis to build relationships among the constructs of the path creation framework that are tabulated in summary matrices. Fifth, it discusses research findings in light of the literature and articulates five propositions, and one main overarching proposition conceptualizing path creation. Sixth it constructs a framework and develops a matrix for path creation that include path dependence, actors, mechanisms, factors, and outcomes. This paper ends with a set of suggested strategies on diversification of regional economies.

3.3 Theoretical Background

Countries followed different paths to transform their economic structure, moving from simple to complex and diversified products; “as countries become more complex, they become more diversified; they add more products to the export mix without really abandoning the products they started with” (Hausmann & Hidalgo, 2010). However, only advanced economies and a few developing countries have been able to transform their economic productive structure over the past four decades (Hidalgo, 2009). A fundamental research question in economic development is then “Why are some countries able to diversify into new products, industries and clusters while others continue to face challenges to diversify?” It is then crucial for policy makers to articulate the challenges and underlying conditional factors of emergence and evolution of new products, industries and clusters in order to formulate sound industrial policies and adopt intervention programmes that create new paths for economic growth. Path dependency (existing economic structure); industrial relatedness (process of diversification); and role of firms and institutions in creating industrial clusters are three phenomena researched in the literature and used as a basis for this research study.

The main outcomes of the systematic literature review are seven findings and four main propositions. First, economic regions are composed of different macro, meso, and micro factors and actors; as a result, new pathways result from the interplay between these factors and actors which make the system complex thus demanding a network and heterodox economic approach to theorizing regional economies. Therefore, neither

neoclassical growth theory in a neutral space, nor institutions in a real space or region, nor clustering or agglomeration of firms in a real space, nor region or geography alone can provide a sufficient explanation for regions undertaking different development trajectories and achieving varying degrees of economic growth.

Second, the evolution of space or region comprised of institutions, firms, products and industries can be reconciled in evolutionary economic geography thinking by viewing the emergence and evolution of institutions, firms, products and industries as a dynamic process. The coevolution of institutions, firms, products and industries create novelty over time, which is an essential conceptual framework to be studied in order to understand the path dependence and path creation of regional economies. It provides a framework for analyzing the mutual causal influences between systems, including factors, and the roles of structure and agency. The evolutionary economic geography, path dependence and path creation are promising foundation concepts to understand the evolution of regional economies.

Third, the existing structure of the economy acts as an underlying factor for future changes. In a sense, the current state of regional economies matters in economic development (Hidalgo, 2009) because “at any point in time the state of the economy depends on the historical adjustment path taken to it” (Martin & Sunley, 2006: 400) for “once a particular pattern of socio-economic development is established, it can become cumulative and characterized by a high degree of persistence or path dependence” (Martin & Sunley 2003:27; 2006; Martin & Simmie, 2008). Sources of path dependence include institutional arrangement, institutional environment and factors such as accumulated capabilities & knowledge, variety & interrelatedness of products & industries. Hence, understanding sources of path dependence such as geographical location, natural resources, infrastructure, and existing capabilities in the economic structure is essential for shaping future growth and development.

Path dependence impacts on diversification

(Project-1 SLR: Proposition-1)

Fourth, “new regional development paths” are created on the basis of existing ones (Martin, 2010) and pre-existing accumulated and embedded capability and knowledge in the variety of products generated by regional economies determine the development trajectories of regions. Therefore, related and unrelated products that are distanced from existing capabilities and knowledge will be difficult to produce, and it will also be difficult to attract new industries that are technologically unrelated to pre-existing industries.

New regional development paths are created on the basis of existing ones

(Project-1 SLR: Proposition-2)

Fifth, the creation of new capability and knowledge shaping new paths for development is a complex economic process undertaken by economic agents, such as institutions and firms. The concepts of “building blocks of economic complexity” (Hidalgo & Hausmann, 2009; Hidalgo, 2009); “related and unrelated variety” (Frenken et al., 2007; Boschma & Frenken, 2011); “industry relatedness” (Neffke & Henning, 2008; 2014; Neffke et al., 2011a); and “differentiated knowledge base” (Asheim & Coenen, 2005); form building blocks on factors that impact on the branching process and path creation (Martin & Sunley, 2006; Frenken & Boschma, 2007; Martin, 2010; Neffke et al., 2011a). Moreover, the argument is that “new regional development paths” are created on the basis of existing ones (Martin, 2010) through proposed conceptual mechanisms such as indigenous creation (emergence of new technologies and industries that did not exist before in a region), diversification, transplantation (the import of a new industry or technology from elsewhere, which then forms the basis of a new pathway of regional growth), and upgrading (revitalization of an industry through new technology, products and services) (Martin & Sunley, 2006); which all provide a step foundation to theorize the mechanism of path creation.

Furthermore, Neffke et al. (2011) provide empirical evidence that “*the rise and fall of industries is strongly conditioned by industrial relatedness*” whereas technological relatedness determines path dependencies in the diversification process of regional

economies. Therefore, new paths emerge in the context of existing capabilities, which can be “existing structures, and paths of technology, industry and institutional arrangements” (Martin & Simmie, 2008:186). Regions branch out into related varieties or industries (Frenken et al., 2007) or related knowledge and capabilities (Hausmann & Hidalgo, 2010). In a sense, the variety and interrelatedness of pre-existing capability, knowledge, products and industries in a regional economy determine the path creation mechanism and trajectories of regions. Therefore, it will also be difficult to attract new industries that are technologically unrelated to pre-existing industries.

Relatedness determines path dependence in the diversification process of regional economies

(Project-1 SLR: Proposition-3)

Sixth, the main argument laid out is the need to integrate institutions, firms, products, and industries into one unified framework to understand the emergence and evolution of regional economies; whereby capability, knowledge, proximity, relatedness, and variety are underlying factors for the creation of new paths for diversification and growth through the actions undertaken by economic agents. Moreover, the complexity of the economic system would require integrated “platform policies” (Cooke, 2007; 2012a; Asheim et al., 2011) that take into consideration the variety of factors and actors that shape the emergence and evolution of institutions, firms, products and industries.

Finally, while both firms and institutions are instrumental in shaping trajectories of regional economies, institutions could form the nucleus of industrial clusters that consequently lead to the spin-off of firms establishing a cluster (Wolfe & Gertler, 2004); however, the role of institutions in establishing path dependence conditions and creating new paths of regional economies remains a gap undercut in the literature, thus presents an area of interest for a future research agenda as they both play a crucial role in the diversification and branching activities.

Institutions impact on the direction of the economic diversification process

(Project-1 SLR: Proposition-4)

The four propositions discussed above form the construct of a guiding conceptual framework for path creation (Figure 14) and the role of institutions in the economic diversification of regions and countries, particularly the creation of new paths for growth and diversification. The initial conceptual path creation framework is constructed on the proposed path dependence model of local industrial evolution of Martin (2010) and path creation mechanisms (Martin & Sunley, 2006). It attempts to construct the mechanisms for how institutions influence the development of a region, particularly the creation of new industrial paths for growth within path dependence constraining conditions, specifically natural-based economies. Moreover, it provides the basis for conducting this qualitative research, i.e. research questions through interviews and focus groups in the research strategy and design.

3.4 Research Strategy and Design

The most appropriate means to investigate the research question “How do institutions influence economic diversification?” is through a rich, case-based dataset study that could include interviews, focus groups, case studies, strategies, policies, analyses, surveys and supported by quantitative analysis. The scope of this research study is, however, limited to the case of the Abu Dhabi region in UAE through interviews and focus groups. The qualitative research process and associated data structure are illustrated in Figure 15 and Figure 16 respectively. The systematic literature review not only provides the theoretical foundation but also the literature propositions that generate the research questions. The synthesis of interviews and focus groups further support and refine the literature propositions and introduce new propositions. The findings and propositions of interviews and focus groups are discussed and analyzed in light of existing theoretical foundations and propositions that generate the final set of propositions.

3.4.1 Methodology

The research question “How do institutions influence economic diversification?” is investigated through a rich, case-based dataset of Abu Dhabi, through semi-structured

interviews and focus groups that consist of the following questions which are generated from the systematic literature review propositions.

- What are the key factors that are attributed to the creation of new paths growth and diversification?
- How are new industries created?
- What are the mechanisms for creating new industries?
- How do government organizations, e.g. policy making and state owned institutions, influence on the creation of new paths for diversification?
- What are the strategic and policy implications for the creation of new paths for economic diversification?

3.4.2 Unit of Analysis

The study of path dependence and path creation of regional development in existing literatures is normally bounded to a single industry or single industry region. The unit of analysis for this research is a region. The starting point for this doctoral research is a regional rich case based study analysis of Abu Dhabi in UAE, then the research could be extended and applied to another region (and country).

The rationale for selecting Abu Dhabi, UAE as the case study is for various reasons. Abu Dhabi is 80% of the size of UAE, it is an industrial economic base for UAE compared to Dubai which is a service oriented economy. UAE economy has been the most dynamic in the region, it has been growing on average at a rate of approximately 4.2% over past four decades, its GDP grew from AED 58.313 million in 1975 to AED 1,447.6 million in 2013 (current prices). It has been able to reduce its dependence on natural resources from 67% (1970s) to 34% (2013) of GDP. At AED 158,205 GDP per capita (current prices) in 2013, UAE is amongst the richest countries in the region. Abu Dhabi and UAE have outperformed other countries within the Middle East in terms of creating a vibrant business environment, it is ranked by the World Bank as first in ease of doing business.

3.4.3 Scope of Research

The case analysis of Abu Dhabi through semi-structured interviews offers a specific focus on how institutions have influenced the economic development of a regional economy that is characterized by high path dependence on natural resources. The main purpose, however, is to generate a broader framework that explains how institutions influence economic diversification that could be tested at a later stage to cover other countries.

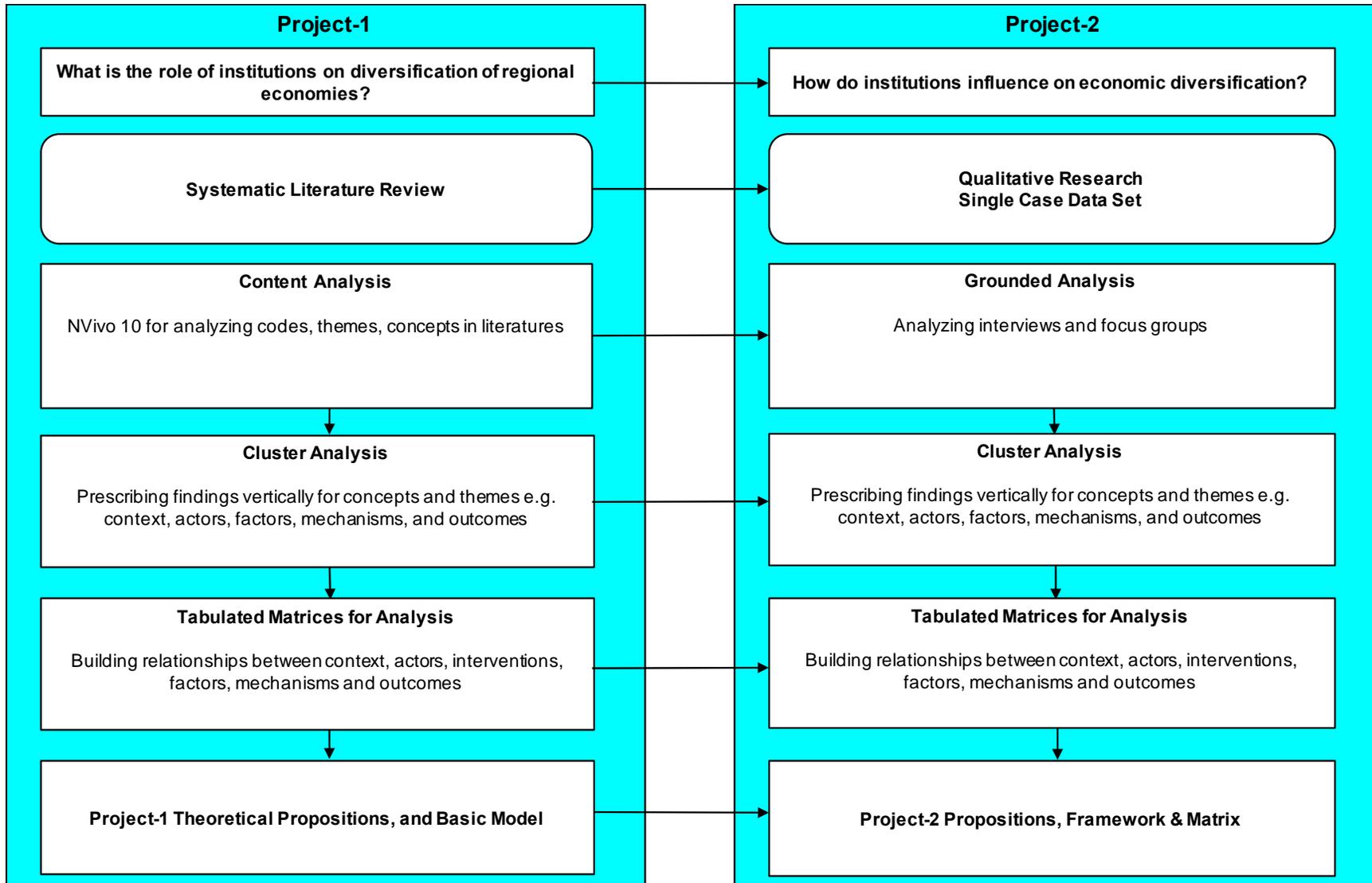


Figure 15: Project-2 Research Strategy & Design

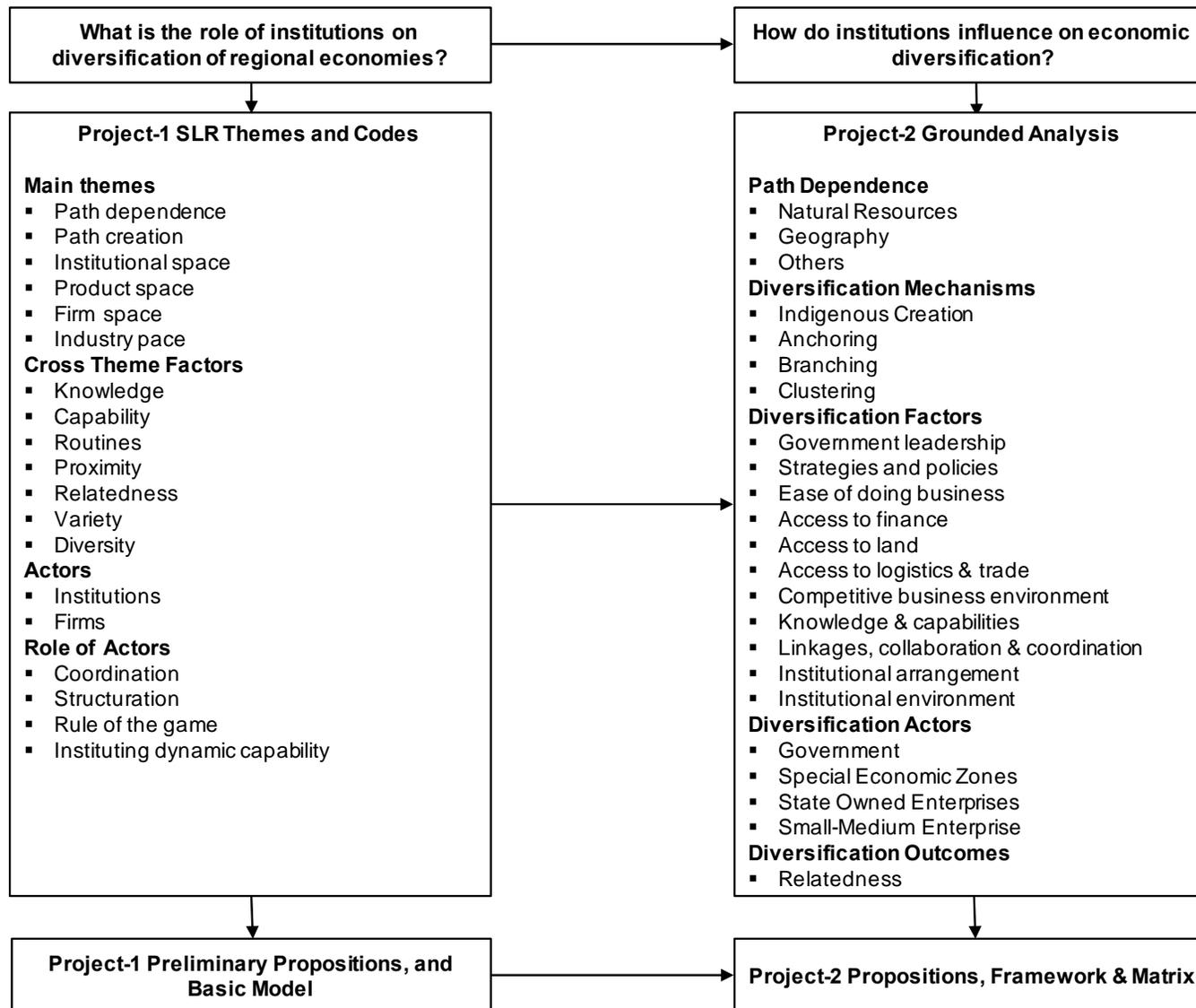


Figure 16: Project-2 Data Structure

3.4.4 Sampling

The individual interviews and focus groups were conducted with representatives from various economic actors. The interviews included representatives from policy making and economic development organizations selected on the basis of their previous engagements on diversification policies and current function responsibility on economic development. The first focus group included senior executives from SOEs and SEZs. The other three focus groups included firms operating within three main industrial SEZs. The interviews and focus groups were pursued instead of other methods such as questionnaires as they offered dynamic interactions with various economic actors, enabled grounded theory building and facilitated the exploratory nature of the research to progressively building up data and knowledge on themes and concepts as research progressed through interviews and focus group discussions.

Table 23: P2 Interviews and Focus Groups

Reference	Interview & Focus Groups	Entities
Individual Interview		
Inv1	Previous Project Leader (Previously) on Formulating Abu Dhabi Economic Vision 2030 and 2009-2013 Five Year Economic Plan	Abu Dhabi Department of Economic Development
Inv2	Director of Strategy	Abu Dhabi Department of Economic Development
Inv3	Director of Foreign Trade	Abu Dhabi Department of Economic Development
Inv4	Advisor on Economic Studies and Policies	Abu Dhabi Department of Economic Development
Inv5	Senior Study Specialist	Abu Dhabi Department of Economic Development
Inv6	Executive Director	Higher Corporation for Special Economic Zones
Inv7	Director	Higher Corporation for Special Economic Zones

Reference	Interview & Focus Groups	Entities
Inv8	Strategy Manager	Abu Dhabi Tourism Authority
Inv9	Strategy Manager (Previously)	Western Region Development Council
Inv10	Project Manager (Previously)	Abu Dhabi Council for Economic Development
Focus Groups		
FG1	1 st Focus Group Executive Director Advisor Executive Director Executive Director Executive Director Executive Director Executive Director	Abu Dhabi Department of Economic Development Zones Corps Emal: Aluminium Firm (SOE) Emirates Steel (SOE) Abu Dhabi Council for Economic Development (ADCED) Masdar City (SOE), partial participation Strata (Aerospace-SOE), partial participation
FG2	2 nd Focus Group Managers and Directors	12 Private firms operating in 3 Special Economic Zones
FG3	3 rd Focus Group Managers and Directors	25 Private firms operating in 3 Special Economic Zones
FG4	4 th Focus Group Managers and Directors	20 Private firms operating in 3 Special Economic Zones
Remarks: The firms participated in the focus groups FG2, FG3 and FG4 are operating in three economic zones referenced as SEZ-1, SEZ-2 and SEZ-3 in the report.		

3.4.5 Data Collection

The data collection is cognitively founded in the preliminary conceptual framework that is shaped around the findings of the systematic literature review, in particular around the basic path creation framework (Figure 14). Although, there is an element of prior selective process, i.e. elements of the path creation framework generated from existing literature propositions, hence these are anticipated to be the main themes for interviews

and discussions, the data collection is exploratory based on interviews and focus groups' discussions, thus themes and codes emerge and evolve accordingly.

The process of data collection consists of three steps. First, a focus group was conducted that included a policy maker executive, a policy advisor executive, an executive of a state owned enterprise and an executive of a special economic zone. It is noted that individual meetings were held with each of the participant prior to the focus group discussions in order to provide an overview of the research as well as presenting descriptive statistics on the economic diversification of Abu Dhabi and UAE. Second, three focus groups were conducted, attended by 57 firms out of 320 firms that were invited to participate through their respective SEZs. The participants were given the options to randomly select the membership to any of three focus groups thus each focus group included a random mix of firms operating in different SEZs. The researcher presented some background information on the economic diversification of Abu Dhabi and UAE to each group and facilitated the discussions in a workshop style setting.. Third, interviews were conducted with various policy makers representing different government entities.

In a sense, interviews and focus groups' discussions act as confirmation of key themes and factors of the preliminary conceptual framework and at the same time the data collection is an exploratory process of understanding diversification mechanisms, diversification institutional factors and the role of institutions in influencing the creation of new paths for growth and diversification. Thus, the data collection process confirms and refines existing propositions, as well as suggests new propositions that integrate mechanisms, factors and actors for economic diversification.

3.4.6 Control of Biases

The researcher conducted some of the interviews and focus groups as part of his duty as an Executive Director - Economic Policy Planning for Abu Dhabi Council for Economic Development; however, the analysis, synthesis, discussions and write-up of this report was carried out after leaving the organization. The main mandate for the Abu Dhabi Council for Economic Development is to act as a policy advisor to the

government of Abu Dhabi, and advocates for increased participation and contribution of private firms towards economic growth and diversification. These duties include the conducting of research, studies, surveys, interviews, focus groups on issues and challenges facing economic diversification; these are reported and presented first to the economic council board which consists of representatives from public and private sectors and are then issued to the government for consideration and policy changes. In a way the doctoral research and scope of job duties are aligned. Moreover, both public and private respondents are benefiting from these research interactions at a time when the region is at the crossroads of economic change as a result of falling energy prices, thus presenting views that advance policy changes towards economic growth and diversification, although maybe exaggerated by some, serve the purpose of this research. Controlling biases during interviews and focus groups is a challenge but has not been a major issue as the researcher does not represent any group and the main purpose of this research is to explore issues and challenges of economic diversification as perceived by different parties, which are related to job duties. In any case in order to avoid biases, a semi-structured interview was pursued; however, interviews and focus groups were organized around themes resulting from the systematic literature review. On the other hand, the main challenge is stimulating and encouraging some senior executives who are currently serving the government to express freely their viewpoints; this is particularly relevant to the first focus group comprising government executives that were not keen to share their views publically. What has helped is engaging policy makers who previously served the government. Furthermore, the main limitation could have been the reflection and interpretation of viewpoints that are to be communicated to the government but this is no longer relevant because of the researcher's career change.

3.4.7 Instrument Design

The interview discussion protocol is agreed in advance between the researcher and interviewees. The researcher provided interviewees with a context overview document of the evolution of UAE economy and a thematic description of challenges gathered in previous studies. The thematic description represented the initial coding of the

discussions, which included laws and regulations, role of the private sector in policy settings, easing access to finance, mobilizing private firms to extend into new products and industries, and sustaining competitiveness.

3.4.8 Method of Data Analysis

The method of data analysis is first guided by preliminary propositions or constructs resulting from the deductive content analysis of the literature, i.e. the systematic literature review that shaped the research questions, and second embarked onto grounded analysis for interpretation and understanding of data generated from the inductive analysis of interviews and focus groups for the case study of Abu Dhabi.

The grounded analysis offers a more open and flexible approach where theory emerges from data (Glaser, 1992 in Easterby-Smith, 2012); however, as suggested by Strauss and Corbin (1990, 1998) some prescription and elaboration on sampling of the data may be essential to systematically make sense of the data. For this purpose, the seven processes or stages for grounded data analysis of Easterby-Smith et al. (2012) are applied to this study. They enable a practical approach to sifting through volumes of non-standard data (Easterby-Smith et al., 2012).

The priori propositions and associated factors of the systematic literature review provided the preliminary themes and codes for the qualitative data analysis. The source of the grounded data analysis is the interview and focus group transcripts, which are systematically analyzed to refine preliminary themes and suggest new themes, codes and propositions that are declared in the findings and discussions (Easterby-Smith et al., 2012).

The seven processes or stages for grounded data analysis applied to this study. It started with the familiarization with interview and focus group transcripts, which are conducted one after the other, to clarify the focus of the study, initial viewpoints and linkages with respondents. The familiarization stage is overlapped with the reflection stage, in a way shaping and refocusing the engagements with respondents. The conceptualization stage commences when the set of concepts emerge on articulation of viewpoints that suggest refining propositions and opening up new ideas. For example,

reaching clarity over the four diversification mechanisms and understanding linkages between mechanisms and outcomes of diversification. Once the main concepts are established, the process of cataloguing concepts or generating a set of focused codes is detailed, elaborated and structured in tabulated documents. For this study, the tabulated documents included main themes, and three sub-themes, each supported by capturing relevant statements from interviews and focus groups. The recoding process was necessary as the initial process of coding was extensive, hence the recoding of themes to generate a focus on the research questions, rather than capturing all the elements of the interview and focus group transcripts. The linking stage is the most crucial as it generates the refined and new propositions and associated factors in a way framing the theory and contribution. The linking and mapping of mechanisms, factors and actors in matrices provided a grid explaining relationships and making sense of the findings. The last process of re-evaluation is instrumental in validating the findings, particularly following the discussion with the supervisor and research panel, for example, avoiding forced linkages and propositions that are not strongly supported by interview data. The grounded analysis for this study though based on the prior propositions of the systematic literature review, is iterative and exploratory in that it generated refined and new sets of propositions and contributed to understanding the diversification mechanisms, factors and actors.

3.5 Findings

The main results of the qualitative research consist of 11 findings, five propositions and one main overall proposition.

First, the dependence of the Abu Dhabi economy on natural resources, i.e. oil and gas dependency, is a difficult phenomenon that not only impacts on the creation of new paths for growth and development but also reinforces path dependency on natural resources as it generates a comparative advantage for the region. **Second**, services and industries that are related and unrelated to oil and gas have emerged over the past four decades; however, products and industries have not evolved into a higher level of sophistication and complexity beyond basic products generated from natural resources. **Third**, the main mechanism of creation of paths for growth and diversification is

anchoring new industries through direct government investment. **Fourth**, SOEs are the dominant active players in the economy in anchoring industries that are both related and unrelated to the energy industry; in a way the government has performed an entrepreneurial role in creating and investing in SOEs. **Fifth**, the main enabling and constraining factors for emergence and evolution of new industries are attributed to access to finance, access to land, access to logistics and trade, awareness of investment and business opportunities, and innovation capacity. **Sixth**, the government over the past decade has evolved into a competitive state playing an essential role towards setting the strategic direction for economic growth and diversification and in improving the competitiveness of the economy. **Seventh**, the government has established SEZs to circumvent some of the constraints for economic growth, aiming to enable the growth of SMEs and attracting foreign direct investment; however, SEZs have not evolved beyond leasing industrial lands to local and foreign investors. **Eight**, linkages, collaboration, and coordination amongst SOEs, SEZs, and SMEs are weak, thus limiting branching out into new paths for diversification. **Ninth**, consequently SMEs have not grown to a significant scale or sophistication to have a significant impact on economic growth and diversification. **Tenth**, while the government performed an entrepreneurial role during the first three decades of the establishment of UAE, instigating economic growth and diversification, and evolved into a competitive state in the past decade, thus improving the business environment, the future rests on moving towards an innovative state that enables transforming the economy into advanced technological frontiers where related and unrelated varieties of complex products and industries emerge and evolve over time. **Eleventh**, the main strategic and policy implication resulting from the qualitative research is that various government and non-government economic agents foresee the government's continued coordination of economic development. In a sense, this is an integrated platform that enables collaboration and coordination amongst SOEs, SEZs, and SMEs whereby government either plays an enabling or a coordinating role that is key for future growth and diversification. In conclusion the overall proposition is that new paths for diversification are actuated by path creation mechanisms, which are conditioned by sources of path

dependence, institutional arrangement and environment factors, and are propelled by economic actors determining the nature of economic diversification.

3.5.1 Clustered Data Analysis

The method of data analysis is first guided by preliminary propositions or constructs resulting from the deductive content analysis of the literature, i.e. the systematic literature review that shaped the research questions. However, the grounded data analysis is based on interview and focus group transcripts. The seven processes or stages for grounded data analysis commence with the familiarization with and reflection on the interview and focus group transcripts, which generated a loose set of clustered themes and codes. In a way, this clustered data analysis (Miles & Huberman, 1994), shaped the main themes of path dependence, diversification mechanisms, diversification factors, and diversification actors, along with associated codes, as illustrated in Figure 16. The first tabulated document identified a set of codes linked to the themes and mapped associated statements, which generated clustered themes, codes and statements that produced an initial conceptualization of data as well as a set of propositions – in a sense, creating the building blocks of a path creation framework. The results of these initial stages of grounded analysis are discussed below.

3.5.2 Economic Structure

Abu Dhabi is an energy based economy where access to cheap energy feedstock provides a comparative advantage for energy dependent industries; thus it has determined the nature of industrial export products that have emerged and evolved over time including oil, gas, plastics and base metals, such as aluminium and steel, that are energy dependent.

“There are direct and indirect impacts of oil and gas sector on the economy ... the existing oil and non-oil non are still somewhat relatively dependent on the strength on of our energy sector ... we need to draw the links between our comparative advantage which is the oil and gas sector and spillover impact that is created to the overall economy” (FG1 Masdar).

Oil and gas products contributed 78.2% to total exports while non-oil export products and re-exported products contributed only 2.2% each. Plastic and base metal export products characterize the non-oil productive structure of Abu Dhabi economy. The diversification and complexity of the industrial productive structure of Abu Dhabi economy remains low where oil and gas products dominate it. The energy sector will fundamentally remain to be the backbone of the economy for years to come fuelling economic growth; further, it will determine the nature of new products and industries that could emerge over time due to embedded capabilities and comparative advantage within Abu Dhabi economy.

“We have fundamentals that differ from other areas in the world ... we need to find a model that best suits our needs and requirements ... and identify industries that we like to develop ... existing or new ... and have certain advantage” (FG1 ADCED).

While natural resources are the main sources of path dependency, other sources also influence diversification. Geographical location, particularly the proximity to Dubai which is a global logistical and a trade hub, has triggered similar economic structures, introducing a spillover effect. Culture has influenced the strategic choice by government to position Abu Dhabi towards being a cultural tourism destination, whereby the Abu Dhabi Tourism Development Agency ventured into developing Sadiyat Island as a cultural city featuring international and local museums, art and music premises and events. In a sense, different sources of path dependence impact on and reinforce patterns of economic diversification. However, the focus of this study is on the fundamental sources of path dependency, e.g. energy that influences the creation of new products and industries for diversification.

Path dependence impacts on diversification

(Confirming Proposition-1)

There are fundamental structural factors, i.e. proximity and relatedness of industries and institutional barriers, i.e. limited participation of private sector, regulation, legislation, access to finance, investment promotions, collaboration institutions that enable and

inhibit spinning off industries in Abu Dhabi, which emerged as key factors in the panel discussions, interviews and focus groups' discussions. The following section discusses these factors and barriers through the lenses of policy makers, private firms of downstream industries, and state owned enterprises.

3.5.3 Diversification Mechanism

The Abu Dhabi Government adopted prudent diversification strategies and undertook vigorous intervention programmes which manifested into four diversification mechanisms: anchoring, branching, clustering and indigenous creation.

First, the main feature of the diversification mechanism is anchoring capital-intensive industrial firms that are owned by the government as a nucleus for new industries. The Abu Dhabi Government established and coordinated various SOEs to create new anchor industries that are both related and unrelated to the energy industry, such as oil and gas, basic metals, renewable energy, military, aerospace, semiconductor, and tourism. It was an essential step for the government to invest and assume first mover risks associated with new industries that private firms would not undertake, particularly when local demand for associated products and services are limited. In the 1970s-80s-90s, the SOEs were directly related to the natural resource endowment of oil and gas, e.g. Borouge is a pioneer in anchoring the polymer industry, Emal for Aluminium, and Emirates Steel for the steel industry. More recently, in the last decade new SOEs have ventured into unrelated complex products, such as ATIC of Mubadala for semiconductors, Masdar for renewable energy, Tawazun for military and Strata for aerospace.

“The government invested 10 billion dirhams to build Emirates Steel for certain reasons; a couple of those reasons are to really participate in the development of the infrastructure in UAE, and also to be part of the 2030 vision to diversify the economy of Abu Dhabi, and also to facilitate the development of the downstream sectors.” (FG1 Steel)

“When it comes to entering into a new economic opportunity or, let's say a new industry, I think the government when it has by itself invested heavily in it, it

becomes an anchor in which it attracts the private sector to contribute, and the private sector will become more confident in being in that sector as it's seeing the government by itself contributing to that. There is only one worry here: that the government shouldn't become a competitor.” (Inv9)

“Increase confidence of investors, build projects, commitment, remove risk away from investors ... in a sense mitigate or remove risks associated with self-discovery.” (Inv8)

“The private sector will not come because maybe the risk is very high ... so the government, you see that it was a necessary step for the government to take it.” (Inv9)

The rationale is based on the self-discovery phenomenon as private sectors will not invest in grass roots landscape projects due to the significant size of investment required and other factors; hence the government response is to establish SOEs in the hope that ecosystem and downstream industries will emerge over time. Unfortunately, it did not happen in Abu Dhabi probably due to some aspects of the institutional environment such as the lack of certain legal frameworks that protect the investment of foreign individuals and firms, particularly the requirement for split ownership between a local partner and a foreign partner. But it could be the case that the government cannot accurately predict the nature of the industries that could flourish in the regional economy, hence the private sector will not necessarily follow the path of the government led industry initiative and new firms may not enter and grow.

“The government also should be very careful when it comes to taking the decision to enter into a certain sector or industry and ensure that it's not a top-down approach. It should also be based on a thorough analysis and detailing the opportunities, and I think this is what the Abu Dhabi is doing. Because at the end of the day, yes you will be attracting the private sector to contribute, but also the private sector will do their own analysis and due diligence to ensure that there is an opportunity and value added. Even if you are also taking the risk and you are leading, it's not necessarily that the private sector will follow you

because they have their own... So you have also to be sure that you can convince and you can assure that there is a value added.” (Inv9)

New regional development paths are created through different mechanisms one of which is anchoring through SOEs

(Revised Proposition-2a)

Second, there are private SMEs that have been established around SOEs' anchor industries branching into new related products and industries; however, the complexity of these SMEs is limited. The anchoring diversification strategy through SOEs has not led into the branching of vibrant and complex SMEs-driven downstream industries, such as the case for polymers, aluminium, steel, aerospace and renewable energy. Moreover, firms around SOEs are producing simple products that have not extended complexity and added value out of the basic products generated by SOEs. Consequently, the level of diversification and economic complexity remains low, ranked at 66 (Hausmann et al., 2011) worldwide, as measured through the degree of export sophistication.

“There are only few real downstream industries that have been created in Abu Dhabi.”

“From the steel point of view we don't really have a downstream industry to really support Emirates Steel. Let me share with you one of our projects, the wire rod, where we have a lot of downstream applications that can be done; we sell in the UAE only 20%, the rest goes elsewhere, mostly in Saudi Arabia. So there are a lot of things to be done here, I think.” (FG1 Steel)

New regional development paths are created through different mechanisms on the basis of existing ones through branching influenced by SMEs

(Revised Proposition-2b)

Third, is the clustering feature of the economic diversification mechanism experienced in Abu Dhabi, once the government owned anchor firms are established, creating new industries, some policy makers believe clusters should grow organically around anchored firms. Government intervention, however, has been necessary as new firms have not entered to capture the associated business and investment opportunities, thus clustering through the establishment of Special Economic Zones was introduced in Abu Dhabi such as ZonesCorp, KIZAD and MASDAR.

“The government starts with the anchor industry such as EMAL and DUBAL ... Now the next step is to build a cluster around this main industry ... This is now where the policy should be focused, to build the cluster around this anchor company, or the big company like EMAL and Emirate Steel Company. This will be the next step maybe, and this is maybe the focus in the next industrial strategy for Abu Dhabi; this focus is directly to the medium industry, or the light industry, which can benefit from or benefit what we already have, this is what we feel.” (Inv4)

“You build anchors and then leave the rest to be built organically.” (Inv3)

“We have not yet kicked off the clustering process. I’d say the clustering process is an organic process. Yes, and it’s kicked off and you’ve provided the vision, the leadership, the guidance, the direction, the directives and all that, and you’ve sold yourself fully to the market as being like fully behind this process, then the market will engage in it. (Inv1)

New paths of development are created through different mechanisms including clustering through SEZs

(Revised Proposition-2c)

Fourth, Abu Dhabi has also ventured into the indigenous creation of industries through SOEs that did not exist earlier, such as tourism and logistics and trade sectors. The Tourism Development and Investment Company (TDIC) led the development of the tourism sector including hotels, an island city, residential accommodation, and museums, while the Khalifa Industrial City (KIZAD) and Higher Corporation for Special

Economic Zones (ZonesCorp) developed special economic zones to enable industrial development, logistics and trade.

The initial form of path creation for development is utilization of indigenous resources through government support

(Revised Proposition-2d)

In summary, the overarching revised proposition is that regions diversify through different mechanisms influenced by economic actors.

New paths for diversification are created through different mechanisms such as indigenous resources, anchoring, branching, and clustering influenced by economic actors

(Revised Proposition-2)

3.5.4 Economic Diversification Factors

It is established above that new paths for diversification, as is the case for Abu Dhabi, are created through different mechanisms, i.e. indigenous resources, anchoring, branching, and clustering that are conditioned by various economic diversification factors. There are two categories of factors, institutional environment and institutional arrangement. Institutional environment factors are associated with ease of doing business and competitiveness while institutional arrangements are associated with accumulated knowledge and collaboration across economic actors. These institutional environment and institutional arrangement factors are intertwined to shape economic growth and diversification. The most enabling and constraining factors are laws & regulations, access to finance, access to logistics, access to industrial land, investment climate, investment, including awareness of investment and business opportunities, knowledge, and innovation. These factors constitute the institutional environment that positions Abu Dhabi on the track of a liberal market economy condition.

Actors associated with institutional arrangement include government, SOEs, SEZs and SMEs. The diversification mechanisms stated are also influenced and manipulated by the strategic leadership of government, represented by the Abu Dhabi Executive

Council, and three main economic agents; these are government economic organizations, e.g. Abu Dhabi Economic Development Department; Special Economic Zones, e.g. KIZAD and ZonesCorp agencies; and SOEs, while the role of private firms, particularly SMEs, remains insignificant. These actors constitute the institutional arrangement of Abu Dhabi that effectively coordinates the economy. In the next section factors that influence growth and diversification of the Abu Dhabi economy are discussed.

3.5.5 Ease of Doing Business

The dominant anchoring diversification strategy through SOEs established the nucleus of new industries; however, Small & Medium Enterprises (SMEs) drive economic growth, create jobs, and contribute to the development of a dynamic private sector across many economies. In the business environment, the ease of doing business is crucial for the growth of SMEs, particularly around anchor SOEs and within SEZs. Regulations, legislations, access to finance, investment promotions, and collaborative institutions are key components for cultivating a vibrant business and investment environment.

Regulations and legislations, specifically insolvency, 51%/49% local/foreign ownership ratio, transparency, and legal uncertainty, are seen as barriers to fostering the growth of SMEs and entrepreneurs in Abu Dhabi. However, in many sectors entrepreneurs have circumvented these barriers and pursued successful businesses, hence these barriers were not binding constraints that prevented start-ups.

Access to finance for industrial SMEs has been an obstacle in a country where local banks have ample financial resources. In 2012, financing SMEs constituted only 4% of banks loans in UAE. Realizing the importance of SMEs, Abu Dhabi created the Khalifa Fund to support and finance entrepreneurs; however, SMEs continue to face challenges.

“In any strong economy, SMEs play a major role towards development.

Therefore, it’s not only the Khalifa Fund that should be doing the funding, banks should also step in and look at it in a different way and provide support in order

to initiate funding, especially local banking, and so there has to be a proper mechanism to do so.” (FG1 ZonesCorp)

“Financial institutions are not structuring proper funding nor are they trying to look at the importance of the industrial sector in the economy. Local banks should take the initiative and understand the importance of the industrial sector funding, especially towards SMEs.” (FG1 ZonesCorp)

“New access to finance regulations are being looked at which will ensure that there is a proper environment for the private sector to grow and succeed. We have to accept that there will be some probable failures, but generally, these regulations will enable private businesses to become more successful.” (FG1 ZonesCorp)

One way to avoid this situation is for the government to direct local banks to channel some of their loans to industries, as most local banks have local governments as a majority equity shareholder.

However, the investment climate has been identified as a factor that has inhibited the propagation of SMEs, particularly industrial-based SMEs. Awareness of investment opportunities has emerged as an important factor as there are no agencies that collaborate with anchor industries, either to promote demand side investment or to direct investors to investments that could be exploited based on regional comparative advantages.

Private sector firms may not have reached a maturity level to embark on sophisticated industrial investment, as has been observed through submitted business plans that are lacking in clarity and robust business models.

“Investors have to know what to do with investment lands ... and know the requirements ... and processes. (FG1 ZonesCorp)”

The process of issuing an industrial licence has been identified as one of the concerns of investors, which influences the business environment. Based on the IMD

Competitive report¹, the ease of doing business in Abu Dhabi declined in ranking from 25 in 2007 to 30 in 2011. However, the start-up days in 2007 was 63 and this improved to 15 days in 2010.

*“It used to take 365 days and now 50 days ... so there is an improvement”
however “the system has to be integrated together to help the investor and be transparent. (FG1 ZonesCorp)”*

3.5.6 Competitive Business Environment

The government played an entrepreneurial role during the first decades of the establishment of the UAE through the creation of SOEs that anchored many of the industries, circumventing some of market failure forces associated with self-discovery risks in starting up new firms – particularly in new industries. However, during the last decade, the Abu Dhabi Government has focused its attention on enabling a thriving business environment for growth of firms, particularly ease of doing business and improving competitiveness, in a way enabling the free market forces to function properly and establishing an institutional environment in which private firms contribute to economic growth and diversification.

“The government’s role is to be like an enabler, to make sure the right platform is there in terms of regulation, in terms of the business environment, in terms of the... All the regulatory part is the government’s role.” (FG1 Emal)

“Provide necessary enablers to help the private sector and to encourage the private sector and to facilitate the private sector to contribute and make an impact.” (FG1 ED)

“The metaphor that I use is that the government provides the soil and the fertiliser, and the private sector put the seeds and put the water on top.” (FG1)

¹ The Emirate of Abu Dhabi in World Competitiveness 2011 (not a public document)

The main enablers that government should offer, from the perspective of policy makers and private firms, are focused on the development of human capital, laws and regulations, access to finance, access to land, access to trade & logistics.

“We understand our responsibility to provide the private sector with the certain enablers in terms of human capital, financial capital, infrastructure and also efficient economic and business structures, so these are the role of the government and we are committed to provide these kinds of enablers.” (FG1 DED)

“Generally speaking the human capital is the most important resource, innovation, so when you have this young generation and you will provide them with the proper skills and knowledge, provide them with the proper institutions that provide a strong base for the research and development activity, that will help a lot.” (FG1 DED)

“We are at a stage right now where we truly and seriously need to capitalise on our strengths. Oil and gas have fuelled what we already have today on the ground. We need to be smart in thinking how out of the box on how we capitalise on our strengths; our strengths can no longer only be dependent on one source oil and gas, today our strengths should be more centred around human capital, technology, and that can only be done through us believing in the need for us to invest in human capital.” (FG1 Masdar)

The outcome that should be generated from providing these enablers is centred around competitiveness.

“The government’s job is to provide you with the right platform, to provide you with the environment that is competitive, that would make you succeed.” (FG1 Emal)

“The government will do what it’s supposed to do – make sure that the private sector is provided with the necessary tools, the necessary environment for it to be competitive and flourish and be a successful sector.” (FG1 ZC)

One of the key aspects is capitalizing on comparative advantage to generate competitive advantage for industries.

“I think one of the key things that is delaying the development, or even blocking maybe the development of manufacturing industries in Abu Dhabi is the fact that Abu Dhabi has two key competitive advantages, which are basically energy and capital. These are not sufficiently being turned into – comparative advantages, at the firm level so that investors can capitalize ... it’s very clear that cheap gas is not available, cheap fuel is not available, cheap finance is not available. With those three being not available for industries, they’re not going to happen.” (Inv1)

3.5.7 Knowledge and Capabilities

There are different forms of knowledge and capabilities that shape economic diversification, e.g. education system, innovation capacity, infrastructure, financial system, etc. In Abu Dhabi, innovation capacity stands out as the most demanded by SMEs; however, while the government strategically has given it a top agenda priority, innovation capacity remains limited.

The anchoring diversification strategy through SOEs adopted by Abu Dhabi, although having enabled the region to venture into new industries, has not built innovation capacity neither within the SOEs not in targeted industries, such as basic metals of Aluminium and Steel, or Military, Aerospace, and Renewable Energy. The exception is Borouge which, in 2013, established its Innovation Center. It should be noted that Borouge is a joint venture with Bolaris who owns the process technology, hence transplanting local innovation capacity in Abu Dhabi; however, it remains within the SOEs, not across the polymer industry. It is, however, observed that SOEs are acknowledging the importance of building innovation capacity, such as Emal.

“I think what we have today in Emal is a very, very successful story, not on innovation, but innovation for successful business, which is two different scenarios ... Dubai has spent a lot of money to develop the technology that we are using today, and I can guarantee you it is one of the most sophisticated,

plus viable, plus efficient on the energy consumption. So you need to compete on a different level when you talk about innovation.” (FG1 Emal)

“We have almost four financially driven researches with Masdar; it has a value, it has a scope to deliver, and has an output that has value for Emal ... three of them have delivered what is supposed to be delivered. Today we are piloting one of them on a bigger scale, the other two really are energy efficiency it’s almost saved us \$220,000 every year if we implement it.” (FG1 Emal)

“I give you an example: for one of the UAE team working on the carbon side, she changed the philosophy of the process; this process has been designed by an outsider, by the big company, a firm that is well recognised; she changed again the process scheme and we were able to save \$200,000 per year, and multiply it by the number of the lifecycle of the plant, and she is just a one year’s graduate student from UAE national and she is smart enough, but she is given the opportunity to produce. So the value is not really the creation of the idea, the value is how can we create an idea that has a return on value?” (FG1 Emal)

The above informs us is that education and collaboration are essential for building up innovation capacity; these are even more important for sophisticated industries such as Aerospace.

“Strata, for those of you that don’t know us we manufacture aircraft parts, so if you know the Airbus 330, Airbus 340, Airbus 350, even the big aircraft, the one that carries 525 people, which Emirates has, they’ve ordered 90 of them, the Airbus 380, we actually manufacture parts on them. We also do parts for Boeing 777, Boeing 787, there are aircrafts called the ATR which flies mainly in Europe, we do parts on the ATR42 and the 72. So specifically for us innovation is an important factor, but innovation cannot come if you do not have a baseline, so what was important to us, and today we are purely a build-to-print manufacturer or a build-to-print supplier.” (FG1 Strata)

“I also have to make sure that I develop an R&D environment or an R&D ecosystem, sometimes working jointly with the Masdar Institute of Science and

Technology in this, sometimes working with the Petroleum Institute where carbon fibre is concerned, and we developed that R&D baseline so Emiratis can work in there, develop their new processes, develop new technologies, even try to, let me say, innovate or redesign existing processes according to Airbus or Boeing specs.” (FG1 Strata)

Clustering diversification strategy through SEZs has also played a role in the economic growth and diversification of Abu Dhabi; however, SEZs are not playing a role in creating innovation capacity. The majority of investors operating with SEZs find innovation essential for their business operations; however, a major challenge indicated by the investors is the lack of innovation capacity in the UAE and within the SEZs. For SEZ-1, companies are engaged with in-house innovation activities and views that the zone has a role in building innovation capacity and linkages with UAE research institutions; this is particularly relevant since SEZ-1 have an innovation institutional capacity that can be extended to support firms operating within SEZ-1. Some investors of SEZ-2 find that innovation within and outside UAE is fairly active; however, others have indicated a weakness in this regard. Another challenge highlighted was the need to develop links with domestic research institutes. Investors of SEZ-2 find innovation essential to their business operations and therefore depend on in-house innovation related activities. Results also indicate that the majority of investors find government support for innovation programmes to be important. Furthermore, they find attracting globally recognized enterprises that support and facilitate innovation to be vital. Some investors stated that they have in-house innovation activities; however, they pointed out the need for test labs for certification purposes.

Investors within SEZ-3 have indicated that they engage in in-house innovation related activities as well as utilize the innovation lab offered for access by the zone; however, in overall innovation, the capacity in Abu Dhabi is weak.

“SEZ-3 provides free access to their innovation lab which is fully equipped with the latest technologies.” (FG4)

Moreover, SEZ-3 investors indicated that the major challenge for their operation is the lack of innovation capacity and services available in the UAE; therefore, they refer to third party innovation services outside the UAE. They have also indicated that the zone has a role in building innovation capacity in addition to creating linkages with research institutions in the UAE and indicated that providing government support for innovation programmes within the zone is their most preferred action to increase innovation in the zone.

Branching diversification strategy is a third form of economic growth and diversification that largely depends on SMEs. Downstream industrial firms, particularly SMEs operating outside or within SEZs, are expected to be linked to anchor SOEs, hence branching into incremental innovation; but, in practice, the innovation capacity of SOEs and SMEs is weak. As a result, firms are recommending government and zones to undertake programmes that support innovation activities.

“Create structured mentoring and angel programmes to support the passion of young entrepreneurs to see their ideas take root and flourish.” (SEZ-1 Investor)

“The Abu Dhabi Government has been providing a lot to support innovation, they are on the right track and it’s probably time to start looking at the more complex innovations to distinguish themselves in the region; to do that they need to attract the right people and make it worth their while to come here.” (SEZ-2 Investor)

3.5.8 Linkages and Collaboration

The anchoring, branching, and clustering mechanisms for the creation of new paths for growth and diversification are triggered by economic actors, mainly state owned organizations, including SOEs and SEZs in the case of Abu Dhabi, subject to various institutional factors that enable or constrain the growth of firms, products and industries. The cross-thematic factors that enable or constrain path creation and emerged strongly among interviews are linkages, collaboration and coordination between Government, SOEs, SEZs, SMEs and MNEs. These include different forms, such as linkages through supply chains and through local content agreements, coordinating investment

and business opportunities, collaborating on knowledge and capability building, collaborating on building innovation capacity, coordinating to attract FDIs, collaborating on access to finance, coordinating access to land, coordinating public private partnerships, coordinating access to trade, coordinating access to energy, collaborating on incubating startups, and collaborating on business communities.

Most of the zones have a high concentration of similar or linked businesses within the zone; however, investors pointed out that zone operators need to further develop their networking and advisory services to help integrate their businesses with companies operating within and outside the zones. The majority of SEZ-1 investors pointed out that their preference is for zone operators to facilitate cooperation between companies, universities and research institutes, and provide business matchmaking services with companies operating in the local economy. Other recommendations include topical conferences, symposia and targeted networking events to build an effective community, in addition to creating a public domain database for investors. For SEZ-2, despite there being a good level of concentration of businesses within the zone, investors pointed out that there is a lack of networking and knowledge sharing; this includes the unavailability of business matchmaking channels, seminars and conferences for the companies to communicate and share ideas. Investors also found a lack of advisory services and investment promotions performed by the zone. Investors of SEZ-2 preferred having access to business matchmaking tools to help them find potential business partners who are operating in the local economy, which was deemed the highest among the list of actions that operators should take to enhance networking. Another favoured recommendation by the investors is to have the zone establish a network of knowledge sharing, linking businesses. The majority of investors of SEZ-3 believe there is a high concentration of similar businesses within the zone while business matchmaking had relatively good results, as certain partnerships were established in the zone. Investors also highlighted their satisfaction with services, such as access to intranet services (which offer contacts lists to the zone's companies and freelancers) and having events on a quarterly basis for networking purposes. Investors within SEZ-3 pointed out there is potential for improvement, which includes the need for further efforts with regard to support in awareness and investment promotion of the company's products/services,

and providing advisory services to integrate the business with companies operating outside the zone. The majority of SEZ-3 investors have pointed out that they would want the SEZ-3 to provide business matchmaking services with companies operating in the local economy in order to improve their investor networking capabilities. Another recommendation was to provide business matchmaking abroad – making businesses global.

“Zone-1 should be more effective in its mission, in bringing a community in terms of (as a small city) a physical community that it was supposed to produce with both residential and commercial space where people can reside and work, with economy, shared environment and with interaction with educators, universities and researchers. That was one of the drivers in creating SEZ-1 to capture knowledge economy in renewable energy, to create this cluster. However, this did not happen as expected.” (SEZ-1 Investor)

“A business partner database would make conducting business a lot easier, I can probably find 3 suppliers that can provide me with the same quantity and quality of materials that my supplier in Sharjah does and save money on transportation costs.” (SEZ-2 Investor)

“Big companies have someone to guide them to the local market; however, small companies do not have the same... we need specialized business development managers to help us in finding local clients and partners.” (SEZ-3 Investor)

In a sense, ease of doing business and a business competitive environment constituting the degree of institutional environment, and knowledge & capabilities, are essential in the diversification process. Of particular importance is innovation capacity, whereby its build up requires linkages and collaboration among government, SOEs, SEZs and SMEs, hence, a higher degree of institutional arrangement.

In summary, proposition-4 is revised to read

“Institutional arrangement and institutional environment factors underpin economic diversification mechanisms”

3.5.9 State Owned Enterprises (SOEs)

Abu Dhabi's economy is dominated by large and capital intensive SOEs that are the anchor for industries or industrial clusters, e.g. ADNOC for the oil and gas industry, Borouge as a single company in the petrochemical industry, Emirates Global Aluminium for aluminium products and Emirates Steel for steel products. SOEs have always been an important element of most economies during the initial phases of development, which are typically followed by spinoffs of firms and institutions, creating an economic ecosystem around anchor industries – as in the case of the petrochemical industry in Singapore. SOEs in Abu Dhabi have been the backbones that fuelled economic growth over the past four decades. There is a consensus among interviewees that SOEs play a critical role in shaping the economic structure of UAE and the anchoring diversification strategy should continue.

“The economic history of Abu Dhabi has been written by ADNOC and ADNOC policies and ADNOC strategies.” ... “I think the key player, I would call it even the black horse that has been driving Abu Dhabi's diversification for most of the past 30 to 40 years, is ADNOC. Many people will not be happy to hear this. But it's an irony that the main oil producer itself has been the main player driving the diversification of the Emirate away from oil production.” (inv1)

Although, the economic vision has called for the private sector to be very active in the economic activities and enlarge the enterprises bases, it is recognized that the government cannot do it alone. The role of the government is to enable the private sector and increase their contribution and “make the private sector an active part of the policy making process. Therefore, there is a need for the private sector to be part of the leading initiatives undertaken in the country, thus a need to establish a platform to understand the needs of the private sector and listen to the voice of the private sector.

“We knew that the government relied a lot on the government firms when they are starting specific industries; aerospace they created Strata, when it comes to base metal they created EMAL.” (Inv3)

“The challenge is working on changing the concept that there are certain economic activities or industries the government should lead to attract the private sector to contribute, and there are certain areas also the government should step back and not be competing with the private sector.” (Inv9)

“You (referring to SOEs) should only be filling the gaps. Focusing only on the gaps. There was really a gap in Abu Dhabi when it comes to hotels, especially in certain grades or certain areas eight years or ten years ago ... within a few years TDIC managed definitely to fill that gap. Then after that they need to focus on addressing the gap or to be an anchor to create the opportunities and lead in certain new sectors. But not to enter and compete, because if you enter and compete, definitely you’ll win.” (Inv9)

Further, firms, in particular large and capital intensive SOEs, provide the anchor for the emergence of new industries where macro-scale industrial clusters emerge out of micro-scale interactions among firms and institutions across the value chain, which makes up the fabric of the economic structure. However, the Abu Dhabi economy has not witnessed spinoff companies that are linked to these anchor industries; as a result, domestic demand for their products remained low.

“We do not have downstream industries that support our products ... thus we sell around 20% of production capacity abroad.”

“Now the vehicle for encouraging the downstream is there, it is the difficulty now between us as a company we need to survive, because we just can’t finish a construction, we need to pay our debts and we need to make it sell in our valuable successful story for Abu Dhabi. You need to balance between the two: how much you need to get, and we know that every company that will come, they need to stand on their own feet and it takes them a while to be standing on their own feet; is it five years? Is it ten years? And how much of the stake are you going to leave on the table and how much do you need to retain to pay your debts? So the balance is what you need to do.” (FG1 Email)

“I need to encourage the downstream industry really to come and sit down with us. I know we are almost there with five companies in our portfolio today, three of them are aluminum based companies, that means they’re going to use our product, but two of them are a process type service provider for our, I would call it the environmental side of the story, so we will be able really to promote a zero, a green aluminum in Abu Dhabi, and this is the first time and we are proud, and shall, when we finish the cycle of agreement and terms and conditions, we are almost there, it will be the first inception that an aluminum company or a smelter that will have a zero landfill, from an environment impact.”
(FG1 Emal)

“I think that by ADNOC establishing sister companies that are not directly involved in upstream activities, oil and gas production but rather midstream, downstream activities and all that. ADNOC has played, and petrochemicals have played the bigger role in driving the diversification of Abu Dhabi. Most of the businesses that have been created in other sectors, be it in the hospitality sector, in the transportation sector, even telecommunications sector, and so forth, have been largely financial services sector, have been largely driven by the activities of the ADNOC sister companies, no one else.” (Inv1)

The branching of new industries is a collaborative effort among private sector firms, SOEs and government agencies; however, Abu Dhabi is facing an absence of collaboration among economic actors, in particular between SOEs, SMEs and SEZs.

“Absence of industrial collaboration institutions.” (Inv2)

“Lack of partnership and collaboration between SOEs and downstream industries.” (Inv2)

Therefore, there is a need to mobilize SOEs’ contribution towards the creation of downstream industries, hence, an institutional and coordination role in shaping the emergence of related industries. The scope of collaboration is wide, including supporting SMEs through local content contracts, and knowledge and capability building leading to innovation.

“Because of the gaps in overarching policies, regulatory, and finance, the government has to step in and exert pressure on the anchor industries to provide a certain amount of their procurement to local suppliers so that they can participate in the supply chain. You cannot buy everything from outside as an aluminum manufacturer here in Abu Dhabi. Also, on the downstream side, instead of these guys sitting there, we’re aluminum guys and we play in the global commodity market and we’re just going to sell the raw aluminum and ship it outside. You can’t do that. If someone can take this aluminum and add value to it here in the country, why not. So if someone wants to buy some raw aluminum from you and use it to manufacture building material, frames for windows or whatever, or furniture or medical tools, then you should be selling some of that aluminum locally, even if it’s at a lower price or whatever to give them some competitive advantage over other manufacturers.” (Inv1)

“Strata located in Al Ain. They do have a high need for engineers and certain specializations for the coming years, yet are they communicating this clearly to their institutions?” (Inv9)

The entrepreneurial dimensions also play an essential form of unrelated diversification where private firms, particularly SMEs, introduce new services and products for that to kick-off Government. and SOEs have a role in making investors aware of investment and business opportunities.

“Government and SOEs should declare investment & incentives, awareness of business opportunities.” (Inv9)

There is a need for creating integrated industrial approaches or platform policies, e.g. integrating the value chain of industries such as Masdar, could supply rooftops of factories with photovoltaic cells as suggested by one participant, as SOEs will not be keen to initiate such a collaboration platform.

“I need the downstream industries to come and sit down with us.” (FG1 ZonesCorp)

3.5.10 Special Economic Zones

Special Economic Zones (SEZs) are major strategic forms of investment in infrastructure pursued by Abu Dhabi that aim to facilitate the clustering and growth of firms and diversification of economic structure.

“The economic zones, they call them economic zones for a reason: that you provide an area with infrastructure and with a source of energy, which is mostly gas in most cases, better than outside those zones. So light industries can get better, let’s say, when it comes to the profit margin for their products it will be higher than outside the economic zones. So if we apply this model we need to evaluate, are we currently giving this in Abu Dhabi?” (Inv9)

The main value propositions of SEZs in Abu Dhabi are mainly foreign business ownership in free economic zones, access to industrial land, access to trade, and provision of a competitive advantage for firms through cheap energy.

Access to land is key for SEZs as it enables foreign firms to lease industrial land for long periods of time reaching up to 50 years; however, the constraints are awareness and clarity of laws and regulations for leasing land.

“The private sector needs area, it needs land, it needs finance, it needs infrastructure, and this is the role of ICAD, especially ZonesCorp, and also the same with KIZAD, Khalifa Industrial Zone.” (Inv2)

“So if you come and ask for land, first of all land is available, there is no problem with that; the problem is you understand exactly what you want to do, what kind of investment you want to create on this land.” (FG1 ZonesCorp)

“Know the requirements to obtain the land ... put in the right information on the system so we will be able to understand your actual requirement of the land and answer all the questions such as environmental issues, because that will dictate where is the location of the land and what are the requirements that you need to do as a factory not to harm the environment and in addition to other requirements.” (FG1 ZonesCorp)

What is also essential is that SEZs are established within or close to air and sea port facilities, such as KIZAD, thus providing logistics to access international trade.

“Infrastructure that facilitated building up logistics which led to easing of access to trade hence opening up markets.” (Inv3)

“That’s what they want to have: the full logistical services linked with the ports and the airports. Logistics services and easy access to the markets.” (Inv9)

However, beyond access to land and trade, the essence of SEZs is a competitive advantage offering for firms operating within the SEZs, enabling their growth over time. This includes incentives, policies, and regulations that facilitate and support foreign firms to operate within Abu Dhabi.

“Economies cannot develop and grow and be competitive unless they have incentives, policies, regulations that can support industrial companies to be established in their countries, for them to access them to sell their goods overseas, locally or internationally they can sell their goods; on that basis the new industrial economic specialised zones were built.” (Inv3)

“I just saw last week Fast and Furious 7, the new movie that was shot here in the Emirate of Abu Dhabi, one of the largest well-known series of films in the world has been shot here in the Emirate of Abu Dhabi by the support of twofour54 giving them the right incentives to make sure that such films have been shot here in the Emirate of Abu Dhabi, especially in Abu Dhabi landmarks such as Emirates Palace and Etihad Towers and... So basically if you see the film it will urge you to come to explore Abu Dhabi, that’s what I felt. I am already from here, but nevertheless what I saw in the movie is exceptional, it draws you to Abu Dhabi, to see what’s in Abu Dhabi.” (Inv3)

Furthermore, ease of doing business and to trade is a major attractiveness for operating within the zones.

“It is not a matter of providing the land and building your project on your plot, it is at the end of the day a chain, meaning how can you get your raw material in

the country, how can you bring the best labour to work in your company or manufacturing industry, how can you get the best machines, equipment, knowhow to work on your project? And then surely how to do and get the right network to send your goods? So in a package, compared to its prices, the best you can get from my point of view is what Abu Dhabi industrial zones deliver today.” (Inv3)

“If you are targeting international firms, then that’s what they want to have: the full logistical services linked with the ports and the airports. Logistics services and easy access to the markets.” (Inv9)

However, most importantly for the case of Abu Dhabi is the provision of cheap energy sources.

“We’re talking about gas. Yes, gas. I think the challenge is also the gas source in Abu Dhabi when it comes to these industries and this was a challenge to many establishments within the region” (Inv9)

Thus the value propositions stop short of extending an offering to enable growth of firms through clustering of firms and enabling networking, linkages and collaboration between firms within the zones and across industries.

“When I saw the industrial zones come up, I saw a dream that by default clusters will be built around anchor projects. This has not happened yet. Fair enough, such industries or economies, you don’t see the outcomes in a year or two or ten even. We are a very small country, plans, industrial zones have just started, even ten years is a very short time, we literally import over 90% of our goods, so it was a smart move just to leave them, establish their basic manufacturing, needed goods internally, domestic goods I mean.” (Inv3)

The impact of SEZs on the overall economy is rather difficult to assess. SEZs are being recognized as an enabler of economic growth and FDI; however, these assumptions are not validated on the ground, as the contribution of firms operating within SEZ to GDP is not provided. Moreover, the linkages of SEZs and local firms outside the zones is generally weak which make SEZs islands within the economic structure

“Some people see that the free zone is not sufficient to the economy, but for me actually it is a very big important role to create FDI, and the free zones bring a lot of the companies inside and this has benefited indirectly to the economy. It starts with the export, and extends to offer business opportunities to local firms such as in transportation.” (Inv4)

The anchoring diversification strategy through SOEs which extended towards an SOE with a special economic zone, such as the case for Tawazun for Military Manufacturing and Strata for Aerospace Manufacturing, has yet to create a buzzing cluster around SOEs and within associated zones.

“Manufacturing companies have been established; they started manufacturing, successfully running their businesses, but I think with their number now almost, as I said, between 300 and 400, in only KIZAD and ZonesCorp that are running today, we should think seriously how to build clustering projects around it.”
(Inv3)

“I think the best example would be Strata building parts of airplanes with Boeing. This manufacturing company is a state owned company that is today considered one of the main players in building tails of airplanes, parts of the tails of the airplanes, and are considered a very successful company, meaning a big percentage of their employees are local citizens; it has been built literally in the desert in an area that was inhabited by animals, now today you see it literally a small city, a town. After sitting with them, and surely more or less they import their raw material 99.9% from overseas, said okay, let’s take advantage and build a cluster around Strata, which made common sense, and they agreed, and this is one of the main objectives of Strata even of such a project.”
(Inv3)

3.5.11 Small and Medium Sized Enterprises

Abu Dhabi has not yet exploited its full existing capabilities and relative comparative advantages that are available in the downstream industries of existing anchor based industries, i.e. energy, petrochemicals and base metals. Policy makers therefore should

pursue industrial policies and intervention programmes that extend existing capabilities into industries of higher added value and higher complexity levels. There are many products and industries that can be exploited that are already produced by many other countries; hence, the proximity and relatedness of new products and industries to existing anchor-based industries and the opportunity value to be generated, should function as the underlying determining factors to set the economy on new paths for growth.

“We will continue to have industries related to energy, e.g. aluminum and steel ... and we cannot eliminate energy driven industries ... these industries bring technology and talent to the economy.” (FG1)

“The new sectors in an oil and gas economy are, always will be, interconnected and we will never be able to disconnect them.” (FG1)

“We want to understand the comparative advantage of these industries and the technology that they bring to us.” (FG1)

Government’s role should be limited to enabling the investment climate for entrepreneurs and private sector firms to exploit available investment opportunities in emerging industries. Taking into consideration the dominant role of SOEs in the economy, their contribution for creation of downstream industries becomes crucial as discussed in the following section.

“Masdar is a new economic development programme to help diversify the economy away from and oil and gas by building on our own strengths and by creating new knowledge based industries that can be sustainable if our oil and gas industry is healthy and fuelling the growth of the economy ... however, our strengths cannot be centred around one source and we should instead centre it around human capital and technology.” (FG1 Masdar)

3.5.12 Diversification and Path Creation Strategies

Countries and regions pursue different strategies to structure their economic development. There are different institutional and structural factors that enable or

constrain the creation of new paths for growth and diversification. The Abu Dhabi case demonstrates that institutional factors are associated with competitive advantage and easing of doing business that are driven and influenced by regional policies and strategies, while the structural factors are related to path dependency; these factors consequently determine the outcomes and nature of new paths for growth.

“The international model used by several countries for the successful development of manufacturing industries, it’s a three-layer model. Turning your competitive advantages into competitive advantages at the firm level. First, the overarching policy and regulatory umbrella was very effectively put in place, providing all the general enablers required by target industries to grow and flourish. Second, you put the anchor investments in place, the target industries in the second layer and third, you put the SMEs in place in the lower layer. Without SMEs you’re not going to have any manufacturing. There is no industrial landscape that is made up of only large manufacturers. (Inv1)

The approach of the Abu Dhabi Government to improve the business environment and competitiveness is channelled through formulating a government wide policy agenda, an economic development vision, and strategies. In 2007, Abu Dhabi launched the policy agenda that declared the overall vision and policy goals for the whole of the government.

“We have visionary leaders, who inspire our nation, our country, our very clear region, and they lead us with this very clear objective. So the leadership, the wise leadership is very fundamental.” (FG1 DED)

“Smart economies supported or fuelled by visionary leadership like we have here in the UAE, we were able to capitalise on our deep energy expertise as well as the substantial financial resources to establish such an economic platform centred around the renewable energy and sustainability, and in a way that allowed us to become true global leaders in the energy sector rather than us only being exporters of barrels of oil.” (FG1 Masdar)

In 2007, and continuing till the present time, each government entity has formulated a rolling five-year strategy that set priorities, measures and initiatives to deliver the government's wide goals and outcomes.

In 2009, Abu Dhabi Economic Vision 2030 was launched, which detailed vision and strategic goals and objectives for economic diversification; it was followed by five-year economic development plans, and industrial development strategies.

“Our leadership insisted that we, as government entities and semi-government entities, establish a thorough plan and strategy that will lead us in the next 15 years or so to have a diversified economy away from the oil sector.” (Inv3)

The Abu Dhabi Economic Vision prescribed 12 specific industrial sectors to be focused upon and be developed mainly through SOEs.

“If the government believes that that sector is a strategic sector then it's a sector that we would like to be involved in in the long run; if we don't believe this is a sector that is strategic for us, that is key for our development, then there is no need to support that sector.” (FG1 Email)

Abu Dhabi has effectively pursued a targeted diversification strategy centred around anchoring new industries through SOEs as well as focused on improving competitive advantage and ease of doing business.

“We've built at some point, while we were looking at the industrial strategy, we built a very robust, extensive prioritized model to determine which manufacturing industries are best suited for Abu Dhabi. The industries I mentioned to you are some of the industries that were selected by the model itself and it was not like – even the input that went into the model was not the decision of one guy. It was an approach through, we had like 10 or 15 consultants with varied expertise and they all were deciding on every value that's going to go for every value in the model until we came out with a list of prioritized manufacturing industries for Abu Dhabi. The basic metals will do very well in Abu Dhabi. So you have steel, you have aluminium, it can go into

copper. Now beyond those, you've got foodstuff, you've got pharmaceuticals, you've got packaging.” (Inv1)

“I would say people have talked about a lot of types of industries that can be used as drivers of diversification in the Emirate. I think all of these types of industries that we have heard about over the past 10 to 15 years boil down to two, beyond what ADNOC and its sisters have been doing. It boils down to two: manufacturing and tourism because – I might add financial services but it's not going to be like financial services in its broad sense.” (Inv1)

The underlying assumption for the targeted anchoring diversification strategy is that firms will be created around SOEs and related products, services, and industries will be emerged and evolved over time.

What is very evident is that both initial targeted industries and branched industries are very much associated with energy, with the exception of tourism. It was only during the past decade that Abu Dhabi ventured into industries that are unrelated to energy, such semiconductor, military, and aerospace; however, it has yet to witness whether new firms, products, and services will be clustered around these anchor firms.

On the other hand, the nature of industries initiated by private firms are different, and include pharmaceuticals and solar. energy

“I'm talking about the type of manufacturing industry that is driven by human brain and by educated manpower. If we go there, I think Abu Dhabi might do well. Pharmaceuticals is certainly one of them, certain types of manufacturing industries that are related to renewable energies like solar energy and things like that also might do well. (Inv1)

The new proposition-5 resulting from the above is that

“Economic actors including Government, SOEs, SEZs, and SMES influence diversification mechanisms and diversification factors to achieve desired diversification outcomes”

(Proposition-5)

3.5.13 Summary of Findings

In summary, new paths for diversifications are created by path creation mechanisms, which are conditioned by sources of path dependence and institutional arrangement & environment factors, and are driven by economic actors determining the outcome of economic diversification. The path creation mechanisms include indigenous creation, anchoring, branching and clustering. These are influenced by sources of path dependence, such as natural resources of oil and gas, and geography. The underlying factors for path creation are categorized into institutional environment and institutional arrangement. Institutional environment factors are attributed to government functions of liberal market economies, mainly laws & regulations and ease of doing business, such as access to finance, access to trade, access to logistics and access to land. On the other hand, institutional arrangements are attributed to coordinated market economies whereby government agents coordinate economic endeavors by setting diversification strategies, building knowledge and capabilities, increasing innovation capacity, establishing public private partnerships and joint ventures, and creating linkages across economic actors; however, in some cases government agents are actively participating in economic activities through SOEs and SEZs.

In a sense, these statements represent the elements of the path creation framework. Next the relationships amongst the elements of the path creation framework are discussed. The objective is to refine propositions, build a framework and develop a matrix for path creation.

3.6 Discussions

In this section, the conceptualization, linking, and re-evaluation stages of grounded data analysis are integrated. The main purpose is to refine propositions, build a framework, develop a matrix for path creation. The discussions below refine, rather than accept or reject, the initial propositions generated from the interviews and focus groups of previous sections. Moreover, these discussions construct relationships among actors, factors, and mechanisms and integrate these elements into a framework and a matrix for path creation. The propositions, framework and matrix provide the basis to theorize

creation of new paths for growth and diversification, the platform to formulate a set of diversification strategies to achieve desired diversification outcomes.

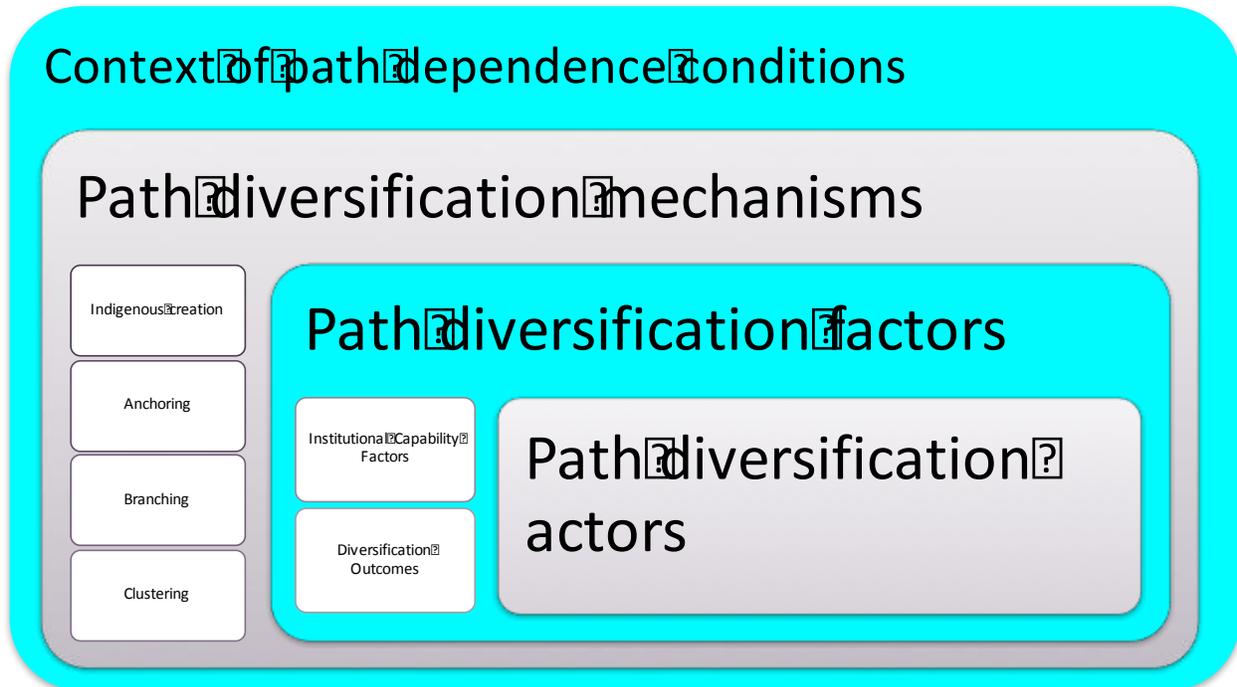


Figure 17: Project-2 Tabulated Matrix Structure for Data Analysis

3.6.1 Matrix Data Analysis

The first set of grounded analysis on clustered data analysis generated a set of propositions shaping the building block of a path creation framework as discussed above. In this section, the conceptualization, linking, and re-evaluation stages of grounded data analysis are discussed. The separate clustered data analysis of each theme and code limits exploring the relationship between actors, mechanisms, factors and outcomes. Therefore, a matrix data analysis (Miles & Huberman, 1994) is pursued where the relationships among actors, mechanisms, factors and outcomes are integrated and tabulated into matrices. The building blocks of themes, codes and statements are formed into a set of concepts that suggest refining propositions and opening up new ideas, for example, reaching clarity over the main themes of path dependence, four-diversification mechanisms, categorizing diversification factors into institutional capabilities and diversification outcomes. Once the main concepts are established, the process of cataloguing concepts or generating a set of focused codes

is detailed, elaborated and structured in updated tabulated documents. For this study, the tabulated matrices included main themes, and sub-themes (codes), each supported by capturing relevant statements from interviews and focus groups. The initial process of coding was extensive, hence the recoding of data to generate a focus on the research questions, rather than capturing all elements of the interview and focus group transcripts, was necessary.

The linking stage is the most crucial; it is based on creating a matrix of themes and codes or in other words a matrix of the elements of the path creation framework as illustrated in Figure 17. The linking and mapping of mechanisms, factors and actors in matrices provided a grid explaining the relationships and making sense of the findings. It helped not only to generate refined and new propositions but also define the constructs of the path creation framework (Figure 18), in a way framing the theory and contribution. The last process of re-evaluation is instrumental in validating findings, particularly following the discussion with the supervisor and research panel. The grounded analysis for this study, though based on the prior propositions of the systematic literature review, is iterative and exploratory. It generates refined and new sets of propositions and constructs for the path creation framework that contribute to understanding pathways to diversification (Figure 18 and Figure 19). These are elaborated in the discussions below.

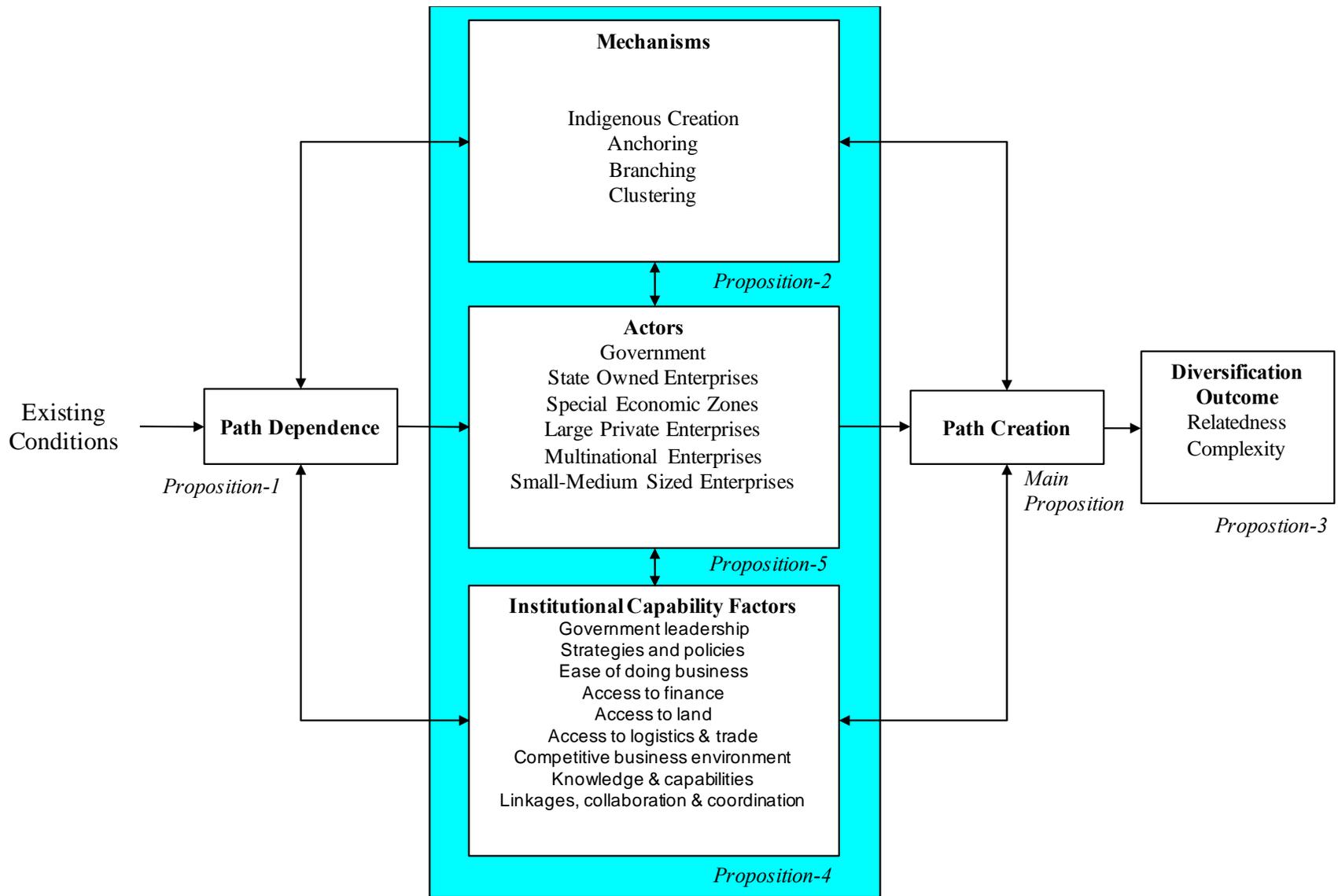
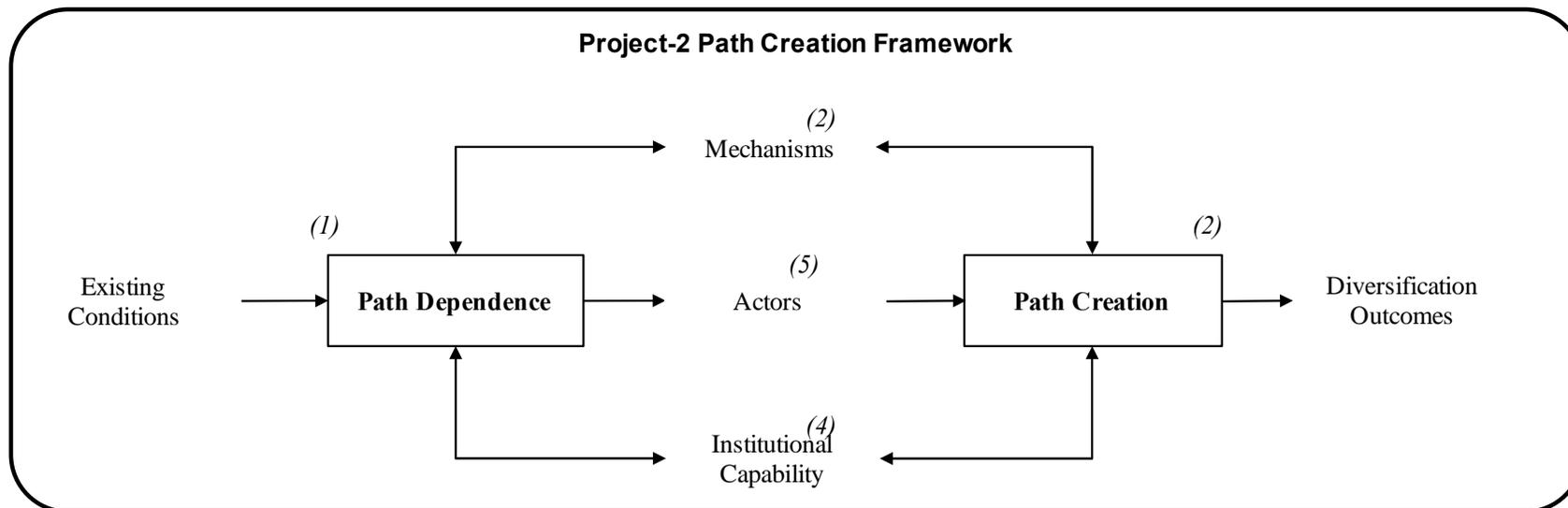


Figure 18: Project-2 Constructs of Path Creation Framework



Project-2 Path Creation Propositions

Proposition-1: Path dependence impacts on diversification.

Proposition-2: New paths for diversification are created through indigenous creation, anchoring, branching, and clustering path creation mechanisms undertaken by economic actors.

Proposition-3: Degree of path dependence and level of relatedness underpin diversification mechanisms.

Proposition-4: Degree of relatedness and complexity of institutional capabilities underpin diversification mechanisms.

Proposition-5: Economic actors drive diversification mechanisms, and influence institutional capabilities to achieve desired diversification outcomes.

Project-2 Main Proposition: New paths for regional diversifications are created through indigenous creation, anchoring, branching, and clustering mechanisms. Economic actors are found to drive diversification mechanisms and influence institutional capabilities to achieve related and unrelated varieties of industries.

Figure 19: Project-2 Propositions and Framework for Path Creation

3.6.2 Path Dependence

The first proposition examined is the impact of path dependence on economic diversification. This research addresses the importance of existing economic structure or path dependence in determining the future paths. Path dependence theory is concerned with heterodox evolutionary and institutional economic geography. It is a critical realist approach that is considered as a “major building block of a new interpretative or epistemological paradigm (Martin & Sunley, 2006; Martin, 2010). On ontological grounds, path dependence can be used as explanans (that which explains) rather than explanandum (that which has to be explained) (Notteboom et al., 2013) as it is “primarily concerned with uncovering its substantive underpinning mechanisms and empirical instances” to explain regional economic development.

Path dependence is defined by Martin and Sunley (2006: 402) as “a probabilistic and contingent process in which at each moment in historical time the suite of possible future evolutionary trajectories (paths) of a technology; institutions, firms or industry is conditioned by (is contingent on) both the past and the current states of the system in question”. The current state of regional economies matters in economic development (Hidalgo, 2009) because “at any point in time the state of the economy depends on the historical adjustment path taken to it” (Martin & Sunley, 2006: 400) for “once a particular pattern of socio-economic development is established, it can become cumulative and characterized by a high degree of persistence or ‘path dependence’” (Martin & Sunley 2003:27; 2006; 2008). Further, the process of economic diversification and branching into new products, clusters, and industries is conditioned by path dependence factors, i.e. pre-existing capability, proximity and relatedness (Hausmann & Hidalgo, 2011; Neffke et al., 2011a&b). The theorizing of path dependence by Martin and Sunley (2006; 2008) is supported by works of Hidalgo (2009) and Neffke et al. (2011) who provide empirical evidence on the underlying hypothesis that the current position of countries and regional economies in the product space and industry space determines

their future position. The case of Abu Dhabi demonstrates the relevance of path dependence to economic diversification mechanisms, as summarized in Table 24.

Table 24: P2 Matrix Table for Path Dependence and Mechanisms

Diversification Mechanisms	Diversification Factors	Path Dependence
Indigenous Creation	Natural resources Culture Geography Comparative advantage Economic complexity	Strategic geographical location provides opportunity value for trade and logistical hub (land, sea and air) Although for the case of Abu Dhabi, it is benefiting from the proximity and spillover effect of Dubai – a global logistical hub Culture influences strategic choice for positioning Abu Dhabi as a cultural tourism center
Anchoring		Anchor industries are directly or indirectly dependent on natural resources (oil, gas, polymers and energy for aluminium and steel) Anchor industries dependent on natural resources are characterized by simple complexity products (aluminium and steel bars) Natural resource based economic structure offers comparative advantage, hence reinforcing path dependence
Branching		Firms around anchor firms are of simple complexity, producing basic products, hence remain dependent on natural resources
Clustering		Clustering is not path dependent

Abu Dhabi is an oil and gas, path dependent economy where access to cheap energy feedstock provides a comparative advantage for energy dependent industries, thus it determines the nature of industries that have emerged and evolved over time, such as Aluminium, Steel, and Polymers that are energy dependent. However, other products and industries that are unrelated to sources of path dependence have emerged over time in Abu Dhabi. Therefore, the research findings from one aspect support the

theoretical and empirical proposition that path dependence is a fundamental phenomenon; however, it further demonstrates that path dependence both reinforces existing economic productive structure and influences the emergence of new products and industries that are related to the sources of path dependence, such as oil and gas. On the other hand, while the concept of path dependence is plausible, as it explains the creation of related products and industries, gaps still remain unanswered in the literature, i.e. new paths for growth and diversification are created through path dependence conditions. The plausibility of path dependence is therefore undermined by its condition, which is that path dependence economies are fixed and inflexible hence endogenous change is muted, thus for change to occur exogenous forces are the only hope for economics to escape the lock-in state (Martin & Sunley, 2006:406) of products and technologies. Moreover, the relationship between type and degree of path dependence, related and unrelated path creation varieties and diversification, role of economic actors, impact of factors, path creation mechanism on establishing path dependence as well as on creating new paths, are not addressed in the theory of path dependence.

We therefore, take a different theoretical positioning for this research project. Path dependence is an underlying condition both for reinforcing existing path conditions and creating new varieties for growth and diversifications, depending on the various economic actors, economic factors, and diversification mechanisms.

Path dependence impacts on diversification

(Project-2 Proposition-1)

In a sense, path dependence may explain some of the trajectories of path creation and diversification. However, the outcomes of path creation result from the continuous interplay between actors, factors, and mechanisms whereby path dependence is reduced to being as one of the underlying factors.

3.6.3 Path Diversification Mechanisms

The second proposition examined in this section is on path creation mechanisms. The evolution of local industries is mainly theorized on life cycles (Audretsch et al., 2008) of

products, (Klepper, 1996; Murmann & Frenken, 2006), clusters (Martin & Sunley, 2011; Menzel & Fornahl, 2010; Van Klink & De Langen, 2001), and industries (Audretsch & Feldman, 1996; Covin & Slevin, 1990). These are the evolutionary thinking of local industries which are founded on the product and industry life cycle, i.e. introduction, growth, and maturity (Covin & Slevin, 1990; Utterback, 1994). The evolution of the industrial structure of regions (Neffke et al., 2011a&b; Boschma et al., 2013), and countries (Hausmann & Klinger, 2007), however, has gained a recent interest theorized on evolutionary economics (Boschma & Lambooy, 1999; Martin & Sunley, 2007). Regions are continuously experiencing the introduction of new technologies, products and sectors through a process of creative destruction (Schumpeter, 1939; Martin & Sunley, 2006; Boschma & Frenken, 2011; Essletzbichler, 2015).

There are different development paradigms to frame the development of industrial districts; the dominant one is “new industrial district” (Marshallian or Italianate form) that is attributed to “the role of small, innovative firms embedded within a regionally cooperative system of industrial governance which enables them to adapt and flourish despite globalizing tendencies” (Markusen, 1996); however, Markusen (1996) identified three additional types of industrial district, i.e. hub-and-spoke formed around an external oriented firm, satellite platform composed of several unconnected plants embedded in external organizational links, and a state-anchored district centred around one or more public sector-institutions. The argument of Markusen (1996) is that the role of large firms and state institutions matters in shaping the development of industrial districts. These provide the necessary environment for smaller firms to enter and grow. The environment captures factors such as firms’ size, up and downstream industry linkages, degree of vertical disintegration, networks among district firms, district-wide governance structures, innovative capabilities, and the organization of production. However, these models explain the development of industrial districts but do not explain the development mechanism of industrial districts nor explain the evolution of the regional economy as a whole over time.

Martin and Sunley (2006) theorize on regional development around path dependence and the path creation phenomenon. The mechanisms are indigenous creation of new

technologies and industries that did not exist before in a region, heterogeneity and diversity, transplantation (the import of a new industry or technology from elsewhere, which then forms the basis of a new pathway of regional growth), diversification into technologically related industries, and upgrading of existing industries. Fredin (2014) further, identifies three stages of regional development: first, the entering of new knowledge which may, or may not, be the starting point for a new local industry; second, the formation of the new local industry; third, the anchoring process of the new local industry which in a way resembles indigenous creation. Moreover, “there is a need for a ‘path as process’ approach, the process of economic evolution must be understood as an ongoing, never-ending interplay of path dependence, path creation and path destruction that occurs as actors in different arenas reproduce, mindfully deviate from, and transform existing socio-economic-technological structures, socio-economic practices and development paths” (Martin & Sunley, 2006).

The economic growth and diversification of Abu Dhabi has evolved over time through four main mechanisms; these include the indigenous creation of industries, such as pearls, fishing, and oil, anchoring of new industries that did not exist earlier, such as Aerospace, Military and Semiconductor through State Owned Enterprises (SOEs), branching of related industries such as polymers, aluminium and steel undertaken by both private firms and SOEs, and clustering through Special Economic Zones (SEZs). These four diversification mechanisms refine the propositions of Martin and Sunley (2006) and Fredin (2014) and introduce the economic actors as a driving force for the diversification mechanisms, to read as follows:

New paths for diversification are created through indigenous creation, anchoring, branching, and clustering path creation mechanisms undertaken by economic actors.

(Project-2: Proposition-2)

This proposition is, however, incomplete without constructing the relationships between underlying factors, such as path dependence and diversification outcomes.

3.6.4 Path Diversification Outcomes

In this section, the relationship between path diversification mechanisms and diversification outcomes are discussed.

The case of Abu Dhabi demonstrates that both path dependence and relatedness matter to economic diversification. The high degree of path dependence on natural resources, i.e. oil and gas, during the earlier stages of development reinforces the dependence of industries and limits the varieties of industries, while gradually breaking away from path dependent conditions towards a low degree of path dependence opens up opportunities for unrelated industries to emerge and evolve over time.

Table 25: P2 Matrix Table for Mechanisms and Outcomes

Diversification Mechanisms	Diversification Factors	Path Diversification Outcomes
Indigenous Creation	Sources of path dependence Related and unrelated diversification varieties	Indigenous creation of products and industries are highly path dependent on endowed resources, e.g. energy and geography, hence, relatedness is high Low economic complexity due to association with commodity and basic products such as crude oil
Anchoring	Economic complexity	Anchoring unrelated products and industries such as Aluminium, Steel, Copper that are unrelated to existing path dependence conditions Low economic complexity, e.g. basic metals
Branching		Related variety of products and industries that are path dependent on existing economic structure, e.g. polymers Low to high economic complexity, e.g. polymers from oil and gas, then plastic products from polymers
Clustering		Related and unrelated varieties of products and industries, e.g. processed food and beverages, and construction materials High economic complexity, e.g. vessels and pipes for existing energy industry, cables

The process of economic diversification and branching into new firms, products, clusters, and industries is conditioned by path dependence factors, i.e. pre-existing capability, proximity and relatedness (Boschma & Frenken, 2011; Hausmann & Hidalgo, 2011; Neffke et al., 2011a). Path dependence, however, does not inform us how new paths for growth and diversification are created but it guides us, indicating that all evolutionary processes and mechanisms could be argued to be path dependent, which generates novelty, and hence new pathways of development (Martin & Sunley, 2006). On the other hand, new paths of growth and diversification could also emerge, which are not based on sources of existing path dependence conditions, through non-evolutionarily processes, such as the transplantation of new industries from elsewhere Martin and Sunley (2006). In other words, degree of path dependence influences the pattern of creation of new paths for diversification.

The process of diversification is defined as the creation of new industries through the recombination of related pre-existing technologies in the region (Frenken & Boschma, 2007; Boschma & Frenken, 2011). Related variety or diversification in a sector, region or nation is “a key concept in evolutionary economy geography” as it integrates knowledge, proximity and relatedness with economic renewal, new growth paths and regional growth (Asheim et al., 2011a). Frenken et al. (2007) extend the argument and frame the theory of relatedness, proposing that the nature of diversification from existing industries is prescribed as related and unrelated variety. There are different forms of relatedness; relatedness of technology and relatedness of firms as in the cluster theory, and relatedness of industries and relatedness of products as in the capability theory, while knowledge and capabilities are common factors among these forms of interrelatedness. The technological relatedness acts as a driver of this diversification process, in which a new sector spawns a related sector (Klepper & Simons, 2000) or the recombination of capabilities from multiple, related sectors (Klepper, 2002); furthermore, new industries are created from existing industries (Frenken & Boschma, 2007; Boschma & Frenken, 2011). Moreover, the productive structure of the economy is transformed through related and unrelated products or related and unrelated knowledge and capabilities (Hidalgo et al., 2007; Hidalgo, 2009; Hausmann & Hidalgo, 2010). In

other words, degree of relatedness influences the pattern of creation of new paths for diversification.

In a sense, economic diversification is a path creation evolutionary process that is conditioned by relatedness and path dependence. Path dependence reinforces existing conditions and relatedness tends to reinforce a particular economic structure (Martin & Sunley, 2006); thus, in the case of regions with a high degree of path dependence conditions such as oil and gas, the indigenous or endogenous creation of paths for economic development prevail in the absence of exogenous forces. The mirror of this argument is that regions with a low degree of path dependence should experience unrelated economic development.

It can be inferred from the above that there are different levels of path dependence conditions that generate different levels of diversification outcomes, i.e. related and unrelated varieties. A high degree of path dependence is associated with related varieties, while a low degree of path dependence is associated with unrelated varieties. Moreover, the path creation mechanisms undertaken by economic actors are conditioned by path dependence and relatedness. Indigenous creation and branching diversification mechanisms generate related varieties of paths for diversification while anchoring and clustering generate unrelated varieties of paths for diversification.

Abu Dhabi during its earlier stages of economic development was highly dependent on natural resources such as pearls, fishing and oil. This fits all countries where the indigenous creation of industries is highly dependent on available natural resources, which is associated with a low variety of industries. It is inferred that in high dependence regional economic conditions, related and low complexity varieties are created through indigenous creation mechanisms.

The diversification of the economic structure away from oil and gas has been a challenge for Abu Dhabi; thus exogenous forces were necessary to create new unrelated paths for diversification. Abu Dhabi pursued an economic diversification strategy that is built around anchoring new unrelated varieties such as Semiconductor, Aerospace, Military and Renewable Energy through SOEs. Regions with a high degree

of path dependence that aspire to create new paths for diversification which are unrelated to existing sources of path dependence, would require the deliberate action of economic actors to anchor new products and industries. In a sense, in high path dependence conditions, unrelated and low complexity varieties are created through anchoring path creation mechanisms.

Abu Dhabi pursued a diversification strategy that distances its economic structure from path dependence on oil and gas; while oil and gas industries remain the backbone of the economy, new related and unrelated products and industries have emerged over time though not significantly. It is inferred that regions with low path dependence conditions and the absence of a dominant technology or industry would essentially experience branching of new products and industries that are related and unrelated (to some degree) to the existing economic structure, as demonstrated in the works of Hidalgo on product space. In other words, in low path dependence regional economic conditions, related and complex varieties are created through branching mechanisms.

In the case of a region that is not locked into a path dependence, then the possibility of creating unrelated (and related) and high complexity products and industries through the process of clustering is high. This is also experienced in Abu Dhabi where clustering through SEZs enables the region to become less path dependent and creates unrelated varieties of products and industries. In a sense, in low path dependence regional conditions, unrelated varieties are created through clustering mechanisms.

Degree of path dependence and level of relatedness underpin indigenous creation, anchoring, branching, and clustering diversification mechanisms

(Project-2 Proposition-3)

In summary, new paths for diversifications are actuated by path creation mechanisms, which are conditioned by degrees of path dependence and degrees of relatedness, and are propelled by economic actors determining the structure of economic diversification. However, the economic actors operate within an institutional context that influences economic diversification and this is discussed in the following section.

3.6.5 Path Diversification Factors

In this section, the institutional factors that shape path creation and diversification mechanisms are discussed. The underlying institutional factors for path creation are categorized into institutional environment and institutional arrangement, as established in the systematic literature review. Institutional environment factors are attributed to government functions, mainly laws & regulations, and ease of doing business such as access to finance, access to trade, access to logistics and access to land. On the other hand institutional arrangements are attributed to government agents actively coordinating and participating in economic activities, such as SOEs and SEZs, setting and targeting diversification strategies, building knowledge and capabilities, increasing innovation capacity, establishing public/private partnerships and joint ventures, and creating linkages across economic actors. So institutional arrangement and institutional environment factors matter and our interest is on how these actors influence the nature of economic growth and diversification. i.e. diversification mechanics and diversification outcomes. The relationship between institutional diversification factors and the four diversification mechanisms is discussed below and summarized in Table 26.

During the early stages of economic development, Abu Dhabi relied on natural resources of pearls and fish, then on oil and gas, whereby the region is characterized by a simple institutional environment. The innovation of manufactured pearls by Japan killed the natural pearl trade, moreover micro fishing businesses retreated over time due to low income and availability of other sources for higher income, i.e. government career. The oil and gas industry was initially established by international oil companies, then national oil companies started to take over the operation over time. In a sense, indigenous creation is associated with the simple institutional environment and the government role is to support the indigenous creation of industries, and in some cases introduces laws and regulations to protect indigenous products and industries.

Table 26: P2 Matrix Table for Mechanisms and Factors

Diversification Mechanisms	Diversification Factors	Path Diversification Factors and Mechanisms
Indigenous Creation	Government strategies and policies	Policies and strategies that support indigenous industries such as fishing
Anchoring	Laws and regulations Processes Access to finance Access to land Access to logistics and trade Investment promotion	<p>Targeting strategy towards anchoring a few industries, such as basic metals, military, aerospace, and media</p> <p>SOEs are effectively the arm of the government to establish targeted industries</p> <p>Joint venture between SOEs and MNEs; however, extended collaboration towards building local industries does not exist</p> <p>Laws for local content that drives SOEs to collaborate and support SMEs</p> <p>Capital intensive anchor industries</p> <p>Government investment in new anchor firms (SOEs)</p> <p>Joint venture between SOEs and foreign firms</p> <p>Simple institutional environment as market forces are in place</p> <p>Higher institutional arrangement mainly to operate SOEs</p>
Branching		<p>Strategy directed towards developing downstream industries; however, success has been limited and demand for SOEs' product is limited</p> <p>Laws and regulation that are enabling FDI and VE</p> <p>Business ownership</p> <p>Mobility of labour force</p> <p>Transparency and consistency of laws</p> <p>Single source government funding through Khalifa Fund</p> <p>Limited support from local banks</p>

		<p>Limited FDI</p> <p>Absence of venture capital</p> <p>Access to land outside SEZs is a challenge and impacts on the growth of industrial firms</p> <p>Lack of information on investment and business opportunities</p> <p>Complex institutional environment that enhances ease of doing business, enabling the growth of SMEs</p> <p>Low institutional arrangement as market forces in place driven by higher participation of private sector, e.g. SMEs</p>
<p>Clustering</p>		<p>Clarity of laws and regulations with respect to leasing industrial land is a concern</p> <p>Firms established within SEZs may be subject to different regulations</p> <p>Providing industrial lands through ownership or long-term leases are impacting on the establishment of new firms, both within and outside SEZs</p> <p>Complex institutional environment that enhances ease of doing business and competitive business environment</p> <p>High institutional arrangements to operate SEZs</p>

The later stages of development in Abu Dhabi witnessed the established of SOEs that triggered economic diversification through anchoring products and industries that are related to sources of path dependent or natural resources, mainly oil and gas, but gradually extended towards new products and industries that are not related to the existing economic structure, such as aerospace, semiconductor, military, and renewable energy. Government leadership plays a crucial role as, effectively, the government becomes the main economic agent; hence the focus is on building the institutional environment for SOEs to flourish, such as laws and regulations that enable joint ventures between SOEs and MNEs, while other institutional environmental factors that support SMEs have remained low. In a sense, the institutional arrangement and institutional environment gradually increased along with the increase of the complexity of products and industries being targeted and anchored.

Moreover, Abu Dhabi over past decades has adapted its clustering diversification approach through the establishment of SEZs. This has demanded the setting up of institutions that oversee SEZs as well as the enabling of complex institutional environment within SEZs. This mandates high level of institutional arrangement represented by SEZs to provide the infrastructure and logistics for the growth and clustering of firms and industries in a geographical location. The aim is to enable creation of products and services that are mainly unrelated and to some degree related to existing economic structure. SEZs streamlined the laws and regulations, facilitated foreign direct investment, provided access to land to foreign investors through long term lease agreements, offered access to logistics and trade, and cheap energy, which overall improved the competitive advantage of business operations within SEZs. The main challenge is creating linkages and collaboration between SMEs within SEZs and firms operating outside SEZs, moreover, building innovation capacity that enables the growth of SMEs. These however require institutional collaboration arrangements between Government, SOEs, SEZs, SMEs and education institutions. In a sense, clustering

diversification mechanisms is associated with a complex institutional environment and high level of institutional arrangement.

Finally, Abu Dhabi has also experienced growth and branching of firms, products, and industries that are related to natural resources or anchored around SOEs, and within SEZs as a result of prudent government effort that has enhanced ease of doing business and competitive advantage. Of particular importance is access to finance which has been solely provided by the Khalifa Fund, while the banking sector has lacked enthusiasm to support SMEs, mainly due to institutional environmental factors, such as the absence of credit bureau and bankruptcy law. In a sense, the branching diversification mechanism is associated with a complex institutional environment that is typically associated with free market economies. The degree of institutional arrangement and complexity of institutional environment underpin diversification mechanisms. The prevailing diversification mechanisms for regions with low institutional arrangements and a simple institutional environment are indigenous creation and anchoring, while the prevailing diversification mechanisms for regions with high institutional arrangements and a complex institutional environment are clustering and branching.

3.6.6 Institutional Capabilities

The findings demonstrate that institutional arrangement and institutional environment underpin diversification mechanisms. In this section the relationship between institutional capabilities and other elements of path creation are discussed.

The capability theory (Hidalgo, 2009) proposes, “the productive structure of countries is determined by the local availability of highly specific inputs, or capabilities, which can be thought of as specific building blocks of production”. Capabilities could be tangible inputs, such as bridges, ports and highways, or intangibles, such as norms, institutions, skills or the existence of particular social networks. In this theory, at any given point in time, countries are endowed with a set of capabilities, whereas products require specific capabilities. The sophistication of a product is related to the number of

capabilities that the product requires, whereas the complexity of a country's economy is related to the set of capabilities it has available locally. If countries can only produce the products for which they have all the required capabilities, and if capabilities are hard to accumulate, then the current mix of capabilities available in a country will not only determine the products that the country can make today, but also the products that it will be able to make in the future. This is because countries will bias their future production towards products that use many of the capabilities that are already available. Countries that can produce products requiring a relatively large number of capabilities, therefore, should have economies that are more adaptable than countries producing less complex products. Given their large capability endowment, these countries will have more potential uses for any new capability that comes along (Hidalgo, 2009). In other words, complexity of existing accumulated capabilities determines the sophistication of economic diversification.

The theory of relatedness proposes that the nature of diversification from existing industries is categorized as related and unrelated variety by Frenken et al. (2007); where technological relatedness acts as the main driver of this diversification process, in which a new sector is spawned from a related sector or from the recombination of capabilities from multiple, related sectors (Klepper, 2002), or, in other words, the productive structure of the economy is transformed through related and unrelated products or related and unrelated knowledge and capabilities (Hidalgo et al., 2007; Hidalgo, 2009; Hausmann & Hidalgo, 2010). Moreover, "Relatedness is a stronger driver of diversification into new products in coordinated market economies, while liberal market economies show a higher probability to move in more unrelated industries" (Boschma & Capone, 2014) or in other words, relatedness impacts on patterns of economic diversification, i.e. the degree of relatedness influences economic diversification.

It is established that both institutional arrangement and institutional environment underpin diversification mechanisms. Particularly, a high degree of institutional arrangement is associated with anchoring and clustering mechanisms while a

low degree is associated with indigenous creation and branching mechanisms. So, if capability is defined to include institutional environment factors, then the relationship between institutional arrangement and institutional environment holds for capability, as illustrated in Figure 20.

“Degree of relatedness and complexity of institutional capabilities underpin diversification mechanisms”

(Project-2 Proposition 4)

In a sense, simple capabilities are associated with the creation of related varieties of products and industries, whereas complex capabilities are associated with the creation of complex related and unrelated capabilities.

This proposition could be extended to include path dependence. We could think of path dependence as the accumulated knowledge and capability embedded in a regional economy, where economic agents establish the conditions for path dependence and the creation of new paths for growth and development. In a sense, path dependence explains why certain regions lock-in to certain development trajectories due to accumulated knowledge and capability within institutions, firms, products and industries that condition the creation of new knowledge because of absorption capacity (Cooke, 2002) and complexity of existing knowledge and capability (Hidalgo & Hausmann, 2009). The “capability based path dependence” views path dependence as a condition that accumulates a specific set of embedded knowledge and capability that either inhibits or enables the creation of new related or unrelated knowledge and capability, or in other words creates new related or unrelated paths for growth and development. It might be helpful to think of lock-in as one type of path dependence where the degree of path dependence is extremely high due to simple accumulated knowledge and capability that make it difficult to make a change from within, thus inhibit novelty and the creation of new paths. On the other hand regions that are on a path of development, which has accumulated complex knowledge and capability, are able to create and branch into new paths for growth and development that is either related or unrelated to existing knowledge and capability by the deliberate actions of economic agents, such as

firms and institutions as well as globalization and internationalization. The “capability based path dependence” is therefore, an alternative building block that interprets the emergence and evolution of regional economies. However, as discussed earlier, countries and regions with path dependence have been able to introduce products and industries that are both related and unrelated to sources of path dependence conditioned by the degree of path dependence, different institutional factors and path creation mechanisms.

Similarly, capabilities include the institutional environment, such as laws and regulations, access to finance, access to land, access to trade and logistics, innovation capacity, etc. In other words, regions with a high degree of institutional capabilities are able to generate complex capabilities thus create related and unrelated products and industries.

Moreover, it has been established earlier that related and unrelated economic varieties are created through indigenous creation, anchoring, branching, and clustering mechanisms that are determined by the complexity levels of accumulated capabilities. It is deduced that capabilities include knowledge, innovation, infrastructure, institutional environment etc.

3.6.7 Path Creation Framework & Matrix

In this section, the main building blocks of path dependence and path diversification mechanisms, factors and actors are integrated to construct a framework and develop a matrix for path creation as illustrated in Figure 19 and Figure 20.

The path creation framework is based on the “theory of path dependence”, “theory of capability”, and “theory of relatedness”. It integrates underlying path creation factors – let us call these factors institutional capability levers; four path creation mechanisms; and path creation outcomes, i.e. related and unrelated varieties. Actors propel underlying factors or levers and mechanisms for path creation to generate related and unrelated variety diversification outcomes. Actors include Government, SOEs, SEZs and SMEs. The institutional capability factors include institutional environment and institutional arrangement factors.

The institutional environment factors include ease of doing business, laws and regulations, access to finance, access to land, access to trade and logistics etc. The institutional arrangement factors relate to activities carried out by the actors, such as establishing linkages and collaboration, and building innovation capacity. The path creation outcomes are measures for related and unrelated diversification and varieties, which could include economic complexity, economic concentration, and economic diversification. The degree of relatedness and complexity of institutional capabilities underpins the path creation mechanisms and outcome. The proposition is that economic actors, particularly government organizations or policy makers, should pursue a diversification approach or strategies that take into consideration accumulated capabilities that achieve desired diversification outcomes.

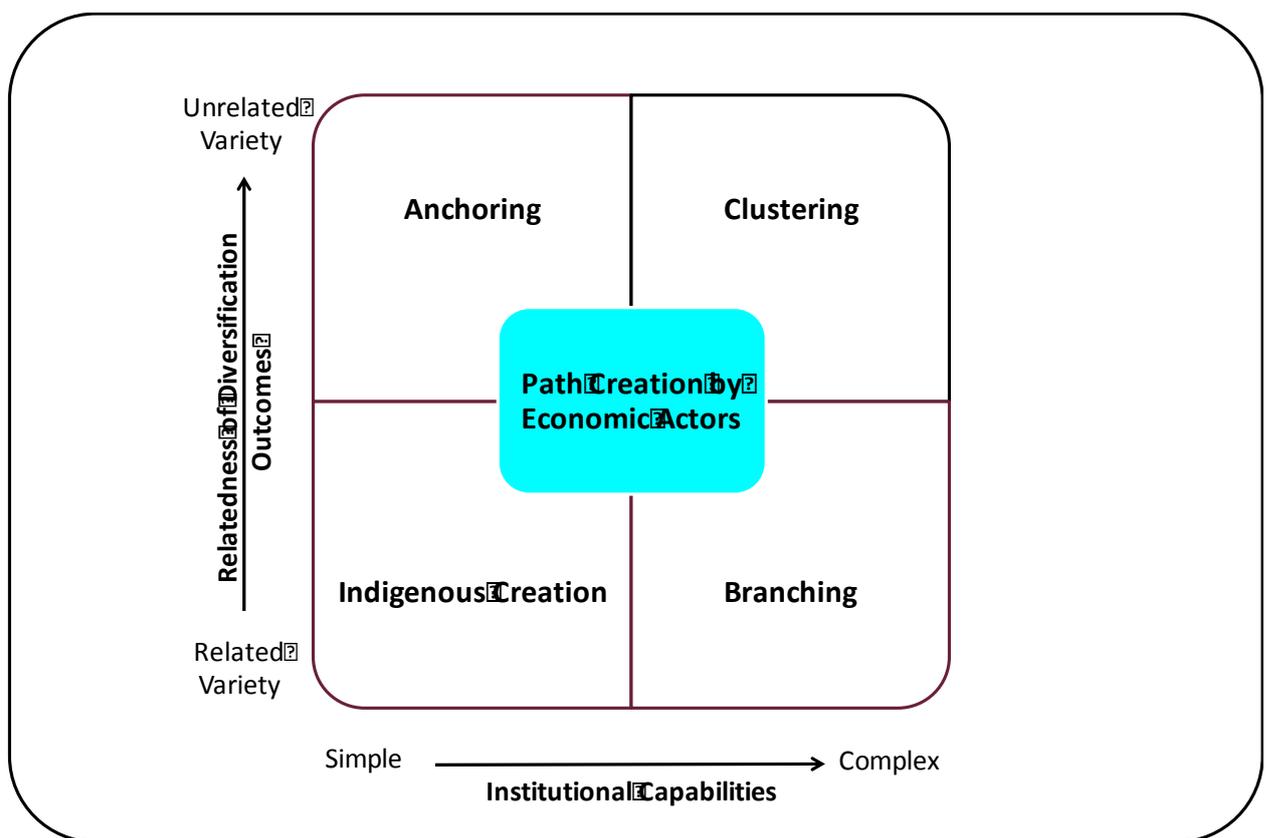


Figure 20: Project-2 Path Creation Matrix

3.6.8 Diversification Strategies

The final building block of the path creation framework is the role of institutions in influencing path dependence, diversification mechanisms, capabilities, and outcomes. The discussions above implicitly included the role of actors to condition institutional capabilities and propel diversification mechanisms to achieve desired diversification outcomes. This section deliberates on the role of actors, i.e. the strategic actions undertaken by economic actors, such as government, SOEs, SEZs, and SMEs as summarized in Table 27.

Table 27: P2 Strategies for Diversification

		Institutional Capabilities	
		Simple	Complex
Diversification	Unrelated Variety	Anchoring Diversification Strategy <ul style="list-style-type: none"> ▪ Establishment of SOEs to anchor new products and industries ▪ Public Private Partnerships and Joint Ventures with MNEs ▪ High comparative advantage around products and industries of SOEs ▪ Build innovation capacity within SOEs ▪ Enable linkages between SOEs and SMEs through local content laws 	Clustering Diversification Strategy <ul style="list-style-type: none"> ▪ Build SEZs infrastructure ▪ Establish competitive advantage within SEZs ▪ Build innovation capacity and centre of excellence within SEZs ▪ Enable access to trade and logistics ▪ Establish linkages between firms within SEZs and across other firms outside SEZs
	Related Variety	Indigenous Creation Strategy <ul style="list-style-type: none"> ▪ Support indigenous industries ▪ Improve comparative advantage of indigenous products ▪ Facilitate trade and exports 	Branching Diversification Strategy <ul style="list-style-type: none"> ▪ Adopt free market institutional environment to create high competitive advantage ▪ Enable access to finance ▪ Build and support entrepreneurial activities

The main argument is that the institutional capabilities manipulated by economic actors have important implications for economic performance. In regions that

are dominated by coordinated market economies or higher degree of institutional arrangement, as in the case of Abu Dhabi, the role of government extends beyond policy making towards collaborating and coordinating across various economic actors, such as government institutions, State Owned Enterprises (SOEs), Special Economic Zones (SEZs), and Multinational Enterprises (MNEs) to enable the creation of new paths for economic growth and diversifications that are both related and unrelated as well as complex and innovative. The outcomes of such a coordinated effort would highly depend on the complexity of the institutional environment. In, a sense the role of institutions differs according to existing path dependence conditions, diversification mechanisms, institutional capabilities and desired outcomes.

Indigenous Diversification Strategy

In cases where capability is simple or not present and there is an abundance of natural resources that represent the sources of path dependence and are characterized as simple and unsophisticated, hence do not embed complex knowledge and capabilities within the economy, consequently the creation of new knowledge and capability or new complex products is difficult. It may be sufficient to capitalize on the comparative advantage of these local endowed industries through the enhancement of both institutional arrangement and institutional environment. In a sense, economic actors, i.e. in regions with simple existing capabilities, support the creation of simple related varieties through indigenous creation mechanisms.

Anchoring Diversification Strategy

In cases where capability is not present, and a region desires to transform the economic productive structure away from their path dependent capabilities towards new and complex products and industries, then direct government intervention is essentially required to anchor new unrelated industries and coordinate the accumulation of associated capabilities. The range of capabilities would include high institutional arrangements through the establishment of large SOEs that act as a nucleus of new industries. This type of region would be equipped with limited innovation capacity and if some kind of innovation

capacity exists it will be concentrated within the SOEs. This, however, should enable radical innovation within the targeted industry on the availability of innovation capacity. In a sense, economic actors, i.e. SOEs in regions with simple existing capabilities create unrelated varieties through anchoring mechanisms.

Branching Diversification Strategy

In cases where embedded capability is complex, a region can branch into a related variety of products and industries that are close to the existing path dependence capabilities with minimum institutional arrangements, i.e. minimum active role for government in the productive structure instead a high degree of institutional environment is all that is needed to encourage starting up SMEs and attract foreign direct investment, hence accumulating a new set of complex capabilities and higher degree of diversification. In a sense, economic actors, i.e. SMES in regions with complex capabilities, create complex related varieties through branching diversification mechanisms.

Clustering Diversification Strategy

In cases where embedded capability is complex, a region can move into related and unrelated complex varieties of products and industries through clustering, which would require a high level of institutional arrangement coordinated by the government through the provision of infrastructures such as Special Economic Zones (SEZs) and a high degree of institutional environment enabled by the government to realize competitive advantage and ease of doing business. In a sense, economic actors, i.e. SEZs, in regions with complex capabilities create complex unrelated capabilities through clustering mechanisms.

Economic actors drive diversification mechanisms and influence institutional capabilities to achieve desired diversification outcomes.

(Project-2: Proposition-5)

New paths for regional diversifications are created by path creation mechanisms. Economic actors are found to drive diversification mechanisms and influence institutional capabilities to achieve related and unrelated varieties of industries.

(Project-2: Proposition-6)

3.7 Conclusions

This research contributes to knowledge and practice. The main contribution of this research is generating a set of propositions, build a framework, and develop a matrix that conceptualize the theorize path creation for economic growth and diversification (Figure 19 & Figure 20). It proposes that new paths for regional diversifications are created through indigenous creation, anchoring, branching, and clustering mechanisms. Economic actors are found to drive diversification mechanisms and influence institutional capabilities to achieve related and unrelated varieties of industries. The diversification mechanisms are conditioned by underlying institutional capabilities that include the institutional environment and institutional arrangement factors. Institutional environment factors are attributed to government functions of liberal market economies, mainly laws & regulations and ease of doing business, such as access to finance, access to trade, access to logistics and access to land. On the other hand, institutional arrangements are attributed to coordinated market economies whereby government agents coordinate economic endeavors by setting diversification strategies, building knowledge and capabilities, increasing innovation capacity, establishing public private partnerships and joint ventures, and creating linkages across economic actors; however, in some cases government agents are actively participating in economic activities through SOEs and SEZs. The mechanisms and underlying institutional capability factors are propelled by economic factors determining the outcome of economic diversification, e.g. related and unrelated varieties. The relatedness factors are influenced by sources of path dependence, such as natural resources of oil and gas, geography, etc.

The path creation framework attempts to provide government organizations with a different set of strategies to influence economic growth and diversification. The path creation strategies identified based on path creation mechanisms are indigenous diversification strategy, anchoring diversification strategy, branching diversification strategy, and clustering diversification strategies. The choice of strategies would depend on the set of institutional capabilities or path creation levers that are influenced by government organizations and other economic actors to achieve desired diversification outcomes. The underlying assumption is that government organizations undertake an active role in coordinating economic activities in one dimension, such as the case for anchoring and clustering diversification strategies, and also undertake an active role in building capabilities for market forces to function properly in other dimensions, such as the case for branching diversification strategy. The role of strategies and policies matters. However, what is crucial is the collaboration and coordination among economic actors to build various capabilities, such as innovation capacity, are important for the creation of new paths for growth and diversification.

The next step of this doctoral research project is to operationalize the path creation framework across different regions and countries. It is proposed to conduct a rich case based qualitative research supported by descriptive analysis to explore the diversification strategies pursued by some countries, in particular the role of institutions on influencing diversification mechanisms and institutional capabilities to achieve desired path creation outcomes. The same methodology of grounded analysis, supported by clustered and matrix data analyses, will be applied for the new research study.

4 PROJECT-3: CASES OF OTHER DIVERSIFICATIONS

4.1 Abstract

A fundamental research question in regional economic development is why some countries have been able to diversify into new products and industries, while others continue to face challenges in diversification? Regions and countries pursue different pathways in transforming the structure of their economies, generating complex varieties of related and unrelated products and industries. This project-3 of the doctorate research builds on propositions of the systematic literature review (SLR) and the qualitative empirical case study on UAE. It studies “How regions create new paths for diversification” It explores the creation of new paths for growth and diversification of Singapore, Norway and UAE. It generates propositions, build a framework and develops a matrix for path creation framework based on the research synthesis of published cases. It ends with a set of suggested strategies guiding policy makers on regional diversification.

4.2 Introduction

This third project researches “How regions create new paths for diversification” through a synthesis of published cases of Singapore, Norway and UAE.

This research paper first highlights the propositions generated from the empirical case study of UAE (Project-2). Second, it illustrates the research synthesis methodology of published cases through grounded and cluster analysis. Third, it analysis the outcomes of research synthesis through content and cluster analysis that generates findings for each of the cases. Fourth, it further conducts an integrated analysis to build relationships among the constructs of the path creation framework that are tabulated in summary matrices. Fifth, it discusses research findings in light of the literature and articulates five propositions, and one main overarching proposition conceptualizing path creation. Sixth it constructs a framework and develops a matrix for path creation that include path dependence conditions, actors, factors, mechanisms, and outcomes. Finally, it provides government

organizations with a different set of strategies to influence policies for economic growth and diversification.

4.3 Foundation Concepts

This research builds on the SLR and a qualitative research case study on UAE. The SLR of project-1 generates the theoretical propositions and basic form of path creation framework (Figure 14) while the empirical propositions resulting from the case study of project-2 further develop a path creation framework (Figure 19) and link the elements of the framework into a matrix (Figure 20). Collectively these propositions, framework and matrix provide a platform to explain the creation of new paths for growth and diversification. This section provides an overview of these propositions, concepts and underlying theoretical foundations, and refers to the SLR for theoretical details. These also represent the foundation concepts and research questions for this stage of the research synthesis of the selected regional cases.

The main arguments in the existing literature are as follows. Regions are continuously experiencing the introduction of new technologies, products and sectors through a process of creative destruction (Schumpeter, 1939; Martin and Sunley, 2006; Boschma & Frenken, 2011; Essletzbichler, 2015). The evolution of local industries is mainly theorized on lifecycles (Audretsch et al., 2008), of products, (Klepper, 1996; Murmann & Frenken, 2006), clusters (Martin & Sunley, 2011; Menzel & Fornahl, 2010), and industries (Audretsch & Feldman, 1996). The evolution of the industrial structure of regions (Neffke et al., 2011a); Boschma et al., 2012), and countries (Hausmann et al., 2007), however, has gained recent interest theorized on evolutionary economics (Boschma & Lambooy, 1999; Martin & Sunley, 2007). Moreover, “there is a need for a ‘path as process’ approach, the process of economic evolution must be understood as an ongoing, never-ending interplay of path dependence, path creation and path destruction that occurs as actors in different arenas reproduce, mindfully deviate from, and transform existing socio-economic-technological structures, socio-economic practices and development paths” (Martin & Sunley, 2006).

The initial propositions and initial path creation framework are built around the path dependence model of local industrial evolution of Martin (2010), path creation mechanisms (Martin & Sunley, 2006), stages of regional development (Fredin, 2014), “building blocks of economic complexity” (Hidalgo and Hausmann, 2009; Hidalgo, 2009); “related and unrelated variety” (Frenken et al., 2007; Boschma & Frenken, 2011); “industry relatedness” (Neffke & Henning, 2008; Neffke et al., 2011a; Neffke & Henning, 2014); and “differentiated knowledge base” (Asheim & Coenen, 2005; Asheim, 2007); that impact on the branching process and path creation (Martin & Sunley, 2006; Frenken & Boschma, 2007; Martin, 2010; Neffke et al., 2011a). The main overarching proposition generated from the SLR and empirical single case study is that

“New paths for regional diversifications are created through indigenous creation, anchoring, branching, and clustering diversification mechanisms. Economic actors are found to influence diversification mechanisms and influence institutional capabilities to achieve related and unrelated varieties of industries”

(Project 2 Main Proposition)

This research supports the position of existing literature, that path dependence matters for regional development as the existing structure of the economy acts as the underlying factor for future changes. Sources of path dependence include natural resources, geography, infrastructure, institutions, accumulated capabilities & knowledge, and others such as variety and interrelatedness of products, services and industries. Hence, understanding the sources of path dependence, such as geographical location, natural resources, infrastructure, and existing capabilities in the economic structure, is essential for shaping future growth and development. Martin and Sunley (2006: 402) define path dependence as “a probabilistic and contingent process in which at each moment in historical time the suite of possible future evolutionary trajectories (paths) of a technology, institution, firm or industry is conditioned by (its being

contingent on) both the past and the current states of the system in question". The current state of regional economies matters in economic development (Hidalgo, 2009) because "at any point in time the state of the economy depends on the historical adjustment path taken to it" (Martin & Sunley, 2006: 400); for that reason, "once a particular pattern of socio-economic development is established, it can become cumulative and characterized by a high degree of persistence or 'path dependence'" (Martin & Sunley 2003: 27; 2006; Martin & Simmie, 2008). Thus, the local context, in particular the institutional capabilities and the "mechanisms, agents and conditions underpinning the geographies of path creation should remain at the top of the agenda for research in this field" (Sydow et al., 2010, in Dawley, 2013).

The initial first proposition generated from the systematic literature and the single qualitative case study is that

"Path dependence impacts on diversification"

(Project 2 Proposition-1)

Path dependence matters for regional diversification; however, regions evolve over time, they do not abandon products that are path dependent on their natural resources but add products that are related or unrelated to their economies. Countries follow different paths to transform their economic structure, moving from simple to complex and diversified products. However, only advanced economies and a few developing countries have been able to transform their economic productive structure over the past four decades (Hidalgo, 2009). The "question of how new regional growth paths emerge has repeatedly been raised by leading economic geographers...as one of the most intriguing and challenging issues in our field" (Neffke, Henning & Boschma 2011: 241 in Dawley, 2013). It would appear that researchers still have "little understanding of how regions diversify into new growth paths, and to what extent public policy may affect this process" (Asheim, Boschma & Cooke, 2011, 894; Dawley, 2013). This research contributes to existing knowledge in different ways. It constructs a path creation framework that explains not only the diversification mechanisms but also establishes the relationships between

actors, factors, mechanisms, and diversification outcomes. The second proposition is

“New paths for diversification are created through indigenous creation, anchoring, branching, and clustering path creation mechanisms undertaken by economic actors”

(Project 2 Proposition-2)

The creation of indigenous industries based on natural endowments and natural resources is the foundation for economic development. However, “as countries become more complex, they become more diversified; they add more products to the export mix without really abandoning the products they started with” (Hausmann and Hidalgo, 2010). In a way, countries add new products and industries that are either related or unrelated to the existing economic structure.

In the existing literature, the argument is that regional development is “a branching process where related activities spin out existing activities” (Frenken & Boschma, 2007; Boschma & Frenken, 2011), “new regional development paths” are created on the basis of existing ones (Martin, 2010), and “the rise and fall of industries is strongly conditioned by industrial relatedness” Neffke et al. (2011a). Hidalgo et al. (2007) show that countries diversify their export portfolios according to such a branching mechanism. Neffke et al. (2011) show that a similar mechanism is at work in the long-term development of Swedish regions. The same line of reasoning has been replicated for regions in Spain (Boschma et al., 2013) and the United States (Essletzbichler, 2015; Neffke et al., 2014). The underlying assumption of this argument is that “regions grow through related diversification for similar reasons that firms do ... regions host resources that expand with their use and are valuable, rare, specific to the existing set of economic activities and hard to access from outside the region (Neffke et al., 2014). In summary, “regional diversification will predominantly be related diversification” (Neffke et al., 2014), regions branch into related varieties or industries (Frenken et al., 2007) or related capabilities (Hausmann & Hidalgo, 2010). Therefore, new paths are created in the context of existing path

dependence conditions and accumulated capabilities, which can be “existing structures, and paths of technology, industry and institutional arrangements” (Martin & Simmie, 2008: 186). Therefore, the third generated proposition is

“The degree of path dependence and level of relatedness underpin diversification mechanisms”

(Project 2 Proposition-3)

Consequently, it will also be difficult to attract and create new industries that are technologically unrelated to pre-existing industries. This argument is, however, “conceptualized around endogenous, self-reinforcing process resulting from the presence of research organizations and scientists, innovative firms operating in related industries, combinatorial knowledge dynamics, an excellent endowment with supporting institutions, continuous branching activities, a vibrant entrepreneurial culture and regional knowledge spillovers” (Isaksen & Trippel 2014). There are, however, other mechanisms for regional development and diversification. Some countries have been able to transform their economic structure towards unrelated and complex products and industries, achieving a structural change (Neffke et al., 2014) within the context of path dependence conditions, through anchoring and clustering mechanisms.

Clustering is one form of development that is founded around the dominant “new industrial district” (Marshallian) in the literature that is attributed to “the role of small, innovative firms embedded within a regionally cooperative system of industrial governance which enables them to adapt and flourish despite globalizing tendencies” (Markusen, 1996). Markusen (1996) further identified three additional types of industrial district, i.e. hub-and-spoke industrial district formed around an external oriented firm, satellite platform composed of several unconnected plants embedded in external organizational links, and state-anchored district centred around one or more public sector institutions. The argument of Markusen (1996) is that the role of large firms and state institutions matters in shaping the development of industrial districts. These forms of development model framed economic actors to provide the necessary environment for smaller firms to enter and grow. Extending this argument

further, many countries have been able to jump-start new industries that are unrelated to the existing economic structure through exogenous factors, such as anchoring new firms or industries. Therefore, “we need to complement existing approaches by a theoretical framework that takes into consideration exogenous sources of new industrial development as well as proactive actions taken by key agents, including policy actors, across multiple scales to overcome barriers that hamper regional economic development in the periphery” (Isaksen & Tripl, 2014) or in path dependence conditions on natural endowments & resources, that are distanced from technological frontiers. The creation of new unrelated and complex varieties, however, “requires a transformation of the local resource base” (Neffke et al., 2014); these are undertaken by key economic actors.

The qualitative case study of UAE illustrates that economic growth and diversification has evolved over time through four main mechanisms: First, the indigenous creation of industries, such as pearls, fishing, and oil. Second, the anchoring of new industries, such as aerospace, military and semiconductors that did not exist earlier, mainly through State-Owned Enterprises (SOEs). Third, the branching of related industries such as polymers, aluminium and steel undertaken by both private firms and SOEs. The clustering of related industries through Special Economic Zones (SEZs). These four diversification mechanisms refine the propositions of Martin and Sunley (2006) and Fredin (2014) and introduce the economic actors as a driving force for the diversification mechanisms.

“Economic actors including drive diversification mechanisms and influence institutional capabilities to achieve desired diversification outcomes”

(Project 2 Proposition-5)

The literature on evolutionary economic geography is, however, centred on firms as protagonists for shaping economic change. The argument of evolutionary economic geography is that “firms affect and change their environment and this change, in turn, affects their performance” (Fitjar &

Rodríguez-Pose, 2015). The routines of individual firms, their capacity to learn and adapt through networks and externalities, and self-organization, and shape the geographical context and environments in which economic activity is taking place, determine change and innovation (MacKinnon et al. 2009; Fitjar & Rodríguez-Pose, 2015). This argument “tends to neglect that firms are embedded in geography and local institutions which they may not always be able to influence” (Morgan, 1997; Martin & Sunley 2006). The creation of new paths for growth is both enabled and constrained by the local context and environment (Martin & Sunley, 2006; Martin, 2010), as local conditions shape the learning and innovative capacity of the economic agents acting in a particular territory (Morgan, 1997). The learning region and regional innovation system frameworks (Cooke & Morgan, 1994) highlight the importance of regions and the work on regional diversification acknowledges the existence and importance of regional resources (Neffke et al., 2014). The local conditions include “local norms & habits”, “quality of local government and other institutions”, “the mix of socioeconomic conditions or the contextual endowments and factors that may facilitate or hinder economic activity” (Fitjar & Rodríguez-Pose, 2015). These regional resources include regional knowledge and capabilities in national economies such as infrastructure, climate and institutions, “untraded interdependencies” (Storper, 1995) and “localized capabilities” (Maskell & Malmberg, 1999). Boschma and Frenken (2011) argue that degrees of technological relatedness between firms and industries affect knowledge spillovers among regional firms, thus impacts on branching into related fields to build one existing competence, “a firm’s ability to discover and exploit external knowledge – its absorptive capacity – depends crucially on the endowments of the area in which it operates” (Cohen & Levinthal, 1990). The “context and geography create the territorial conditions and social relationships which shape the potential of firms to emerge, network, learn, and thrive (and/or die) in different environments” (Fitjar & Rodríguez-Pose, 2015) and ability of the firms to discover and exploit external knowledge (Cohen & Levinthal, 1990). In a sense, these institutional capabilities, represented by local conditions and local resources, affect the capacity of both firms and regions to grow and

diversify their economies. In a way “the mechanisms through which contextual factors associated with regional overall educational, innovative or institutional endowments affect the performance of individual firms and their capacity to learn, change and organize themselves are still poorly understood (Fitjar & Rodríguez-Pose, 2015). The position of this research is that both firms and institutional capabilities are instrumental in shaping the trajectories of regional economies, “institutions could form the nucleus of industrial clusters that consequently lead to spin-off of firms establishing a cluster” (Gertler, 2010); however, the role of institutions in establishing path dependence conditions and creating new paths of regional economies remains undercut in the literature thus presents an area of interest for future research agendas as institutions play a crucial role in the diversification of regional economies.

In a sense, the relatedness and complexity of pre-existing capability, knowledge, products and industries in a regional economy determine the path creation mechanism and trajectories of regions.

“Degree of relatedness and complexity of institutional capabilities underpin diversification mechanisms”

(Project-2 Proposition-4)

In summary, these initial propositions and the initial conceptual path creation framework generated by the SLR and single qualitative case study, contribute to theory and practice. First, they contribute to evolutionary economic geography, in particular the creation of new paths for growth and diversification. They develop a path creation framework for economic diversification which integrates actors, mechanisms, factors, and outcomes shaping regional economic growth and diversification. Second, they provide government organizations with a different set of strategies to influence policies for economic growth and diversification.

These findings and contributions are, however, examined in this stage of the doctorate research through a research synthesis of existing published literature

on three selected regional development cases. The research strategy and design are discussed next.

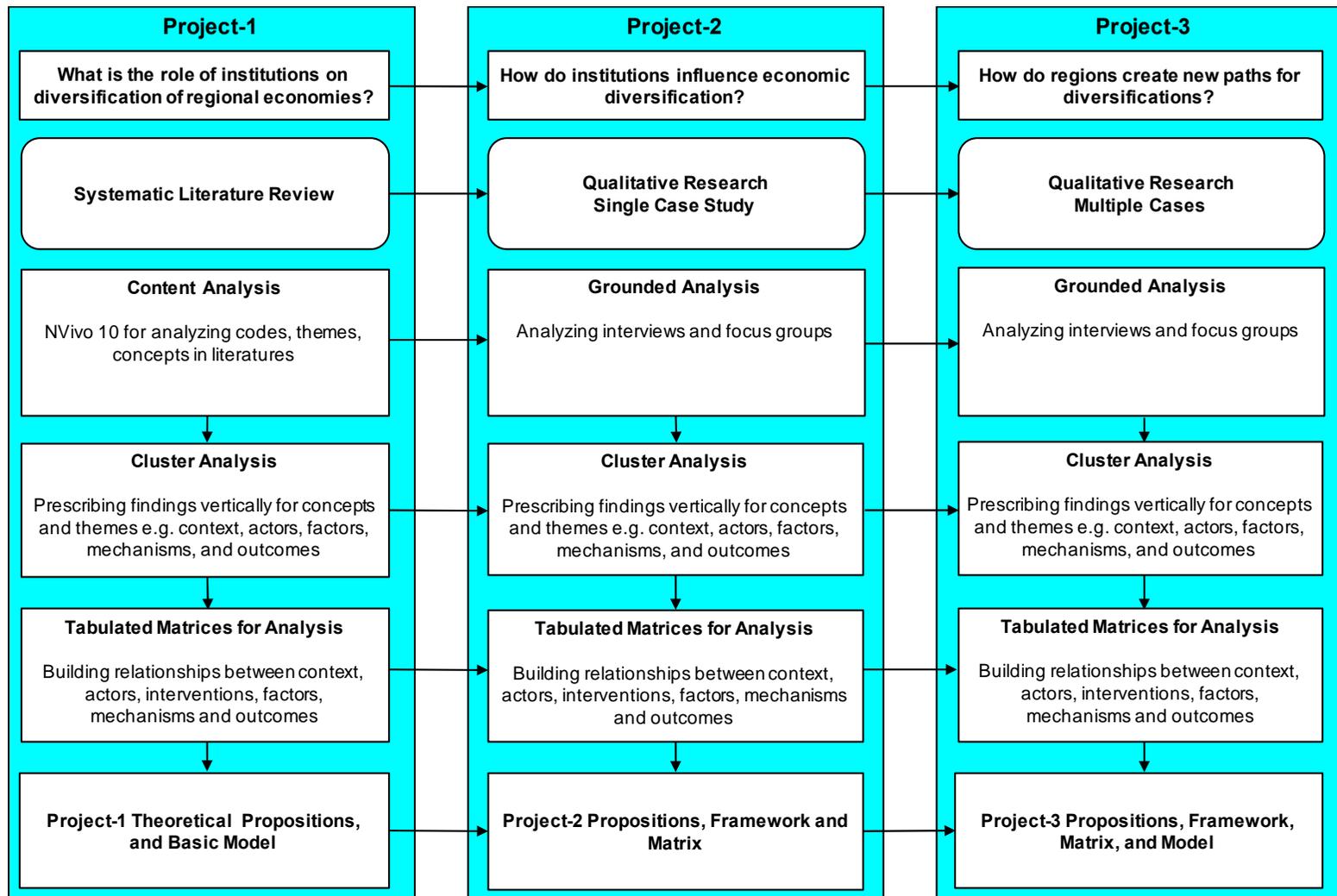


Figure 21: Project-3 Research Strategy and Design

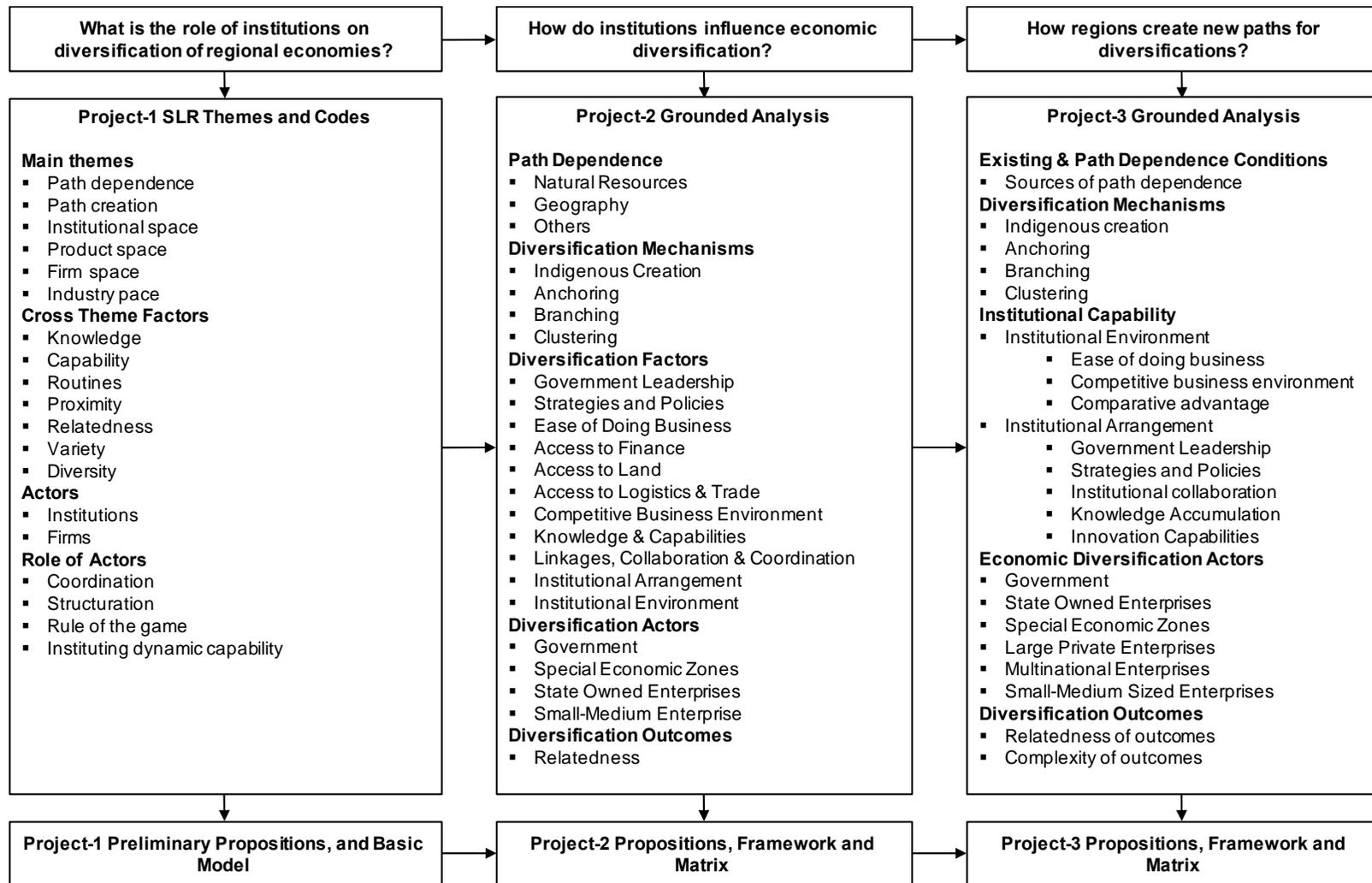


Figure 22: Project-3 Data Structure

4.4 Research Strategy and Design

The structure of the DBA follows a modular structure consisting of three research projects and a linking document. The overall research strategy and design for the DBA is illustrated in Figure 21. The SLR and the qualitative case study of UAE provide the initial theoretical propositions and initial conceptual framework as summarized above. These initial propositions generate the research questions for this study. The scope of this research is limited to qualitative research conducted on secondary data sets of three regional case studies, supported by descriptive statistics as necessary. The synthesis and findings of various regional case studies are discussed in light of existing theoretical foundations and propositions. In this research these propositions are tested, refined, and rejected as well as introduce new propositions to construct the path creation framework for growth and diversification of regional economies.

4.4.1 Methodology

The research on evolutionary economic geography, in particular path dependence and path creation, is predominantly based on quantitative research (Boschma & Frenken 2011; Dawley, 2013). The research question, i.e. on “How regions create new paths for economic diversification” is investigated through a rich, case-based dataset of previously published research on the development of regions. In this research, grounded analysis (Glaser, 1992 in Easterby-Smith et al., 2012; Gioia et al., 2012) once again is applied as in stage 2 but based on a research synthesis (Denyer et al., 2008) of existing published cases. The SLR (Tranfield et al., 2003) conducted for this doctorate research “provides a powerful method, but faces the challenge of synthesizing review results” (Denyer et al., 2008). The empirical work in individual, original research projects, as has been undertaken for the case study on UAE for this doctorate generates a set of propositions “but these often offer only a single perspective” (Denyer et al., 2008). Denyer et al. (2008) propose a systematic research synthesis approach to review existing published research cases. The main objective is to construct a framework that explains the creation of new paths for regional growth and diversification.

The following research questions are generated from the initial propositions and initial conceptual framework resulting from the SLR and the empirical work on the case study of UAE

- How do path dependence and existing conditions impact on diversification?
- Who are the main actors that are driving economic diversification?
- What are the mechanisms of economic diversification pursued in different regions?
- What are the institutional capabilities that support or constrain economic diversification?
- How are context, actors, interventions, factors, mechanisms and outcomes related?
- How do economic actors influence institutional capabilities and diversification mechanisms to create a variety of diversification outcomes?
- What are the strategies to be pursued by policy makers to create varieties of diversification outcomes?

These are explored across different cases. The aim of this empirical research is to construct the relationships between context, actors, mechanisms, factors, actors and outcomes; and conceptualize a path creation framework for economic diversification. The ultimate goal is to guide policy makers on strategies for the creation of new paths for growth and diversification.

4.4.2 Scope and Limitation of the Research

The study of path dependence and path creation for regional development in existing literature is normally bound to a single industry or single industry region. The unit of analysis for this research is regional case studies. The investigation is mainly based on empirical analyses of published research on three selected cases – Singapore, Norway and UAE.

The selection of three cases represents the generic features of creating new paths for diversification regional development or, as George & Bennett (2005) in Jakobsen & Høvig 2014 highlight, “we selected typical cases that represent generic features of restructuring programs from their respective phases of policy development”. A “typical

case exemplifies what is considered to be a typical set of values, given some general understanding of a phenomenon” (Gerring 2007: 91 in Jackobsen, 2014). The information sources of existing published research are regarded as cases. Moreover, “We intend to represent our cases not as statistically defined types but rather as exhibiting characteristics typical of the phenomena under study” (Gerring, 2007 in Jackobsen, 2014).

Selection bias could be a pitfall for the selection of cases. Examples include selection of cases that only support the theory being advanced, rejection of cases that appear to contradict, or only the selection of a typical or extreme case/s, from which erroneous inferences may be made (Jakobsen & Høvig, 2014). These selection biases could be avoided by “a preliminary study of potential cases” (George & Bennett, 2005 in Jackobsen, 2014).

The selection of the three countries of this study is based on commonality around coordinated market economies. In coordinated market economies “endeavours are coordinated strategically” where coordination is constructed through multiple institutions maintaining institutional arrangement to mediate national responses to enhance economic results (Hall and Thelen, 2009). This is in contrast to liberal market economies whereby “firms rely heavily on competitive markets to coordinate their endeavours” (Hall and Thelen, 2009).

The countries coordinated successfully different pathways to diversification, and the descriptive statistics demonstrate varying degrees of diversification outcomes and business environment conditions [Refer to Table 28 to Table 32]. Moreover, Norway and UAE are natural resource based economies where oil and gas industries contributed 26% and 34% to their GDPs in 2013 respectively. While Singapore sets on the other side of the scale with scarcity on natural resources. Furthermore, the main economic players of government, SOEs, LPEs, MNEs, SEZs and SMEs in these three cases influenced the pathways to diversification differently.

The main limitation of this research is that it does not include countries or regions that represent market-coordinated economies. However, the main goal of this research is to inform policy makers of government-coordinated economies on the strategies for

creating new paths for growth and diversification, thus building institutional capabilities of coordinating economic development. However, despite distinct differences between coordinated market economies and liberal market economies, the synthesised knowledge of this research can be utilized for different types of economies on creating new paths for regional development e.g. anchoring new industries in peripheral regions and clustering of industries around large private enterprises.

4.4.3 Method of Data Analysis

In this third stage of the research, grounded analysis is once again being applied but on the research synthesis of multiple case studies (Figure 21). The grounded analysis offers a more open and flexible approach where theory merges from data (Glaser, 1992 in Easterby-Smith et al., 2012). However as suggested by Strauss and Corbin (1990, 1998) some prescription and elaboration on sampling of the data may be essential to systematically make sense of data. Consequently, the method of data analysis is in three steps. First, the initial propositions, framework and matrix of stage 2 generate the research questions for this research synthesis of stage 3 and define existing conditions, path dependence conditions, actors, factors, mechanisms, and outcomes as the main constructs of the path creation framework. These represent themes, and codes for the data structure of grounded analysis (Figure 22). Second, the sources of the grounded data analysis are existing published cases which are subjected to systematic cluster analyses (Miles & Huberman, 1994; Easterby-Smith et al., 2012) to refine initial propositions and suggest new ones that are declared in findings for each regional case and are integrated in the discussions. The findings are presented in vertically clustered tabulated documents for each theme, along with associated codes and supporting statements. Fourth, a matrix data analysis (Miles & Huberman, 1994) around elements of path creation framework is pursued in the discussion, where context, actors, factors, mechanisms, outcomes are all integrated into a matrix that establishes the relationship, hence constructing a path creation framework. The logic is, in the 'context' of a region, that economic actors undertake measures to influence underlying 'factors' to trigger the 'mechanism(s)' generating a set of diversification 'outcomes'.

In summary, the overall process to develop the propositions and construct the framework is iterative and shaped into four stages in order to make the contribution to

research more explicit (Easterby-Smith et al., 2012). First, the SLR provides the preliminary theoretical propositions and construct of the framework. Thus, using elements that are already established at the outset in the literature while at the same time being flexible in order to adapt, based on data collection through multiple methods and within case and across case analysis. Second, the single case study shapes the initial propositions and construct of the framework. Third, the comparative case design verifies the emergent relationships from each case. Fourth, the emergent propositions are compared with existing literature.

4.4.4 Search Strategy

The search strategy comprises identification of main themes, key works, search strings and subsequently articles across research theoretical dimensions of evolutionary economic geography, institutional economic geography, path dependence, path creation, diversification actors, diversification mechanisms, diversification outcomes. The databases selected are ABI/ProQuest, EBSCO, and Web of Science. Additional sources used mainly included International Monetary Fund, World Bank, OECD (Organization for Economic Co-operation and Development) cases from Harvard Business School. The search process included the following:

First, identified keywords and defined search strings that covers diversification to economy or regional development [refer to Table_Apx 1].

Second, searched for articles in the three data bases (ABI/ProQuest, EBSCO, and Web of Science). The search generated unduplicated articles amounting to 2091 for Singapore, 2639 for Norway and 792 for UAE. The total unduplicated articles for the three cases are 4919 [Refer to Table_Apx 2].

Third, the review of titles and abstracts generated only 38 articles relevant articles based on the selection criteria) and quality criteria similar to SLR quality criteria).

Fourth, due to the limited number of articles, others sources are utilized i.e. International Monetary Fund, World Bank, OECD, and cases from Harvard Business Schools. Total articles cross referenced and generated from other sources is 86 articles.

Finally, the process data extraction content analysis and synthesis findings are based on tabulated matrixes that captures main findings as discussed above in the method of data analysis.

Table 28: P3 Comparative Information on Selected Regional Cases

	Singapore	Norway	UAE
Population (Millions) – UN	5.4	5.0	9.3
Dependency Ratio – Young Age (0-14)	20.8	28.6	19.4
Life expectancy at birth	82.5	81.5	76.8
GDP (2013) – Constant Prices 2005 in US\$ Billion – UNSNA	195.021	337.855	234.969
Government Effectiveness (2014) – World Bank	100.0	96.6	90.4
Regulatory Quality (2014) – World Bank	100.0	92.2	80.3
Rule of Law (2014) – World Bank	95.2	99.0	76.4
Control of Corruption (2014) World Bank	97.1	99.0	84.1
Ease of Doing Business – (2014) – World Bank	1	9	31
Human Development Index Ranking (2013) – UNDP	9	1	40
Mean Years of Schooling	10.2	12.6	9.1
Global Competitiveness Index (2015) – WEF	2	11	17
Global Innovation Index (2015) – INSEAD	7	20	47
Economic Complexity Index (2014) – CDI	11	33	66

Table 29: P3 Summary of Research Findings

	SINGAPORE	NORWAY	UAE
Context of Path Dependence Conditions	<ul style="list-style-type: none"> ▪ No natural resources ▪ Geographical endowments 	<ul style="list-style-type: none"> ▪ Fish, oil and gas resources 	<ul style="list-style-type: none"> ▪ Oil and gas resources ▪ Geographical endowments
Government Role	<ul style="list-style-type: none"> ▪ coordinated market economy 	<ul style="list-style-type: none"> ▪ coordinated market economy 	<ul style="list-style-type: none"> ▪ coordinated market economy
Main Economic Actors	<ul style="list-style-type: none"> ▪ SOEs ▪ MNEs ▪ SEZs 	<ul style="list-style-type: none"> ▪ SOEs ▪ LPEs ▪ SMEs 	<ul style="list-style-type: none"> ▪ SOEs ▪ SEZs
Diversification Mechanisms	<ul style="list-style-type: none"> ▪ Anchoring ▪ Branching ▪ Clustering 	<ul style="list-style-type: none"> ▪ Indigenous creation ▪ Anchoring ▪ Branching 	<ul style="list-style-type: none"> ▪ Anchoring ▪ Clustering
Institutional Capabilities	<ul style="list-style-type: none"> ▪ High institutional arrangement ▪ High institutional environment ▪ Complex institutional collaboration capabilities ▪ High human development 	<ul style="list-style-type: none"> ▪ Basic institutional arrangement ▪ High institutional environment ▪ Mid-range institutional collaborations ▪ High human development 	<ul style="list-style-type: none"> ▪ High institutional arrangement ▪ High institutional environment ▪ Simple institutional collaboration ▪ Medium human development
Interventions	<ul style="list-style-type: none"> ▪ Science and technology programmes ▪ State funding and 	<ul style="list-style-type: none"> ▪ Restructuring programmes ▪ National and regional innovation systems 	<ul style="list-style-type: none"> ▪ National and regional policies and strategies ▪ Regional development

	government equity financing	<ul style="list-style-type: none"> ▪ National and regional development agencies 	agencies
Relatedness of Diversification Outcomes	<ul style="list-style-type: none"> ▪ Unrelated varieties by MNEs ▪ Related varieties by SMEs 	<ul style="list-style-type: none"> ▪ Related and unrelated varieties by LPEs ▪ Related varieties by SMEs 	<ul style="list-style-type: none"> ▪ Related and unrelated varieties by SOEs ▪ Related varieties by SEZs
Complexity of Diversification Outcomes	<ul style="list-style-type: none"> ▪ High complexity ▪ ECI is 1.400016 in 2014 and ranked 11 ▪ Complex varieties of unrelated products and industries by MNEs 	<ul style="list-style-type: none"> ▪ Mid-range complexity ▪ ECI is 0.6629404 in 2014 and ranked 33 ▪ Simple and complex related varieties (fish & oil) by LPEs and SMEs ▪ Few complex unrelated varieties by LPEs serving fish and oil 	<ul style="list-style-type: none"> ▪ Low complexity ▪ ECI is -0.3321523 in 2014 and ranked 66 ▪ Simple complexity related and unrelated varieties by SOEs e.g. polymers and basic metals ▪ Simple unrelated SEZs ▪ Few complex unrelated varieties by SOEs
Summary of Findings	In the context of scarce path dependence resources Singapore pursued concurrent anchoring and clustering by MNEs while SOEs provided infrastructure and funding, and support from a highly business-competitive environment and highly complex institutional collaboration capabilities, consequently creating complex unrelated varieties of products and	In the context of high path dependence conditions (fishing and oil), Norway mainly adopted branching through LPEs supported by restructuring programmes resting on national and regional innovation systems that created medium range complexity of related varieties and unrelated varieties serving path dependence resources industries.	In the context of high path dependence conditions on oil and gas, UAE mainly anchoring through SOEs; while business competitiveness is high the collaboration amongst economic players is weak and national or regional innovation policies are not established, consequently creating related and unrelated varieties but of less complexity compared to Singapore and

	industries		Norway
<p>Summary of Contributions</p> <p>SOEs are associated with low institutional capabilities and are generating low complexity of related and unrelated products as in the case of UAE.</p> <p>LPEs are associated with high regional institutional capabilities that are mainly associated with low and high complexities of related varieties of products and industries as in the case of Norway.</p> <p>MNEs are associated with complex institutional capabilities and complex varieties of unrelated varieties as in the case of Singapore.</p> <p>SMEs are mainly associated with related varieties of products and industries whereby institutional collaboration is crucial for their growth.</p>			

4.5 Findings

In this section, the main findings of the selected case studies of Singapore, Norway and UAE are presented.

4.5.1 Data Analysis

The grounded analysis and synthesis involves the information sources of existing published research on Singapore, Norway and UAE. These information sources are regarded as cases and are subjected to systematic cluster analysis (Miles & Huberman, 1994; Easterby-Smith et al., 2012) around elements of previously identified (project-2) and emerging concepts, and codes, i.e. path dependence context, actors, factors, diversification mechanisms and diversification outcomes (Figure 23). The initial propositions (project-2) are separately examined for each case to test, revise, refine or introduce new propositions based on the information sources. The objective is “to modify incrementally the nascent theory in view of factors derived from new sources of information and examples of the phenomenon” (Denyer et al., 2008). Moreover, “we intend to represent our cases not as statistically defined types but rather as exhibiting characteristics typical of the phenomena under study” (Gerring, 2007 in Jackobsen and Hoviq, 2014). The findings are tabulated documents for information sources structured around the path creation elements. These findings are presented in vertically clustered tables for selected regions around the path creation elements.

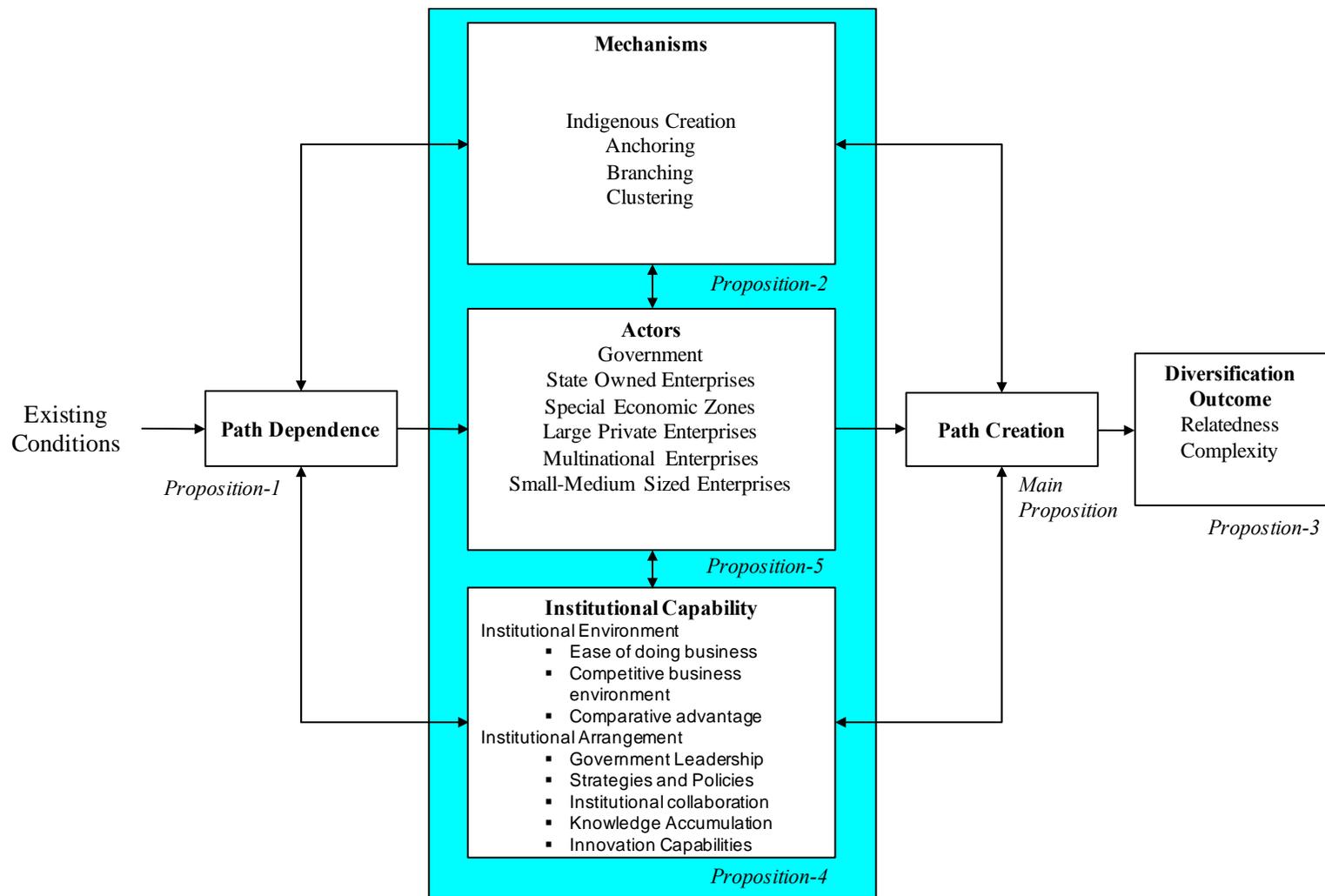


Figure 23: Project-3 Data Constructs of Path Creation Framework

4.5.2 Path Creation

Regions pursued different pathways to grow and diversify their economies. This research sheds light on the complexity of path creation (Boschma et al., 2012; Neffke et al., 2011a; Sydow et al., 2010) and explores the interrelationships between context, actors, interventions, mechanisms and factors that shape diversification outcomes.

Singapore, Norway, UAE are economies coordinated by the government and are led by large Multinational Enterprises (MNEs), Large Private Enterprises (LPEs) and State-Owned Enterprises (SOEs) respectively. They anchored, branched and clustered related and unrelated industries with varying degrees of complexities. The interventions and institutional capabilities are significantly different in each case, which may explain the varying degrees of diversification outcomes.

In the case of Singapore, with its absence of path dependence on natural resources, the prevailing path creation mechanism is anchoring simple and complex unrelated industries through MNEs. Singapore has been able to transform its economy from producing basic garments and textiles in the 1960s towards hydrocarbons, integrated electronic circuits, data processing machines, chemicals, polymers, and biotech. Singapore positioned its economic complexity at 11 globally in 2014. The success of economic diversification is attributed to the high degree of institutional capabilities to coordinate and collaborate amongst SOEs, SEZs, and MNEs, implementation of national science and technology policy programmes (Koh, 2006), state funding to local and foreign firms, and lately on government equity financing (Parayil, 2005; Porter et al., 2013; Wonglimpiyarat, 2013) to stimulate growth of SMEs.

In Norway, path dependence on natural resources, e.g. fish and oil, remains high. The industries around indigenous resources are led by SMEs while the anchoring, branching and clustering of new industries that are related and unrelated to path dependence conditions are pursued through SOEs and LPEs

as well as SMEs. The complexity of related and unrelated generated industries is comparatively simpler than advanced economies. The economic structure of Norway is composed of crude oil, gas, hydrocarbons, polymers, fish, aluminium, transport vessels, and machines. The economic complexity of Norway is ranked 33 globally in 2014. The underlying factors to create new paths for growth and diversification are associated with the high degree of institutional capabilities to implement national and regional innovation systems, and pursue restructuring programmes (RPs) through regional development agencies.

In UAE, path dependence on oil and gas continues to be the backbone of the economy. The economy is dominated by SOEs that anchor simple complexity of varieties that are related and unrelated to natural resource-based industries. SEZs provide the infrastructure for SMEs to cluster new related and unrelated industries. The economic complexity of UAE is ranked 66 globally in 2014. The institutional capabilities to formulate policies and strategies are high and the country has been able to position itself as the easiest nation with which to do business in the region. However, the institutional capabilities to collaborate and innovate among SOEs, SMEs and SEZs are weak, which may explain the limited complexity of related and unrelated varieties that are branched and clustered around anchor firms.

The summary findings above are illustrated Table 29; these are discussed in the following sections.

4.5.3 Diversification Outcomes

The diversification outcomes addressed in this research are relatedness and complexity. The results show that the relatedness and complexity of diversification outcomes differ significantly amongst the three cases (Table 30 to Table 32). These range from simple complexity of related and unrelated varieties in UAE, medium range complexity of related and unrelated varieties in Norway, to the high complexity unrelated varieties in Singapore.

Singapore has been able to transform its economy from producing basic garments and textiles in the 1960s towards electronics (36%), hydrocarbons

(23%), chemicals (15%) that includes biomed products, polymers (5%), and biotech in 2014². Singapore increased its economic complexity index from 1.137327 in 1995 to 1.270295 in 2001 and to 1.400016 in 2014, positioning its economy with a ranking of 11 globally in 2014. It is noted that the high concentration of electronics mandated the government to pursue development of a biotech cluster to diversify the economy further. In a sense, Singapore economy is highly diversified with high complex varieties of unrelated products and industries.

In Norway, natural resources contributed 26% to GDP in 2013. The economic structure is composed of crude oil and gas (60%), chemicals hydrocarbons and allied industries (6%), polymers and plastics (1%), fish (10%), machines (8%), metals (8%), transport vessels and parts for vehicles (3%), and wood related pulp and paper (2%). The main feature is the creation of related industries around polymers and plastics and the unrelated industry of basic metals, i.e. aluminium, that are dependent on cheap energy resources, and also around the machine and vessel industries – though technically not related they are serving the fish and oil industries. The economic complexity index of Norway increased from 0.8695151 in 1995 to 0.6629404 in 2001 and to 0.6629404 in 2014; it is ranked 33 globally in 2014. In a sense, Norway's economy is less diversified than Singapore's, with a medium range complexity of related and unrelated varieties of products and industries.

In UAE, natural resources contributed 34% to the GDP in 2013. The economic structure of UAE is highly concentrated on the limited number of products that are related to natural resources. Main export products include crude oil (68%), precious metals such gold and diamonds (14%), basic metals such as aluminium and copper (5%), chemicals, hydrocarbons and allied industries (2%) and polymers and plastics (2%). UAE, as with Norway, created a new, related industry of polymers and unrelated industry of basic metals benefiting from

² Sources for statistical data are UN Comrade <http://wits.worldbank.org/Default.aspx?lang=en> (Appendix-G) and Atlas of Economic Complexity <http://atlas.cid.harvard.edu>

cheap feedstock and energy resources. The economic complexity index of UAE increased from -0.2956725 in 1995 to -0.3321523 in 2014, it is positioned 66 globally in 2014. In a sense, the UAE economy is less diversified than Singapore and Norway, with low complex varieties of related and unrelated products and industries.

In summary, the outcome of economic diversification differs significantly among the three countries. The economic diversification, degree of unrelatedness to natural resources, and economic complexity of Singapore is higher than Norway and UAE. While Norway and UAE are highly concentrated on their natural resources, they have been able to create new products and industries that are mainly related to crude oil, such as polymers, and unrelated but dependent on indigenous industries, such as aluminium and copper. The main reason is Norway and UAE capitalize on the comparative advantages offered by cheap energy resources. The higher economic complexity of Norway compared to UAE is due to the creation of new unrelated industries of machines, vessels, and electronics that serve the fish and oil industries. It is observed that Singapore is producing more complex varieties of products, i.e. polymers, plastics, and chemicals compared to Norway and UAE (although both countries have comparative advantage due to availability of feedstock to these industries). In a sense, low complexity is associated with high path dependence, hence high relatedness, and high complexity is associated with low path dependence, hence low relatedness. The mechanisms, factors and actors attributable to the creation of these paths are discussed in the following sections.

Table 30: P3 GDP by Economic Sectors

Constant (2005) Prices, 2001-2013 (US\$ Million)

Economic Sectors	Singapore			Norway			UAE		
	Growth of Economic Sectors-GDP CAGR (2001-2013)	Share of Economic Activity (%GDP) 2013	Value of Economic Activity (US\$ Million)	Growth of Economic Sectors-GDP CAGR (2001-2013)	Share of Economic Activity (%GDP) 2013	Value of Economic Activity (US\$ Million) 2013	Growth of Economic Sectors-GDP CAGR (2001-2013)	Share of Economic Activity (%GDP) 2013	Value of Economic Activity (US\$ Million) 2013
Agriculture, hunting, forestry, fishing (ISIC A-B)	1.23	0.04	72.70	4.06	1.77	5,990	3.53	0.71	1,679
Mining, Manufacturing, Utilities (ISIC C-E)	5.96	26.89	52,450	-1.13	26.01	87,868	2.41	43.26	101,648
Manufacturing (ISIC D)	6.10	25.56	4,985	1.58	8.22	27,782	3.30	10.08	23,676
Construction (ISIC F)	3.59	4.09	7,968	2.90	4.93	16,642	6.71	10.63	24,977
Wholesale, retail trade, restaurants and hotels (ISIC G-H)	6.24	17.68	34,485	2.82	9.44	31,877	4.24	13.33	31,319
Transport, storage and communication (ISIC I)	4.27	12.09	23,569	2.08	9.51	32,122	8.03	10.57	24,837
Other Activities (ISIC J-P)	5.62	35.42	6,909	2.23	36.71	124,026	6.76	28.34	66,581

Source: UN Systems of National Accounts - <http://unstats.un.org/unsd/nationalaccount/data.asp>

Table 31: P3 Diversification Data

Countries	GDP Concentration		GDP Diversification		Export Concentration		Export Diversification		IMF Export Diversification	IMF Export Extensive Margin	IMF Export Intensive Margin
	2001	2013	2001	2013	2001	2013	2001	2013	2010	2010	2010
Singapore	14%	14%	7.40	7.00	22.08%	15.31%	4.53	6.53	2.71	0.10	2.62
Norway	19%	14%	5.37	6.99	39.19%	46.3%	2.55	2.16	3.46	0.17	3.29
UAE	21%	17%	4.85	5.79		47.31%		2.11	3.57	0.01	3.56

Source: GDP and Export Concentration and Diversification are own calculations based on UN System National Accounts ISIC Rev 3. <http://unstats.un.org/unsd/nationalaccount/data.asp> while IMF's Export Diversification, Extensive and Intensive Margins are as reported by IMF's The Diversification Toolkit: Export Diversification and Quality Databases (Spring 2014) <https://www.imf.org/external/np/res/dfidimf/diversification.htm>

Table 32: P3 Cases of Diversification Outcomes

	Singapore	Norway	UAE
Context of Path Dependence	<ul style="list-style-type: none"> No path dependence on natural resources 	<ul style="list-style-type: none"> High path dependence on fish and crude oil industries 	<ul style="list-style-type: none"> High path dependence on crude oil and natural gas
Complexity of Diversification Outcomes	<ul style="list-style-type: none"> High complexity ECI is 1.400016 in 2014 and ranked 11 	<ul style="list-style-type: none"> Mid-range complexity ECI is 0.6629404 in 2014 and ranked 33 	<ul style="list-style-type: none"> Low complexity ECI is -0.3321523 in 2014 and ranked 66
Relatedness of Diversification	<ul style="list-style-type: none"> High complexity varieties of unrelated products and industries by MNEs: petrochemicals, electronics, biotech Low complexity varieties of unrelated products by MNEs: hydrocarbons 	<ul style="list-style-type: none"> High complexity related varieties by LPEs: polymers and plastics High complexity unrelated varieties: machinery (offshore and marine technologies), technology industry (navigation, communication and automation), wafers and solar energy systems Low complexity related varieties by LPEs and SMEs: wood processing, pulp & paper, fertilizers Low complexity unrelated varieties by LPEs: Basic metals (aluminium and silicon) 	<ul style="list-style-type: none"> Mid complexity unrelated varieties by SOEs: composite aero-structures components, construction of vessels for shipbuilding Mid complexity related varieties by SOEs: polymers Low complexity related varieties by SOEs: fertilizers Low complexity unrelated varieties by SOEs: basic metals

4.5.4 Context and Path Dependence Conditions

In this section the initial proposition that “path dependence impacts on diversification” is examined. Government leadership, administration and policy-making, geography, natural resources are some of the factors underpinning conditions that enable or constrain growth and diversification. The contexts for path dependence conditions for Singapore, Norway and UAE are discussed below.

In Singapore, natural resources are scarce; however, it is endowed with a geographical location that positions the country in close proximity to main Asian economies. Upon independence in 1965, Singapore faced the challenge of social and economic development under a scarcity of natural resources, a population of two million people, a Gross National Product (GNP) of US\$320 per capita, and a poor infrastructure (<https://www.edb.gov.sg/content/edb/en.html>). The leadership of Lee Kuan Yew, the Housing Development Board (HDB), and the Economic Development Board (EDB) are the prominent figures that recognized these challenges and triggered the transformation of the social and economic development. They focused on public housing, exploited the country’s geographic position as a logistical hub and evolved the economy into technological frontiers.

The government started development efforts prior to independence; it commenced the development of an efficient system of government control over the economy and welfare of its citizens. In 1960, the government formed the HDB to build subsidized public housing quickly. By 1965, over 54,000 flats had been completed. The HDB became the primary avenue for achieving home ownership in Singapore. In 2013, 82% of Singaporeans lived in HDB housing (Vietor & White, 2015). Singapore does not have natural resources of its own to develop and create a comparative advantage in its economy. It is, however, in close proximity of key Asian commercial centres, including Beijing, Tokyo, Seoul, Taipei, Hong Kong, Sydney and New Delhi. The strong drive of the government to increase the competitiveness of its economy has made Singapore one of the most competitive Asian countries. The World Bank

ranked Singapore as the world's easiest place to do business in 2009 and 2012. It has become one of the world's top transportation hubs, with efficient transshipment of sea cargo, and Changi International Airport provides 5,400 flights per week to 200 cities in 60 countries.

In 1961, the EDB was formed to take on the challenge of economic development, in particular attracting foreign direct investments. Its first task was aiding the establishment of the Jurong Industrial Estate, jump-starting the paths for industrial development. The new industries were garments, textiles, toys, wood products and wigs. Since then the EBD has continued to guide the economic development of Singapore, and “took over the crucial role of preparing the groundwork for industrialization of the city-state” (Parayil, 2005). The Singaporean government “maintained a strong involvement in economic policy, developing forward-looking strategies for long-term growth” (Vietor & White, 2015). The case of Singapore demonstrates that states are important actors in enhancing innovation, technological learning, national competitiveness, and national comparative advantage (Parayil, 2005) to create new paths for diversification that are unrelated to the existing economic structure.

In Norway, path dependency on natural resources, institutional capabilities through RPs, and innovation systems and policies are key elements to understand its economic development trajectories. Norway’s path dependence on its natural resources of fish and oil remains a characteristic of its economic structure. However, “the resources sector expanded and diversified by developing new technologies that draw on and contribute to learning and knowledge broadly across the economy” (Ville & Wicken, 2012). “Norway’s resource based sectors ... have for decades been highly innovative, drawing on domestic sources of innovation, technology transfer from foreign sources ... and Norway’s universities and research institutes (Fagerberg et al., 2009; Ville & Wicken, 2012).

Norway has been able to exploit its natural resources and create new related industries in oil and gas manufacturing. The government RPs were led by

dedicated agencies, such as SIVA and InPro that supported the oil-manufacturing cluster in 'Verdal Industrial Park'. The RP mainly focused on vocational training, upgraded the local knowledge base and enabled local firms to diversify and spin off. The "Norwegian technological style" based on the Condeep (concrete deep water) platform in offshore oil production introduced in 1973 is another example of creating related industries within the cluster. Through the enforcement of the "Norwegian technological style"; local suppliers, engineering and construction companies become subcontractors for oil and gas projects hence upgrading their knowledge and capabilities. Moreover, the electronics and ICT industry become integrated into the oil and gas sector, providing industrial control and automation, communication, and navigation products. In the late 1970s, the oil and gas sector become linked to the national industrial policy and strategy. This led to the establishment of four large national oil R&D organizations; Sintef (Trondheim), Christian Michelsens Institute (Bergen), Rogaland Research (Stavanger) and Institute for Energy Technology (Oslo). This was the beginning of the rapid growth of oil related R&D and during the late 1990s oil and gas companies funded 12% of total R&D in Norway. It aimed to build capabilities comparable to international energy firms.

The technological transformation in the sector was concentrated in a relatively small number of actors. Norway "has a tradition of small-scale cooperative enterprise in many of these sectors, overseen by a positive role for the state, which is now giving way to large-scale, corporate enterprise within a highly competitive framework ... have traditionally drawn on domestically generated new technology in their traditional clusters (Ville & Wicken, 2012). The national oil companies, Statoil and Hydro, achieved total control of the Norwegian shelf, and in 2007 the two companies merged. A similar development took place in the supply sector where the amalgamation of Aker and Kvaerner in 2001 resulted in only one local firm able to handle large petroleum contracts.

The case of Norway demonstrates that path dependency on indigenous industries can provide a foundation to branch and cluster related industries that

are mainly associated with low complexity products and simple institutional capabilities. It also informs us on “how not only new products created more diversity in old sectors and industries but also how new resources became the basis for the establishment of new industries of importance for future growth and export specialization” (Ville & Wicken, 2012) or in other words, how to create new varieties of products and industries that are related to the existing economic structure with varying degrees of complexity.

In UAE, path dependency rests around the oil and gas sector economy where access to cheap energy feedstock provides a comparative advantage for energy dependent industries thus it determined the nature of industries that have emerged and evolved over time such as Aluminium, Steel, and Polymers, which are highly energy dependent. The geographical location plays an important role in UAE economy. Dubai has grown to become a global trade and logistics hub. Moreover, other products and industries that are related and unrelated to sources of path dependence have emerged over time in UAE.

The earlier years leading to the 1970s were mainly characterized by fishery and pearl trading then towards the end of 1970s Abu Dhabi witnessed the era of crude oil followed by the natural gas industry. Although 1958 marked the first discovery of oil in the emirate, Abu Dhabi started exporting oil in 1962 and has been growing, dominating its economy since then. During the 1980s, oil and gas income was the sole economic driver and due to the volatility of oil prices the economy was subjected to large swings and growth was not stable. Nevertheless, local governments used oil and gas revenues to embark on modernization and social development programmes aimed towards building infrastructure, education and health sectors, which have resulted in raising the standard of living. One noticeable achievement has been the Jebel Ali Free Zone (Jafza) that has “evolved into a dynamic trade catalyst ecosystem that enables business and creates new opportunities for growth. From a modest start in 1985 with just 19 companies, Jafza today flourishes as a business community with over 7,100 companies including 100 of the Fortune 500s.” The 1990s witnessed a steady economic growth fuelled by the energy sector, which

formed the major part of GDP from the 1970s to the 1990s. However, it was evident that the emirate was lacking a vibrant, diverse and sustainable economy with the lack of a strong economic sector, besides oil. In the 2000s, UAE experienced rapid economic growth, witnessed the emergence of new products and industries, and for the first time, other sectors of the economy were growing at a rate higher than the oil and gas sector, pronouncing a shift in the economic structure positioning of UAE to the verge of economic diversification paths. These new paths for growth and diversification, such as polymer, aluminium and steel are mainly anchored by SOEs and are highly dependent on the comparative advantage provided by the cheap energy sources. In contrast to Norway, UAE has not been able to create a related and innovative sector around its oil and gas industry and anchored industries, e.g. polymers. This is probably mainly due to the absence of institutional capabilities to collaborate on research, development and funds, and innovate among economic actors. This is, however, discussed in other sections of this research report.

The research findings from one aspect support the theoretical and empirical proposition that path dependence is a fundamental phenomenon; however, it further demonstrates that path dependence both reinforces existing economic productive structures and influences the emergence of new products and industries that are related to the sources of path dependence, such as oil and gas. On the other hand, while the concept of path dependence is plausible, it explains the creation of related products and industries; gaps remain unanswered in the literature, i.e. new paths for growth and diversification are created under path dependence conditions. The plausibility of path dependence is therefore undermined by its condition which is that path dependence economies are fixed and inflexible, hence endogenous change is muted; thus for change to occur exogenous forces are the only hope for economics to escape the lock-in state (Martin & Sunley, 2006: 406) of products and technologies. Moreover, the relationship between type and degree of path dependence, and relatedness and complexity of diversification outcomes, role of economic actors, impact of factors, path creation mechanisms for

establishing path dependence as well as for creating new paths, are not addressed in the theory of path dependence.

This research project, therefore, takes a different theoretical position. It is found that path dependence is an underlying condition both for reinforcing existing path conditions as well as creating low complexity related varieties for growth and diversifications. Low complexity is associated with high path dependence, hence high relatedness and high complexity is associated with low path dependence, hence low relatedness. Moreover, low path dependence is associated with unrelated varieties. The complexity of diversification outcomes is influenced by path dependence conditions but is determined by the diversification mechanisms and institutional capabilities that are discussed in other sections.

In a sense, path dependence underpins diversification mechanisms and impact relatedness and complexity of diversification outcomes. This may explain some of the trajectories of path creation and diversification. However, outcomes of path creation result from the continuous interplay between actors, factors, and mechanisms, whereby path dependence is reduced to being one of the underlying factors. The following section addresses the mechanisms for creating related and unrelated varieties with varying degrees of complexity.

Table 33: P3 Cases of Path Creation Mechanisms

	Singapore	Norway	UAE
Indigenous Industries	<ul style="list-style-type: none"> Trade & Logistics 	<ul style="list-style-type: none"> Forestry Fishing Crude oil and natural gas 	<ul style="list-style-type: none"> Crude oil and natural gas Others exist but not significant
Anchoring	<ul style="list-style-type: none"> Low complexity varieties of unrelated products by MNEs: hydrocarbons High complexity varieties of unrelated products and industries by MNEs: petrochemicals, data storage, semi-conductors, biomedical sciences 	<ul style="list-style-type: none"> High complexity related varieties by LPEs: polymers and plastics High complexity unrelated varieties by LPEs and SMEs Low complexity unrelated varieties by LPEs: Basic metals (aluminium and silicon) 	<ul style="list-style-type: none"> Mid complexity unrelated varieties by SOEs: composite aero-structure components, construction of vessels for shipbuilding Mid complexity related varieties by SOEs: polymers Low complexity related varieties by SOEs: fertilizers Low complexity unrelated varieties by SOEs: basic metals
Branching	<ul style="list-style-type: none"> Not addressed 	<ul style="list-style-type: none"> High complexity unrelated varieties by LPEs and SMEs: machinery (offshore and marine technologies) technology industry (navigation, communications & automation), wafers and solar energy systems Low complexity related varieties by LPEs and SMEs: wood processing, pulp and paper, fertilizers 	<ul style="list-style-type: none"> N/A

Clustering	<ul style="list-style-type: none"> ▪ Low complexity varieties of unrelated products by MNEs: hydrocarbons ▪ High complexity varieties of unrelated products and industries by MNEs: petrochemicals, data storage, semi-conductors, biomedical sciences ▪ Singapore pursued concurrent anchoring and clustering mechanisms 	<ul style="list-style-type: none"> ▪ N/A 	<ul style="list-style-type: none"> ▪ Low complexity construction sector
Institutional Capabilities	<ul style="list-style-type: none"> ▪ Economic Development Board (EDB) ▪ Jurong Township Corporation (JTC) ▪ Singapore Science Park (SSP) (petrochemicals) ▪ International Business Park (information technology) ▪ Changi Business Park (software) ▪ Economic Expansion Incentives Act (EEIA) 	<ul style="list-style-type: none"> ▪ Innovation Norway ▪ Regional development agencies 	<ul style="list-style-type: none"> ▪ Regional development organizations ▪ Special Economic Zones (SEZs)
<p>Other Findings</p> <ul style="list-style-type: none"> ▪ Singapore pursued concurrent anchoring by MNEs and clustering (infrastructure by SOEs and SEZs) diversification mechanisms to create complex varieties of unrelated industries, these are supported by high institutional collaboration capabilities ▪ UAE pursued anchoring diversification mechanisms through SOEs and clustering through SEZs; these are not supported by institutional collaboration capabilities 			

- Norway pursued anchoring and branching mechanisms creating complex varieties of related and unrelated industries that serve the natural resource industries of fish and crude oil by LPEs and SMEs. These are supported by national and regional innovation systems and programmes

4.5.5 Path Creation Mechanisms

In this section the mechanisms pursued by Singapore, Norway and UAE to create new paths for diversification are explored.

In Singapore, the predominant mechanism to create new paths for growth and diversification is concurrently anchoring and clustering industries through MNEs while infrastructures, funding, R&D are provided and collaborated by SOEs. Since its independence in 1965 it has focused on attracting MNEs to invest in manufacturing for exporting products, e.g. chemicals and electronics through the EDB. One of the main objectives for EDB as a quasi-government agency was to attract MNEs to invest in targeted manufacturing industries and increases its export basket. The EDB was “the vehicle for funnelling incentives to foreign multinationals, and it closely monitored the world market to identify and attract industries considered attractive for long term development” (Shih et al., 2012).

The main purpose of the EDB is to act as “the spearhead for industrialization by direct participation in industry” (Vietor & White, 2015). Lee Kuan Yew held a vision of creating a “First World Oasis in a Third World Region” by establishing first-rate infrastructure in health care, education, housing, and transportation (Vietor & White, 2015). On Singapore’s ambitious economic goals, Lee Kuan Yew reflected, “I concluded an island city-state in Southeast Asia could not be ordinary if it was to survive”. The economic development started with import substitutions with Malaysia then moved to export-oriented manufacturing. Initially, the EDB targeted four industries: ship repair and containers, metal engineering, chemicals, and electrical equipment. The electronics industry grew successfully but made the economy highly concentrated in electronics and thus became vulnerable to global business cycles (Koh, 2006).

The government undertook a proactive role to create the Jurong Township Corporation (JTC) to provide the infrastructure for MNEs to operate in Singapore. In 1970s, the JTC developed facilities for oil refineries and then supported the creation of the petrochemical industry in the 1980s and continued

its development creating a chemical and petrochemical complex over seven offshore islands by the late 1990s. During the 1980s, it supported the establishment of the Singapore Science Park (SPP). The SPP is a hub for research and development organizations and companies. The development of Singapore's technological infrastructure and innovation capabilities can be attributed to the development of the SSP. It is located near the National University of Singapore (NUS) to link academic research and industries. The development of the SSP was part of the set of coordinated government policies on science and technology policy and promotion of entrepreneurship. As an example, in the case of promotion of entrepreneurship, start-up grants, venture capital and a variety of government assistances have been provided. The motivations of the SSP was to provide and upgrade local infrastructure to house MNEs (Koh, 2006) and to signal to foreign firms and investors Singapore's readiness to promote and attract high-tech and knowledge-intensive industries (Koh & Koh, 2002). In the 1990s, as the country started to move away from labour-intensive industries, JTC supported the information technology (IT) industry, and developed the International Business Park, and Changi Business Park. As the competition for global foreign direct investments increased and MNEs became reluctant to locate their innovation centres in Singapore, Singapore introduced the Economic Expansion Incentives Act (EEIA) to encourage "pioneer industries" and exports to invest in Singapore by providing tax relief. By 1997, 391 establishments were certified as pioneer manufacturing firms, employing 165,431, and generating an output of S\$86.211 billion with an added value of S\$19.933 billion (Shih et al., 2012: exhibit 3).

The case of HP Labs is an illustration of enabling the anchoring of new industries through MNEs. The increased challenge of attracting MNEs, and high dependency on the electronics industry required a different strategy. The EDB identified a biomedical sciences cluster as the next key cluster to be developed alongside existing chemicals and electronics. The clustering of a complex industry that is not related to existing knowledge and capabilities mandated a different approach. The approach rested on the One North project developed by JTC in the 2000s – a world-class research facilities and business

park space that occupies a 200-hectares development strategically positioned in the heart of Singapore. It was built to support the growth of Biomedical Sciences, Infocomm Technology (ICT), Media, Physical Sciences and Engineering. Combined with educational institutes, residences and recreational amenities, it creates an ideal work-live-play-learn environment conducive for creative minds to excel and innovation to flourish. One North is another science park to strengthen the technological infrastructure as Singapore targets life sciences as a new growth pillar. It now houses Fusionpolis, Biopolis and Mediapolis that support the targeted biomedical industrial cluster.

Singapore had been successful in attracting foreign investments through active “promotion of Singapore as a regional headquarters location for multinational companies in the Asia-Pacific rim” (Lee, 1998) mainly through cluster infrastructure projects. Foreign enterprises account for 18% of share of enterprises, 50% (S\$199) for nominal value added, and 31% employment of enterprises³. However, Singapore only recently focused on domestic entrepreneurship to stimulate the branching of local industries. The massive infrastructures for clusters provide the platform to attract MNEs and also enable the growth of domestic SMEs. Moreover, extending the institutional capabilities through the Standards, Productivity, and Innovation Board (SPRING) was essential “to raise productivity so as to enhance Singapore’s competitiveness and economic growth for a better quality of life for our people” (Vietor & White, 2015). “SPRING Singapore has three areas of focus: productivity and innovation; standards and quality; and small and medium-sized enterprises (SMEs) and domestic sector”⁴. Remarkably, 99% of Singaporean enterprises are now small and medium-sized enterprises (SMEs), accounting for 48% (S\$172.3 billion) of nominal value added of S\$362 total enterprise nominal value added, and 65% of employment share.

In summary, Singapore pursued concurrent anchoring and clustering diversification mechanisms whereby SOEs are building the infrastructure for

³ <https://www.singstat.gov.sg>

⁴ <http://www.spring.gov.sg/Pages/Home.aspx>

clusters and MNEs are attracted to anchor unrelated products and industries. In a sense, the institutional capabilities around anchoring MNEs to create complex unrelated varieties and building the infrastructures for clustering are the main underlying factor for diversification, which are discussed in other sections of the report.

In Norway, the main mechanisms for growth and diversification have been the indigenous creation of natural resource-based industries, anchoring and branching related and unrelated industries through LPEs and SMEs. The main feature is the creation of new industry out of an existing resource industry that is technically unrelated, e.g. pulp and paper, machines and vessels, and wafers and solar energy systems. Clustering has also been pursued mainly through self-organizing mechanisms by SMEs for related industries with minimum institutional support from the government rather than infrastructure driven by the state.

The indigenous natural resource-based industries of fish and crude oil account for 1.7% and 26% of GDP and 7.8% and 66.8% of total exports in 2014 respectively. The creation of unrelated varieties of machine and vessel industries that are distanced from the knowledge capabilities of the existing core industries of fish and oil but are linked to their value chain, is probably the keystone of Norway's drive towards diversification and economic complexity. Norway was able to exploit its natural resources because it created and accumulated knowledge and capabilities to develop a large-scale industry, e.g. oil and gas and "new resource-based sectors often emerge not because new natural resources are discovered but because new technologies create the basis for commercial production and marketing of a known resource" (Ville & Wicken, 2012). For example, Norway was able to create new technologies e.g. horizontal drilling and control technologies to extract more oil from the North Sea in 1970s..

In a way, the resource-based industries have influenced the direction of knowledge production and technological development in the economy (Ville & Wicken, 2012). Norway extended existing knowledge and capabilities to create

higher complexity industries, i.e. machines, vessels and wood processing serving the core indigenous industries. It has made Norway a leading provider of oil services and related technologies including sub-sea production technology where Norwegian companies control more than half of the world market (Engen, 2009 in Ville & Wicken, 2012). Similarly, the emerging wood-processing industry required water turbines and other kinds of machines that became an important market for local mechanical works. Some engineering companies became exporters of machinery for the wood-processing industry (Ville & Wicken (2012).

The establishment of new resource-based industries was the outcome of complex and costly processes involving high levels of capital investment, the use of a diverse field of knowledge bases, and the ability to draw on international actors and resources. The successful development was dependent on close interaction with other sectors of the economy and society involving technology, knowledge, financial resources, and various kinds of expertise. For example, “the transformation of Norway’s forestry industry from sawmill production to wood processing (pulp) involved close interaction with local engineering companies, in addition to foreign expertise” (Ville & Wicken, 2012). The interaction and linking of the resource industries with available resources in the rest of the economy and internationally (Ville & Wicken, 2012), in particular the capital goods industry and business services, has strongly shaped the wider patterns of innovation and the structure of the national innovation system (Fagerberg et al., 2009). In a way, the institutional collaboration capabilities around the indigenous resources influenced the branching of unrelated new industries.

The other form of diversification is the branching and clustering of unrelated industries, such as the software and ICT industries, and electronics-cluster, food-cluster and wind-cluster industries. These industries are driven by SMEs; however, they represent a fraction of the GDP and export basket. Nevertheless, the number of SMEs has increased by 10% and their value added increased by approximately 40% over the last decade. SMEs account

for 71.4% (€ 156 billion) to value added; 38% of value added by SMEs is in the oil and gas industry, 99.8% of total enterprises, and 67.7% of total employment in 2014⁵.

In summary, Norway pursued anchoring and branching complex varieties of related and unrelated industries that are linked to the path dependence of natural resources, i.e. fish and crude oil. The institutional capabilities to link and collaborate around national and regional innovation systems have been instrumental in creating the extended knowledge and capabilities required for the new industries. These are discussed in other sections of the report.

In UAE, the economic growth and diversification has evolved over time through mainly anchoring and clustering mechanisms. These include anchoring of related industries such as polymers and basic metals through SOEs; anchoring of new complex and unrelated industries that did not exist earlier, such as Aerospace, Military and Semiconductor, also through SOEs; and clustering low complexity of related and unrelated industries through SMEs and SEZs. However, the products and industries of SMEs are not necessarily linked to the industries anchored by SOEs.

The motivation for new path creation through SOEs is to anchor new industries that both the local private sector and the foreign direct investors could not or would not undertake due to business environment constraints. These include high natural barriers to entry in certain sectors, capital markets failure, maturity of certain markets, lack of incentives for the private sector to perform certain activities, weak domestic demand, and interest in short term orientation (OECD, 2013). This is particularly relevant for industries that are unrelated to existing economic structures in emerging markets or economies in transition, such as UAE but also Singapore, Norway and other GCC countries. The underlying assumption is that these anchor industries would open up opportunities for branching related to downstream industries in the long term. Thus, “state needs to take a leading role in capital accumulation and infrastructure

⁵ 2014 SBA Fact Sheet – Norway Enterprise and Industry, European Commission

investments as only the government could provide sufficient scale and capital to compete internationally and “catch up” with advanced economies” (OECD, 2013); moreover, engaging in long-term investment drives countries to higher-value-added production (OECD, 2013). In a sense, SOEs become agents for creating new related and unrelated paths for economic growth and diversification.

SOEs in UAE have been the main actors that drive economic development, generation of employment and other strategic objectives for regional governments. They have been building the industrial platform or “industrialization industries” (OECD, 2013) of utilities, transportation and telecommunication. Moreover, they have been performing an entrepreneurial function in the creation of various industries and services that are related to the sources of path dependence, i.e. oil, gas, and hydrocarbon refineries, and unrelated to existing economic structures, such as basic products of polymers, steel, cement, and aluminium, and advanced industries of military, aerospace, renewable energy and semiconductors.

These SOEs in UAE and in general “SOEs in GCC countries are ‘islands of excellence’ among MENA SOEs” and are “successful in their own right” in anchoring new unrelated industries; they acted as “incubators of entire ecosystems of companies” (OECD, 2013), as their outputs serve as key inputs to the production processes of other companies, e.g. as feedstock to the petrochemical sector and other downstream industries, “thereby enabling diversification into new activities” (OECD, 2013). However, in general “the local downstream linkages remain weak in the face of a generally narrow private sector” (OECD, 2013). In UAE, several large SOEs have been created which are considered successful, such Mubadala, Borouge in polymers, Emal in aluminium, Strata in aerospace, Emirates Steel in steel, etc. However, the downstream industries around the anchor SOEs remain weak due to limited domestic demand, and a narrow private sector.

UAE also pursued a clustering strategy through SEZs, although it differs from the Singapore approach: first, UAE focused on building the infrastructure and

offered incentives, such as cheap energy; second, the linkage between anchor firms and SEZs are not established; and third, it is not associated with innovation policies, R&D, and collaboration capabilities. This in a way may explain the low complexity of related and unrelated varieties and weak downstream industries around anchor firms.

In summary, the three countries pursued varying mechanisms to create related and unrelated varieties of products and industries. Singapore pursued concurrent anchored and clustering mechanisms to create unrelated industries with varying degrees of complexity, mainly through MNEs. Norway, anchored and branched a medium range complexity of related and unrelated industries through LPEs and SMEs serving the indigenous industries. UAE mainly anchored low complexity related and unrelated products through SOEs and clustered unrelated industries through SEZs. In a sense, indigenous creation is associated with low complexity related varieties, anchoring with low complexity unrelated varieties, clustering with complex unrelated varieties, and branching with complex related varieties. The institutional capabilities associated with diversification mechanisms are explored next.

4.5.6 Institutional Capabilities

The key finding in this research is the underlying factor for determining degree of relatedness & complexity of diversification outcomes is institutional capabilities. In this section the institutional capabilities that are associated with diversification mechanisms, economic actors, creating varieties of related and unrelated products and industries with varying degrees of products and industries. Four themes of institutional capabilities are merging from the comparative case studies. These are government policies & strategies, institutional arrangement, institutional arrangement and institutional collaboration capabilities. These are summarized in Table 34 and discussed below.

Table 34: P3 Cases of Institutional Capabilities

	Singapore	Norway	UAE
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Government Policies & Strategies	<ul style="list-style-type: none"> ▪ National economic strategy coordinated by Economic Strategies Committee (ESC) ▪ National science and technology strategies and programmes 	<ul style="list-style-type: none"> ▪ National innovation system ▪ Regional innovation system ▪ Sector policies (marine resources, minerals and renewable energy sources & technologies) ▪ Local content strategy 	<ul style="list-style-type: none"> ▪ National and regional economic development strategies ▪ Industrial policies
Institutional Arrangement	<ul style="list-style-type: none"> ▪ Ministry of Trade and Industry (MTI) ▪ JTC for infrastructures and SEZs ▪ Temasek for investment and overseeing all SOEs 	<ul style="list-style-type: none"> ▪ Innovation Norway ▪ Regional development agencies 	<ul style="list-style-type: none"> ▪ Regional economic development agencies ▪ Each SEZ is run independently through a board appointed by government representing public and private sectors ▪ No overall governance of SOEs
Institutional Environment	<ul style="list-style-type: none"> ▪ Singapore's Competitiveness (CSC), ▪ International Enterprise Singapore (IE Singapore) for trade development ▪ Competitive business environment ▪ Highly educated workforce ▪ High R&D investment 	<ul style="list-style-type: none"> ▪ Competitive business environment ▪ Highly educated workforce ▪ Low R&D investment 	<ul style="list-style-type: none"> ▪ National and regional competitiveness offices ▪ Competitive business environment ▪ Comparatively lower educated workforce ▪ Very low R&D investment
Institutional Collaboration	<ul style="list-style-type: none"> ▪ Complex institutional coordination through Economic Development Board (EDB) among all actors ▪ A*STAR for coordination of research programmes and commercialization and licensing ▪ Standards, Productivity and Innovation Board (SPRING) 	<ul style="list-style-type: none"> ▪ Innovation Norway 	<ul style="list-style-type: none"> ▪ Limited institutional coordination through local government and economic development departments

In Singapore, the institutional capabilities have evolved over time in response to existing conditions, exogenous global market forces, and endogenous drivers for the development of targeted industries. The institutional capabilities are

complex with many facets: First, government policies and strategies led by EDB and supported by other statutory boards and committees, e.g. Economic Strategies Committee (ESC); Second, institutional arrangement, e.g. Ministry of Trade and Industry (MTI) overseeing all statutory boards and committees, JTC managing infrastructures mainly SEZs, Temasek – the investment arm overseeing SOEs; Third, institutional environment, e.g. Committee on Singapore's Competitiveness (CSC), Trade Development Board, and Promising Local Enterprises (LPE) enhancing the competitive business environment, building new capabilities and alliances, and supporting growth of manufacturing; Fourth, institutional collaboration, which is a subset of institutional arrangement deliberately collaborating on implementation and funding of national policies, science, research, and development programmes, e.g. Agency for Science, Technology and Research (A*STAR) Standards, Productivity, and Innovation Board stimulating growth of entrepreneurship and SMEs, particularly the targeted biomedical cluster. The biomedical industrial cluster demonstrates the complex set of institutional capabilities pursued in Singapore to create complex and unrelated products and industries.

The government continues to take an active and central role in formulating development and technological policies and undertakes a leading and entrepreneurial role in implementing these policies through its SOEs and institutions as well as facilitating the collaboration with SOEs, MNEs, SEZs and SMEs to develop targeted economic sectors. The unavailability of natural resources and exogenous global market forces has influenced the government to build institutional capabilities. These capabilities evolve over time to reflect the complexity of the targeted industries.

In the 1960s, with a low capital base and simple accumulated capabilities, the crucial step was the setting up of the EDB by the MTI in 1961 prior to independence in 1965, which continues to coordinate and collaborate every aspect of economic development as well as social development (Parayil, 2005). The second step was creating JTC. These entities supported jump-starting the economic growth, through building the infrastructure for industrial development

and attracting FDIs as a central component of Singapore's growth strategy. The main targeted industries from the 1970s to 1990s were chemical and petrochemical industries that did not require complex institutional capabilities, such as science and innovation policies.

Since the 1980s, responsibility for coordinating science and innovation policies has rested on the MTI, which is also tasked with the responsibility of formulating key economic policies for the country. As a result, MTI was able to ensure coherence and harmony in the implementation of the various economic and innovation policies, which are undertaken by different agencies supervised by MTI (Koh, 2006).

The creation of SSP through JTC in the 1980s marked the development of technological and institutional capabilities supporting the transition to a complex economy in multiple ways: First, provide and upgrade local infrastructure to house MNEs as well as new industries that require proximity to the institutions of higher learning (Koh, 2006). Second, promotion of entrepreneurship, start-up grants, venture capital and other supports (Koh, 2006). Third, act as a hub for research and development organizations and companies as part of the initial set of coordinated government policies on science and technology policy. Fourth, "signal to foreign firms and investors Singapore's readiness to promote and attract high-tech and knowledge-intensive industries" (Koh and Koh, 2002). The industries associated with SPP have been IT and electronics that demanded a higher level of collaboration between LPEs, MNEs and research institutions.

Amid the financial crisis, growth of other competitive business centres in other countries and increased competition for foreign direct investment, the Committee for Singapore's Competitiveness (CSC) was formed in 1997. The majority of the members of the committee and its five sub-committees (manufacturing, finance and banking, hub services, domestic business, and manpower and productivity) were from the private sector, particularly expatriates and representatives from foreign multinational firms. The primary objectives of the CSC were: a) "to assess Singapore's economic competitiveness over the next ten years, taking into consideration global trends

and the development of existing and emerging competition” and b) “to identify problem areas and propose strategies and policies with a view to maintaining and strengthening Singapore’s competitive position” (Lee, 1999). During same period, Singapore also established the Economic Strategies Committee (ESC) with the goal of “developing strategies for Singapore to maximize our opportunities in a new world environment, by building our capabilities and making the best use of our resources, with the aim of achieving sustained and inclusive growth” (Viator & White, 2015). In 2010, the ESC released its recommendations for the next stage of Singapore’s development focusing on highly skilled people, innovative economy, distinctive global city (Viator & White, 2006). These efforts were instrumental in creating the new targeted biomedical cluster as an engine for growth alongside other industries.

On targeting the complex biomedical industrial cluster in the 2000s by EDB to transition into an innovative-based economy, Singapore reinforced its concurrent anchoring and clustering mechanism through MNEs and extended its institutional capabilities to coordinate and implement every aspect of developing the biomedical industry. The critical challenge for the government was to manage the coordination between the various science and innovation policies and to ensure that the various economic and financial policies, such as tax regimes, regulations on loans, stock market listing rules, etc., were structured and aligned properly to support the objective of a transition to an innovation-based growth strategy (Koh, 2006). The government has been extending its institutional capabilities to “engage in technological creation and create internal engines of growth” (Koh, 2006). Recently, the EDB “developed an 'ecosystem' strategy to foster innovation and diversify the economy ... by attracting the corporate research labs of multinational corporations” (Shih et al., 2012). In order that Singapore could realize its goal of being an ‘innovation based economy’, “the government has embarked on a coordinated effort to encourage innovation and entrepreneurship through improving the linkages between local universities and industries” (Parayil, 2005). The government not only funded basic research and licensed the technologies that were developed within the research institutions, it promoted the incorporation of spin-off

companies built around these technologies, and rewarded researchers involved in these spin-offs' sizable equity stakes. However, the focus on commercialization reduced the quality of scientific research. In 2001, the government decided to take the commercialization function outside of the research institutes and centralize it in a commercial arm of the Agency for Science, Technology and Research A*STAR, which coordinates the activities of these research institutes (Koh, 2006). The private sector is now taking a leading role in R&D. It "has out-spent the public sector in R&D expenditure by nearly four times" (Parayil, 2005). The government is driven to create an innovative industry; it initially focused on electronics and IT but because of "the inability to create IT industries due to the lack of qualified manpower forced the government to look at biotech applications in life sciences as the new innovation frontier to conquer" (Parayil, 2005). In a sense, the creation of a relatively complex biomedical cluster way beyond existing knowledge and capabilities is a difficult undertaking by Singapore which has demanded a complex set of institutional capabilities.

One of the key institutional capabilities that it is important to provide is a conducive environment for innovation, which is to invest in educating the workforce, as well as developing a high-quality information infrastructure that allows the flow and dissemination of knowledge and information. In Singapore, there has been a strong emphasis on technical education since the 1960s. The government provides almost all the funding for schooling at the primary, secondary and tertiary levels, and there are numerous scholarships available to nurture talent, including sending the best students overseas to study at top universities in Europe and the United States. Moreover, entrepreneurial activities are being promoted in schools, academic & research linkages between local and foreign educational institutions are created. For example, the Singapore-MIT Alliance (SMA), to promote engineering education and research collaboration among faculty and students within the engineering faculties at MIT. Another example, the second NUS College in Bio Valley (NCBV), was set up in July 2002 in Philadelphia. Selected "students will intern with biomedical and biotech startups at Bio Valley which is located within central

Philadelphia and surrounded by the comprehensive scientific and industrial development of the Delaware Valley” (Parayil, 2005).

In summary, the institutional capabilities of Singapore evolved over time. It started with simple capabilities to attract foreign investment anchoring low complexity varieties of unrelated products and industries (petrochemicals). Then developed complex institutional capabilities that managed cluster development by providing infrastructure and a competitive business environment for attracting MNEs. Then established very complex institutional capabilities that coordinate research, commercialize and license products innovation products as well as partnering as equity holder in firms to create complex unrelated products and industries (biotech cluster). The proposition generated from the above is that a high level of institutional collaboration capabilities, high institutional arrangement, high institutional environment, and high level of educated workforce, are all associated with unrelated and complex varieties of products and industries.

In Norway, the institutional capabilities are founded on RPs, national and regional development agencies, national and regional innovation systems, and collaboration between anchors and other economic actors.

The RPs of Norway are the main characteristics of state intervention to drive growth and diversification, particularly in peripheral regions. In the late 1980s the state implemented obligatory strategic business development plans (SBDPs) as a condition for RP support. The idea behind the SBDP was to generate local mobilization that would embed the RP across groups of actors (public, private, and civil) and certify local legitimacy and support. In addition, Innovation Norway was assigned the role of ‘quality safety guard’ and thus became the state-level counterpart to the local SBDPs. ‘Innovation Norway’ administers and collaborates with RPs while regional development agencies implement these programmes under the national and regional innovation system. A key element of Innovation Norway’s approach to carrying out its mandate was to develop and introduce a specific planning tool for promoting responsibility and progress, completion, and follow-up of projects. Along with

the SBDP, this led to a certain streamlining and professionalization of RP work across very heterogeneous municipal and regional RPs. The purposes of RPs are to contribute to the development of new jobs, improve business development capacity, and diversify local economic structures (Dale, 2002). This has evolved from an exogenous strategy, through state funding and attracting external investments, towards indigenous export industries based on comparative advantages to the endogenous strategy through collaboration on development strategies to change the existing economic structure.

The earlier forms of RPs in a way are narrow policy instruments to promote the development of existing industries in municipalities and regions facing major challenges and significant decline in their employment and/or population levels, and prone to failures of anchor firms (Carlsson et al., 2014). They are jointly funded by the state, county, and municipal levels and locally administered and last typically for 2-6 years which has led to industrialization (Carlsson et al., 2014). Since 1983 the state has spent more than NOK 2500 million (approximately US\$ 450 million) on RPs in a total of 70 municipalities and regions (Carlsson et al., 2014). RPs are designed both to create related paths associated with incremental innovation and unrelated paths for growth that are associated with radical innovation. The outcomes of these PRs are four findings: First, they demonstrated long-term growth, enhanced business development capacity, and increased industrial and relational diversity (Dale, 2002). RPs have contributed mainly to the growth of existing economies and supported the creation of related paths. Second, the effects of RPs in regions with cornerstone (anchor) companies were in the form of the renewal of existing indigenous and related paths in relation to development in global commodity markets (Dale, 2002) as evident from the cases studied by Carlsson et al. (2014). Third, they showed reinforced path dependency and a lack of adaptability and reorientation (Pike et al., 2010) but supported reorientation or creation of new but related industries. Fourth, they promoted regional collaboration but lacked external collaborations and linkages

The new endogenous policy model, however is focused on facilitating networking, upgrading competency, supporting entrepreneurship and building development capacity to diversify locally while avoiding investments in physical infrastructure (Carlsson et al., 2014). This contributed to the development of more common understandings of challenges and potential ways forward, thus increasing the level of mobilization and alignment of endogenous engagement and resources (Carlsson et al., 2014). The model focused on developing local networks and linkages across societal spheres and sectors. It facilitated the establishment of new firms by supporting entrepreneurs and entrepreneurial initiatives. The restructuring projects in Norway became corporatist endeavours (Jakobsen, 2014) that involved private-public partnerships and cooperation across multiple scales, with the intention of breaking negative trends in peripheral communities and regions (Carlsson et al., 2014). Consequently, the business development capacity and new business establishment increased in all regions where RPs were applied and effectively had a positive impact on the growth and diversification of regions.

In summary, the state policy had focused on maintaining existing industries, thus reinforcing path dependency in indigenous and related industries. In a sense RPs in general are associated with indigenous and related industries; though the new RPs promoted collaboration and linkages, the institutional capabilities remained limited which explains the related diversification outcomes in the sense that “national policy may help or hinder a region’s recover” (Martin, 2012).

Regional development policies are pursued through the establishment of regional development agencies in many regions. The government development agencies, such as Innovation Norway, IndPro and others, not only administer regional RPs but also facilitate and collaborate on the implementation of “collaborative innovation strategies” (Fitjar & Rodriguez-Pose, 2015). Regions promote “national and regional innovation system” and the “Norwegian tradition for nation based R&D programs” (Asheim & Coenen, 2005) to build “regional networks and the development of clusters” through institutional collaboration

capabilities. These included Arena programmes, Norwegian Centres of Expertise, VRI (Programme for Regional R&D and Innovation), and regional research funds that were established in 2010 (Jakobsen et al., 2012). For example, the development of the “electronics cluster in Horten” and “food cluster in Rogland” is mainly associated with “the national and regional innovation system” and “Norwegian tradition for nation based R&D programs” (Asheim & Coenen, 2005). The success of the electronics sector is attributable to “the build-up of unique competences among key personnel attached to the locality”, for example the mobility of workers between local firms is supported through the regional innovation system programme or ‘REGINN’ of the Norwegian Research Council (Asheim and Isaksen, 2002). The food cluster is supported by Regional Commercial Development and Entrepreneurship (ARNE) in which the private sector, municipal and regional authorities co-operate to support the food industry, the ‘Fagforum for Mat og Drikke’ (Professional Forum for Food and Drink) whose primary mission is to promote knowledge sharing and competence dissemination among local firms, education and R&D organizations, and ‘The House of Food’ as a regional centre of expertise on gastronomy and food technology.

Regional, non-regional and international collaborations seem to generate different diversification outcomes as “firms benefit from interacting with a wide range of regional and non-regional (national and, particularly, international) partners, both in terms of their potential for product and process innovation, and both for incremental and radical innovation” (Fitjar & Rodriguez-Pose, 2015). Regional collaboration is connected with a significantly higher likelihood of both product innovation and radical product innovation (unrelated and complex varieties) in regions with high levels of R&D expenditure, whereas there is no significant relationship in regions with low R&D expenditure. Firms in regions with lower levels of investment in R&D benefit from reaching out to additional national partners relative to firms in areas with a higher R&D intensity (Fitjar & Rodriguez-Pose, 2015). International collaboration is significantly connected to innovation in regions with low levels of R&D expenditure, whereas the association is not significant in regions with higher R&D expenditure. Firms that

collaborate with international partners are significantly more likely to introduce both product innovations and radical process innovations (related and low complexity varieties), although the association is somewhat weaker than that observed for product innovations. However, regions with higher levels of educated workforce are more likely to introduce product and radical innovations; as the absorptive capacity channelled through international collaboration is increased to generate innovation outcomes (Fitjar & Rodriguez-Pose, 2015). “The Norwegian economy is characterized by relatively low R&D intensity and high absorptive capacity as measured by levels of higher education thus policies that promote regional collaboration are likely to be counter-productive ... notably, most other Norwegian regions would probably be better off putting their absorptive capacity to use in developing global pipelines through which they could assimilate ideas from the main global nodes of knowledge” (Fitjar & Rodriguez-Pose, 2015). Therefore; Jakobsen et al. (2012); and Fitjar & Rodriguez-Pose (2015) questioned the emphasis on “regional collaboration and promotion of clusters and local networks in pursuit of economic development”.

The complexity of institutional collaboration capabilities around indigenous and related industries differ significantly from unrelated industries. The former are limited to collaboration in small-scale indigenous industries, SMEs driven and often in rural areas, between social and economic actors such as farmers, fishermen, ship owners, ship designers, and the mechanics of the small workshops with a common economic interest in introducing new technology around small engines and vessels. This collaboration evolved to include university professors and resource-based industries as long ago as the late 19th century and over time more specific institutions supported close collaboration between professors in scientific organizations and modern industrial firms (Ville & Wicken, 2012). The creation of complex related and unrelated industries, such as information and communication technologies in offshore industries as well as electronics, however, demanded complex institutional capabilities driven by RPs and shaped by national and regional innovation systems. The high investment levels in the offshore sector created a market for local knowledge-intensive sectors, including high-tech industries.

Information and communication technologies became integrated parts of production systems and development processes of the resource-based industries (Ville & Wicken, 2012). By the end of the 20th century, the oil and gas sector were the main customers for the local ICT industry, but also for many research institutes, consultancy firms, engineering companies, the machinery industry, and other parts of the knowledge-intensive business sector (Engen, 2009 in Ville & Wicken, 2012). The close interaction between oil and gas producers and knowledge-intensive organizations in Norway created over time a strong cluster of companies and research institutions, which shaped technological development in the petroleum sector and became potential export sectors. These clusters became important elements of the economy both as producers and as competence centres for other sectors of the economy (Ville & Wicken, 2012).

In the case of Norway, the national innovation system is focused on scientific areas relevant to the exploitation of natural resources. The establishment of Norges Geologiske Undersøkelser (NGU, Geological Survey of Norway) in 1866 became the basis for mapping resources in Norway, and the work by NGU and professors at the University of Oslo established an overview of known minerals by the early 20th century (Ville & Wicken, 2012). Oceanography became an instrument to map marine resources and movement of various fish species in the ocean. In marine biology, Norwegian scientists [G.O. Sars (1837–1927), Johan Hjort (1869–1948)] were in the forefront of developing theories on the movement of herring and other fish species at specific periods. The development of physical oceanography analysing currents, saliency, and other factors of importance for life in the ocean created the basis for a leading scientific community [H.U. Sverdrup (1888–1957)] in Norway, providing data relevant for fisheries. The creation of modern meteorology (Vilhelm Bjerknes (1862–1951) was also linked to demand from fisheries for improved weather forecasts (Ville & Wicken, 2012). Norwegian scientists within marine biology collaborated closely with local fishermen and became an important conduit for the diffusion of new technologies and fishing methods (Ville & Wicken, 2012). This relationship has been reproduced throughout the 20th century, and the

development of a large oil and gas sector in the Norwegian economy strengthened the “bio-environmental” model. The scientific community was more specialized in this type of research towards the end of the 20th century compared with 30 years earlier (Ville & Wicken, 2012).

In summary, exogenous based RPs or policy instruments, e.g. state funding attracting external investment, are associated with low institutional capabilities that generate related and low complex varieties, whereas endogenous-based policy instruments, e.g. collaboration, are associated with higher levels of institutional capabilities and generate unrelated and complex products. Regions with high levels of institutional capabilities, e.g. high R&D investments, would benefit from regional collaboration to create unrelated and complex products and industries. Regions with low levels of institutional capabilities, e.g. low R&D investment would benefit from non-regional and international collaboration to generate related and low complex products and industries.

In UAE, the institutional capabilities rest solely on strategic planning, institutional arrangement, and institutional environment.

The UAE federal government through the Prime Minister’s Office, and regional government, i.e. Abu Dhabi Executive and Dubai Executive Council, has built policy making and strategic planning capacity over the past decade that has set the aspiration and strategic direction. This has resulted in the development of the UAE vision 2021, Abu Dhabi economic vision 2030, Dubai Plan 2021 and various sector-based strategies.

The entrepreneurial initiatives undertaken by the government through SOEs have driven the economic growth witnessed in 1970s-2000s. Over the past decade, the UAE government undertook steady institutional environment and competitiveness reforms, which has resulted in a remarkable positioning across various global competitiveness measures. UAE is ranked 3rd in the region and 40th worldwide on human development, competitiveness and doing business. UAE is also ranked 1st regionally and 12th and 22nd globally and on the Global Competitiveness Index and Doing Business respectively. UAE, Abu Dhabi and Dubai in particular have pursued an active clustering economic diversification

strategy through SEZs that provides a competitive institutional environment for growth of firms, products and industries. The competitiveness initiatives have already enabled UAE to become a thriving business hub for firms and entrepreneurs to grow, prosper and contribute to the future sustainable development of UAE. It is observed that the competitiveness organizations, i.e. the Federal Competitiveness and Statistics Authority, Dubai Competitiveness Office, and Abu Dhabi Competitiveness Office, are mainly focusing on monitoring the competitiveness indicators for the nation and regions, while the competitiveness strategies are embedded within the national and regional development strategies.

One of the key challenges faced by UAE is access to finance. Firms and entrepreneurs would produce value added products if access to finance were eased. Access to finance for industrial SMEs has been mainly sourced through the Khalifa Fund for Enterprise Development, a government organization that was established in 2007 to help develop local enterprises in Abu Dhabi with a total capital investment of AED 2 billion. As one policy maker notes, “in any strong economy, SME’s play a major role towards development. Therefore, it’s not only Khalifa Fund that should be doing the funding, banks should also step in and look at it in a different way and provide support in order to initiate funding, especially local banking, and so there has to be a proper mechanism to do so”. However, banks with ample financial resources have contributed little to SMEs; in 2012, financing SMEs constituted only 4% of banks’ loans in UAE. This is because “financial institutions are not structuring proper funding nor are they trying to look at the importance of the industrial sector in the economy. Local banks should take the initiative and understand the importance of the industrial sector funding, especially towards SMEs”. In comparison with other countries in the region, the average business lending interest rate in UAE moved from being in line with regional interest rates up to 2007 to becoming higher than the average rate in any other country towards 2011. Supply of loans through and towards the end of the financial crisis dropped as banks become more risk averse, particularly because banks bear the risk in financing in the absence of credit insurance companies and a lack of credit information on

individuals, while the establishment of Al Etihad Credit Bureau may help the situation, difficulty to access alternative forms of finance by local businesses will remain an obstacle. Nevertheless, lending to the private sector has begun to return in 2013 and 2014. The government has been looking at ways to ease access to finance, “new access to finance regulations are being looked at which will ensure that there is a proper environment for the private sector to grow and succeed. We have to accept that there will be some probable failures, but generally, these regulations will enable private businesses to become more successful”. One way to avoid this situation is for the government to direct local banks to channel some of their loans to industries as most local banks have local governments as a majority equity shareholder.

On institutional arrangement, governance of SOEs is an indication of the level of institutional arrangement (OECD, 2013). SOEs in UAE are governed by independent boards appointed by the government representing both public and private sectors; however, there is no single agency overseeing SOEs – as in the case of Singapore. Lately, SOEs are becoming more engaged in the strategic planning for economic development to ensure alignment across all economic actors. Moreover, the regulatory and audit environment has been strengthened. For example, the Abu Dhabi Accountability Authority (ADAA) was established in December 2008, replacing the Audit Authority, The scope of ADAA’s work includes government departments, local authorities, institutions, companies and projects in which the government’s share is not less than 50%, and also the subsidiaries of these institutions, companies and projects. It therefore has the right to audit the 21 key local SOEs and their subsidiaries, estimated at 160 companies (OECD, 2013).

The UAE, in contrast to Singapore and Norway, has no agencies that collaborate with anchor industries either to promote demand side investment or to direct investors to investments that could be exploited based on regional comparative advantages. The Abu Dhabi Investment Forum, which is held regularly in London, Tokyo and Singapore, is a flagship investment promotion organized by the Abu Dhabi Department for Economic Development in

collaboration with bilateral business councils, that is attended by around 300 delegates including senior government officials, public and private sectors' representatives, investors, along with industrial, financial and banking organizations. However, investors are demanding more channels to address investment promotions.

The UAE, in contrast to Singapore and Norway, lacks institutional collaboration among government, SOEs, SEZs, and SMEs, which in a way may explain the weak ecosystem around anchored SOEs and the low complexity products and industries generated in the economy. Moreover, UAE recognizes its sustainable economic development rests beyond competitiveness and more towards innovation as the key driving force of successful catch-up into advanced economies and technology frontiers. While UAE is ranked 36 on the Global Innovation Index, it is ranked 66 for Economic Complexity as the productive structure of the economy is characterized by the low to medium complexity of exported products, such as polymers, aluminium and steel; this, however, reveals that accumulated innovation capacity should be utilized for technological advanced products and services in order to sustain economic growth. The UAE Prime Minister announced 2015 as the year of innovation, coinciding with the release of UAE Innovation Strategy, which in the medium and long term will aim to facilitate upgrading existing knowledge and capabilities and in turn influencing the emergence of sophisticated services and products. The absence of national and regional science and technology policies, regional innovation policies and programmes, and dedicated institutions for collaboration that link economic actors, as applied by Singapore and Norway, may make the progress towards high complexity products and industries slow.

In summary, institutional capabilities are instrumental in creating complex varieties of related and unrelated products and industries. There are different institutional capabilities; these are characterized as policy-making, institutional arrangement, institutional environment and institutional collaboration. The strength of strategic planning as in Singapore and UAE sets and aligns the direction for growth and development. It directs SEZs to build the infrastructure

to attract MNEs to anchor and cluster new, high complexity, unrelated industries as in Singapore, and branch low complexity related and unrelated industries as in UAE. It also mobilizes regional development agencies to restructure their economies, creating higher complexity related and as well as unrelated industries that are linked to path dependence conditions, as in Norway. The institutional arrangement, e.g. centralized agencies overseeing every aspect of development SOEs, as in Singapore, is associated with the creation of complex unrelated varieties. While the institutional environment, e.g. ease of doing business, provides the platform for SMEs to have growth in related varieties, the creation of complex industries remains a challenge. The degree of institutional collaboration amongst government, SOEs, SEZs, MNES, LPEs and SMEs is probably the main underlying factor that enables the creation of high complexity related and unrelated varieties – which Singapore has mastered.

4.5.7 The Main Economic Actors

In this section, the role of economics in influencing mechanisms, institutional capabilities and outcomes is discussed. The cases of Singapore, Norway, and UAE demonstrate the roles in which actors differ depending on the context, institutional capabilities, diversification mechanisms, and nature of diversification outcomes pursued. This in a way extends the discussions in existing literature that the scope of regional actors to develop and apply contextual policy interventions (Boschma & Frenken, 2009) is continually shaped by the political economy of the region (MacKinnon et al., 2009) in particular in peripheral regions due to dependence on state intervention to stimulate adaptive capacity and growth (Martin, 2012).

In Singapore, to jump-start economic growth, the Singaporean government took a proactive role by creating several SOEs and statutory development boards to provide the infrastructure necessary to attract foreign investment and provide for the basic needs of Singapore's people. MNEs played the critical role of creating the new industries while SMEs have started more recently to contribute more to economic growth and diversification. To complement the crucial objective of the EDB to develop Singapore, the JTC was created to guide the

construction of industrial estates as well as to manage and provide industrial space for MNEs, while the Development Bank of Singapore took over the industrial financing from the EDB. The Public Utilities Board addressed electricity and water needs, while the HDB oversaw public housing. The Ministry of Trade and Investment (MTI) established Temasek Holdings in 1974 to manage these investments on a commercial basis. By 2013, after significant privatizations, Temasek held more than S\$215 billion in assets, yielding a shareholder return since inception of 16%, despite being government-owned. The government, through Temasek, held stakes in a wide variety of firms all across the economy, including a bird park, an airline, a shoemaker, several utilities, and a shipping company. Like privately owned firms, Singapore's GLCs were focused on market performance, rather than wider government-dictated social initiatives. However, Temasek executives did not sit on the boards of these companies. Since its independence, Singapore has been founded on MNEs to create the new industries. EDB Chairman Leo Yip explained, "It's what the leading companies in the world can offer us. Global companies from the U.S., Europe, and Japan, they bring the leading-edge technology, production chains, and business practices into Singapore. They bring expertise. Why should we stop harnessing that?"

In Norway, large enterprises drive economic development, which enables the growth of SMEs subcontractors in industries that are mainly related to natural resources; it is "a large enterprise-led engineering economy with a multitude of SMEs in its platform of related marine industries that operate notably as supply network clusters in many instances" (Cooke, 2016).

In UAE, economic development rests mainly on SOEs and SEZs for the creation of new paths for diversification. "SOEs have been the main actors that drive economic development, generation of employment ... been building the industrial platform or "industrialization industries"" (OECD, 2013) of utilities, transportation, and telecommunication. Moreover, they perform an entrepreneurial function in the creation of various industries and services that are related to sources of path dependence, i.e. oil, gas, and hydrocarbon

refineries, but unrelated to the existing economic structure, such as basic products of polymers, steel, cement, and aluminium, and advanced industries of military, aerospace, and renewable energy. The regional governments, mainly Abu Dhabi and Dubai, pursued anchoring economic diversification programmes at an accelerated pace through leadership, policies and strategies that were effectively executed by state-owned institutions and enterprises, in a sense acting as entrepreneurs or change agents that introduced novelty in services and products and stimulated economic growth but with some variations. Dubai focused on logistics, tourism and financial services, while Abu Dhabi pursued capital-intensive industrial diversifications that are associated with or branched from the energy sector, such as polymers, and the aluminium and steel industries. The last decade witnessed the creation of various SOEs that anchored new industries in Abu Dhabi. In 2002, Mubadala was established to “help diversify the economy and deliver both financial returns and socio-economic benefits to the emirate”. Consequently several firms were created covering a variety of industries: Dolphin Energy (2003) for gas transport, Imperial College London Diabetes Centre (2005), Masdar for renewable energy (2006) and Masdar Institute of Science and Technology (2007) that are located within Masdar City (2008) aimed to become a sustainable eco-city economic zone, Al Yah Satellite Communications Company (Yahsat) (2007), Globalfoundries (2009) which is a 100% acquisition into semiconductor manufacturing, Strata for advanced composite aerostructures manufacturing located within its associated Nibras Al Ain Aerospace Park (2010) and other companies. Emirates Global Aluminium (EGA) is the fifth largest aluminium producer in the world. It is jointly held by Mubadala of Abu Dhabi and the Investment Corporation of Dubai with their core operating assets being Emirates Aluminium (“EMAL”) which started up in 2013 with an investment valued at approximately AED 38 billion (US\$10.2 billion) and Dubai Aluminium (“DUBAL”) which was commissioned in 1979 with a combined annual production of 2.4 million tonnes per annum. Emirates Steel was established in 1998; it grew in a relatively short period of time from a simple re-roller of imported steel billets to a complex integrated manufacturing plant. In 2012, the

company began producing at a capacity of 3.5 million MTPA, following two expansions and the investment of AED 11 billion (US\$ 3 billion). Borouge is a leading provider of innovative, value creating plastics solutions that started up in 2010 and its annual production capacity is reaching 4.5 million tonnes of polyethylene and polypropylene.

In UAE, Singapore and other GCC countries, the role of SOEs has extended much beyond other comparable countries, turning into MNEs operating in the home country and abroad, such as the case of Saudi's Telecom Group, UAE's Etisalat and Qatar's Qtel in the telecommunications sector. The airlines sector is also dominated by SOEs that run national airlines, such as Etihad Airlines, Emirates Airlines, Qatar Airways and Singapore Airlines, which are rated amongst the largest globally. SOEs also operate in the not-for-profit sectors such as hospitals. Mubadala Healthcare, a unit of the Mubadala Development Company owned by the government of Abu Dhabi, established the Cleveland Clinic Abu Dhabi, Healthpoint, Imperial College London Diabetes Centre (ICLDC), National Reference Laboratory, Capital Health Screening Centre, and Tawam Molecular Imaging Centre. These healthcare and testing service providers are established through partnership with international healthcare centres designed to provide a wide range of complex and critical care requirements.

Countries as diverse as Norway, Egypt, Singapore and a number of European transition economies, continue to have relatively large SOE sectors (OECD, 2013). It is estimated that 28 out of the 100 largest companies in emerging markets have a government stake (Economist, 2012), and that state participation in the marketplace has generally not seen any significant retreat, except in a few countries with a heavy socialist legacy (OECD, 2013).

The motivation for new path creation through SOEs is to anchor new industries that both the local private sector and the foreign direct investors could not or would not undertake due to business environment constraints. These include high natural barriers to entry in certain sectors, capital markets failure, maturity of certain markets, lack of incentives for the private sector to perform certain

activities, weak domestic demand, and interest in short term orientation (OECD, 2013). These in particular are relevant for industries that are complex or unrelated to existing economic structure in emerging markets or economies in transition. The underlying assumptions are that these anchor industries would open up opportunities for related downstream industries in the long term. Thus, the “state needs to take a leading role in capital accumulation and infrastructure investments as only the government could provide sufficient scale and capital to compete internationally and “catch up” with advanced economies” (OECD, 2013), moreover, engaging in long-term investment and driving countries to higher-value-added production (OECD, 2013). In a sense, SOEs become agents for creating new related and unrelated paths for economic growth and diversification.

The success of SOEs is debatable; however, some success stories include Singapore and China in using SOEs as “a motor of capital markets development, sectoral policies, infrastructure provision and even poverty reduction on the other” (OECD, 2013). The majority of SOEs in the Middle East and Africa remain “elephants among gazelles”, often suffering from lower productivity and facing difficulty competing with private sector incumbents (Amico, 2012). On the other hand, SOEs in GCC countries are “islands of excellence” among MENA SOEs, which “demonstrate a level of economic performance and sophistication in governance and strategy that is remarkable, even by private sector standards” (Hertog, 2010). They are successful in their own right” (OECD, 2013), they have been instrumental in the economic growth, and acted as “incubators of entire ecosystems of companies” (OECD, 2013); their outputs serve as key inputs to the production processes of other companies. For instance, the outputs of the petrochemical SOEs – almost entirely state-owned – are used as inputs in important downstream industries, including ones operated by other SOEs, thereby enabling diversification into new activities (OECD, 2013). Countries with a more focused industrialization agenda in which the local private sector has been accorded a relatively larger role, and where the mandate of SOEs has been more commercially focused, have generally fared better with their relatively smaller public industries. The

most impressive successes in state-owned manufacturing are concentrated in the Gulf countries (OECD, 2013). However, in general “the local downstream linkages remain weak in the face of a generally narrow private sector” (OECD, 2013). The case of Saudi Basic Industries Corporation (SABIC) is an example a holistic institutional arrangement that enabled the creation of downstream industries linked to the anchor SOEs. SABIC is the largest listed company in Saudi Arabia. It has converted the comparative advantage of cheap gas feedstock into a highly profitable and by now multinational industrial conglomerate (OECD, 2013). The Industrial Cities of Jubail and Yanbu (RCJY) were established alongside the evolution of SABIC, along with other government and privately owned corporations.

In UAE, the case is different. Several large SOEs have been created which are considered to be successful in their own right, such as Mubadala, Borouge in Polymers, Emal in Aluminium, Strata in Aerospace, Emirates Steel etc.; however, the downstream industries around the anchor SOEs remain weak due to limited domestic demand, a narrow private sector and, particularly important, the absence of institutional collaboration among SOEs and other economic actors. The success of SOEs in GCC countries is attributable to formal and informal governance structures that have protected Gulf SOEs’ managerial autonomy, focused accountability on a small set of principles and allowed for clear commercial mandates. At the same time, a number of Gulf-based SOEs display unorthodox governance practices in terms of disclosure, board independence, and other parameters (OECD, 2013).

The salient finding is the association of economic actors, institutional capabilities and diversification outcomes. SOEs are associated with low institutional capabilities and are generating low complexity of related and unrelated products, as in the case of UAE. LPEs are associated with high regional institutional capabilities that are a mainly associated with low and high complexity of related varieties of products and industries as in the case of Norway. MNEs are associated with complex institutional capabilities and complex varieties of unrelated varieties as in the case of Singapore. SMEs are

mainly associated with related varieties of products and industries whereby institutional collaboration is crucial for their growth. The interrelationships between actors, mechanisms, factors, and outcomes are discussed and constructed in the following sections.

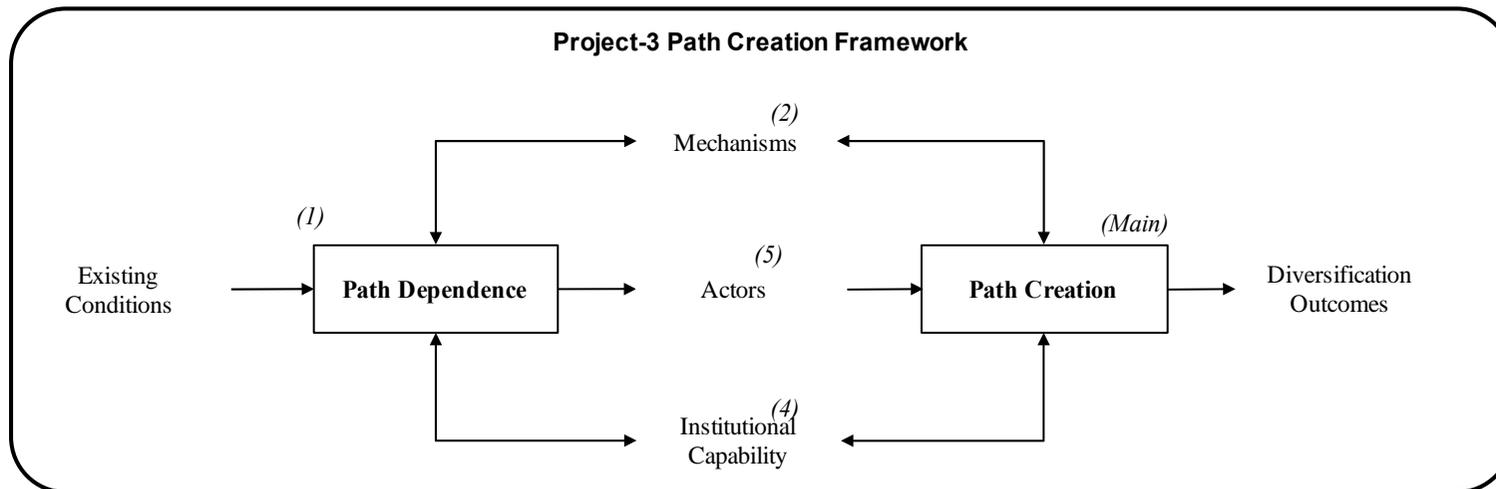
4.5.8 Summary of Findings

It is found that countries and regions pursue different pathways to diversification. In the context of scarce path dependence resources Singapore pursued concurrent anchoring and clustering by MNEs while SOEs provided infrastructure and funding, and support from a highly business-competitive environment and highly complex institutional collaboration capabilities, consequently creating complex unrelated varieties of products and industries.

In the context of high path dependence conditions (fishing and oil), Norway mainly adopted branching through LPEs supported by restructuring programmes resting on national and regional innovation systems that created medium range complexity of related varieties and unrelated varieties serving path dependence resources industries.

In the context of high path dependence conditions on oil and gas, UAE mainly anchoring through SOEs; while business competitiveness is high the collaboration amongst economic players is weak and national or regional innovation policies are not established, consequently creating related and unrelated varieties but of less complexity compared to Singapore and Norway.

In a sense, the context of path dependence conditions, actors, mechanisms, institutional capabilities, and outcomes represent the main elements for the path creation framework. Next the relationships amongst the elements of the path creation framework are discussed to generate the propositions, build a framework and develop a matrix for path creation.



Project-3 Path Creation Propositions

Proposition-1: Proposition 1: Context of path dependence and existing conditions underpins diversification mechanisms and impacts relatedness and complexity of diversification outcomes.

Proposition 2: New paths for diversification are created through indigenous creation, anchoring, branching, and clustering path creation mechanisms that are associated with relatedness and complexity of diversification outcomes.

Proposition 3: Relatedness and complexity shape diversification outcomes.

Proposition 4: institutional capabilities underpin diversification mechanisms and determine relatedness and complexity of diversification outcomes.

Proposition 5: Economic actors drive diversification mechanisms depending on institutional capabilities to create complex varieties of related and unrelated diversification outcomes.

Project-2 Main Proposition: In the context of path dependence and existing conditions of a region, economic actors undertake measures to influence the institutional capabilities that trigger indigenous creation, anchoring, branching, and clustering diversification mechanisms, in order to create complex varieties of related and unrelated diversification outcomes.

Figure 24: Project-3 Propositions and Framework for Path Creation

4.6 Discussions

In this section, the main purpose is to generate the final set of propositions, build a framework (Figure 24) and develop a matrix (Figure 26) for path creation framework. The five propositions generated from empirical case study on UAE (Project-2) are discussed and refined based on findings of this research project. The research synthesis is extended to construct the interrelationships between the elements of the path creation framework. The aim is to interpret, conceptualise and explain the creation of new paths for growth and diversification for regional economies. Consequently, provide government organizations with different sets of strategies to influence policies for economic growth and diversification.

4.6.1 Data Analysis

Path creation is a topic that has recently been introduced into evolutionary economic geography, which provides a promising foundation to theorize the emergence and evolution of regional economies, particularly the creation of complex varieties of new related and unrelated products and industries within a context of particular geographical location, as result of the deliberate action of economic agents, such as firms and institutions.

The overall objective is to develop a “prescriptive knowledge” (Denyer et al., 2008), that interprets and explains the path creation of new paths for regional diversification. The synthesis (Denyer et al., 2008), is extended and applied to the context of regional diversification as follows: in the path dependence ‘context’ of a region, the ‘intervention(s)’ undertaken by ‘actor(s)’ to influence underlying institutional capability ‘factor(s)’ to trigger the diversification ‘mechanism(s)’ to create set of diversification ‘outcomes’ with varying degrees of relatedness and complexity. The content analysis is pursued to establish relationships amongst context, actors, mechanisms, factors and outcomes, these are integrated into a tabulated matrices (Figure 25). The first step is to synthesise the research findings to update and develop propositions that focus on each of the elements. Second, the relationships amongst the path creation

elements are integrated and anchored on the institutional capability factors, consequently constructing a matrix that explains how regions create new paths for diversification.

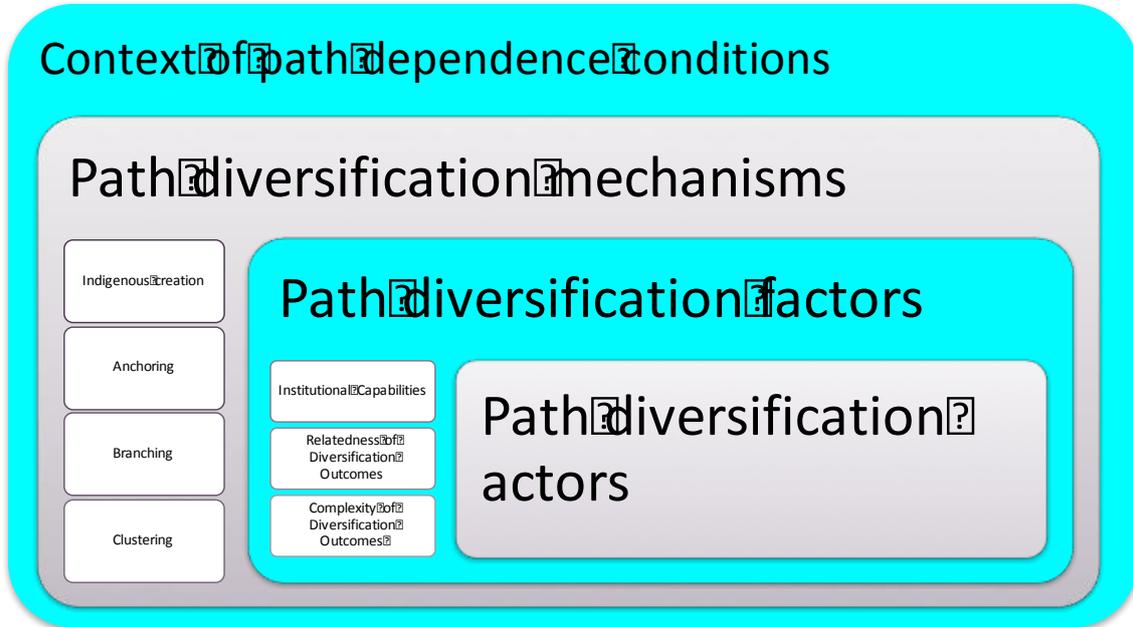


Figure 25: Project-3 Tabulated Matrix Structure for Data Analysis

4.6.2 Diversification Outcomes

This research contributes to existing literature and extends the path creation matrix developed as a result of the empirical case study of Project-2. It introduces economic complexity as another diversification outcome and reconstructs the matrix by establishing the relationship between relatedness, complexity and institutional capabilities that interprets the diversification outcomes of regions. [Refer to Figure 26 and Table 35]. In this section, the building block of relatedness and complexity shaping the outcomes of economic diversification is established below while the institutional capabilities are discussed in section 4.6.6.

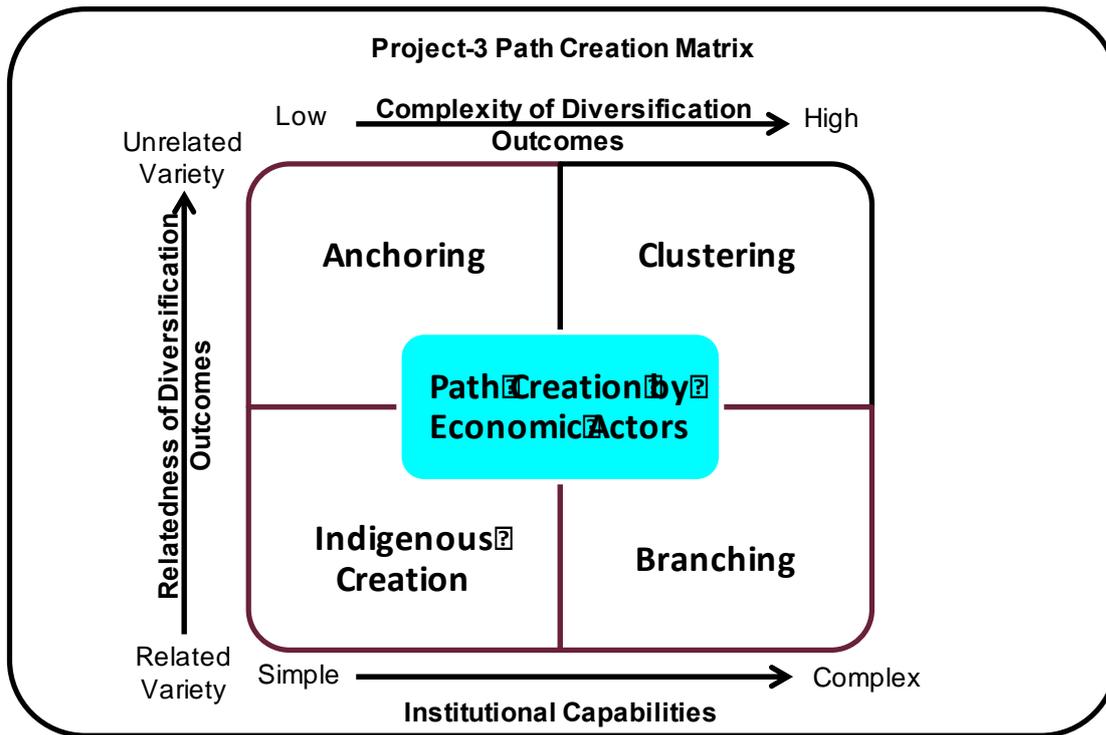


Figure 26: Project-3 Path Creation Matrix

The theory of relatedness prescribes the nature of diversification as related and unrelated variety (Frenken et al., 2007; Boschma and Frenken, 2011) depending on “industry relatedness” (Neffke and Henning, 2009; 2014; Neffke et al., 2011a), “technological relatedness” (Klepper and Simons, 2000) and knowledge proximity (Hidalgo and Hausmann, 2009; Hidalgo, 2009). On the other hand, the theory of capability or economic complexity (Hidalgo and Hausmann, 2009; Hidalgo, 2009) prescribes the outcome of economic diversification as simple or complex, depending on the embedded accumulated knowledge and capabilities within the country.

The proposition is “relatedness and complexity shape diversification outcomes”. The productive structure of countries is determined by accumulated knowledge and capabilities. These include knowledge embedded in government, firms, industries and clusters; and capabilities that could be tangible inputs, such as bridges, ports and highways, or intangibles, such as norms, institutions, skills or the existence of particular social networks. The argument is that at any given point in time, countries are endowed with a set of knowledge and capabilities,

such as path dependence conditions on natural resources. Economic development starts with the cultivation and exploitation of these natural resources in their basic products e.g. bananas, dates and fish. Moreover, the indigenous industries, such as forestry, fishing, and crude oil, are categorically related to path dependence on natural resources and are of low complexity. As countries and regions evolve, they do not abandon existing products but rather add new products that are related to natural or indigenous resources. It is found that the creation of related varieties to the existing economic structure can range from simple to complex products and industries. Regions evolve from fishing to processing fish, from cultivating vegetables and fruit to processing foods, from crude oil to hydrocarbons and chemicals. The process of moving up the value chain production increases the degree of relatedness and complexity of diversification.

Table 35: P3 Tabulated Matrix for Relatedness & Complexity of Outcomes

		Diversification Complexity	
		Simple Variety	Complex Variety
Diversification Relatedness	Unrelated Variety	<ul style="list-style-type: none"> ▪ High concentration ▪ Limited number of unrelated varieties (low diversification) ▪ Low complexity products & industries (low economic complexity) 	<ul style="list-style-type: none"> ▪ Low concentration ▪ Highest number of related and unrelated varieties (high diversification) ▪ Highest complexity of products and industries (high economic complexity)
	Related Variety	<ul style="list-style-type: none"> ▪ High concentration ▪ Limited number of related varieties (low diversification) ▪ Low complexity products & industries (low economic complexity) 	<ul style="list-style-type: none"> ▪ High concentration ▪ High number of related varieties (high diversification) ▪ High complexity of products and industries (high economic complexity)

This research, however, departs from the theory of relatedness. It also finds that countries and regions continuously jump-start new, unrelated industries that did not exist in their economic structure. The creation of unrelated varieties in the existing economic structure can range from simple to complex products and industries. The process of moving up from basic unrelated product to a wide range of unrelated products is associated with increasing levels of products' complexity. In a sense, relatedness and complexity shape diversification

outcomes, as illustrated in Table 35: P3 Tabulated Matrix for Relatedness & Complexity of Outcomes.

“Relatedness and complexity shape diversification outcomes”

(Project-3 Proposition-3)

4.6.3 Context of Path Dependence Conditions

The findings confirm the previous proposition that path dependence impacts on the economic diversification of regions; moreover, it impacts on the relatedness and complexity of diversification outcomes.

Path dependence is a core concept in evolutionary economic geography and institutional economic geography. It is considered to be a “major building block of a new interpretative or epistemological paradigm” (Martin & Sunley, 2006; Martin, 2010). On ontological grounds, “path dependence can be used as explanans (that which explains) rather as explanandum (that which has to be explained) (Notteboom et al., 2013)” as it is “primarily concerned with uncovering its substantive underpinning mechanisms and empirical instances” to explain regional economic development (Martin & Sunley, 2006; Martin, 2010). It is thus a key building block for explaining regional development and the creation of new paths for diversification.

Path dependence is a place-dependent phenomenon where historical trajectories are shaped by past incidents, decisions, and events (Boschma & Frenken, 2006; Martin & Sunley, 2006; Essletzbichler & Rigby, 2007). Martin and Sunley (2006) explain that path dependence in economics is framed as a technological ‘lock-in’ historical events that occurred in the past reinforces a particular path and condition future paths of economic technologies, organizations, and systems, as dynamic increasing returns resulting from large fixed, initial and set-up cost, or dynamic learning effects or coordinating effects or self-reinforcing expectations (Martin & Sunley, 2006); and as institutional hysteresis whereby both formal and informal institutions are difficult to change or slow to change over time (Martin & Sunley, 2006).

The plausibility of path dependence is, however, undermined by its historical events and lock-in feature in the existing literature. It is defined as an economic condition that is fixed and inflexible, hence endogenous change is muted; thus, for change to occur, exogenous forces are the only hope for economics to escape existing path dependence conditions (Martin & Sunley, 2006: 406) of products and technologies. This argument is however problematic as it “regards path creation as an accidental, adventitious, or serendipitous event that is not particularly revealing” (Martin, 2010), as many regions and countries have been able to create new paths for growth and diversification under path dependence conditions. On the other dimension, path dependence is defined as enabling rather than constraining, which implies that the generation of novelty is a generic feature of path-dependent evolutionary processes (Martin, 2010). This research, however, takes a different theoretical position on path dependence.

Path dependence in this research is viewed as a phenomenon that explains existing conditions and economic trajectories pursued by different regions. ‘Path dependence’ is a notion that ‘emphasizes how economic performance is shaped by the legacy of past decisions and events’, whereas ‘lock-in’ refers to ‘a situation in which the weight of existing assets, cultures and practices has prevented successful regional adjustment’ (Birch et al., 2010:37; Karlsen & Dale, 2014). Path dependence is not simply constraining but also enabling, and regional evolution may generate a variety of outcomes. However, path dependence could be thought of as the accumulated knowledge embedded in products, firms, institutions, industries, and regions, as established in the SLR. The argument is that the degree of complexity of existing knowledge influences the diversity of knowledge in a region (Hidalgo & Hausmann, 2009), thus the diversification outcomes. This ‘knowledge based path dependence’ is built on recent empirical studies on economic complexity of regional development (Hidalgo, 2009) and regionally embedded knowledge relatedness and branching of new paths from existing ones (Neffke et al., 2011a).

In this research, it is found that path dependence is a condition that accumulates a specific set of embedded knowledge, which either inhibits or enables the creation of new related or unrelated knowledge that are simple or complex depending on the complexity of existing knowledge. Regions with high path dependence conditions on basic natural resources that are embedded with basic knowledge are associated with simple and related varieties of products. These regions would pursue simple varieties of unrelated products and industries that would benefit from the comparative advantage of natural resources such as cheap energy sources for basic metals. Regions with low path dependence conditions on natural resources are associated with complex accumulated knowledge and complex related and unrelated varieties of products and industries. In a way, the context of path dependence and existing conditions not only impact on diversification mechanisms but also on the relatedness and complexity of diversification outcomes.

“Context of path dependence and existing conditions underpins diversification mechanisms and impacts on the relatedness and complexity of diversification outcomes”

(Project-3 Proposition 1)

4.6.4 Path Creation Mechanisms

The results show that the regions followed different pathways to grow and diversify into related and unrelated industries with varying degrees of economic complexity. They also illustrate the different mechanisms to diversify economies, which are associated with the context of path dependence conditions, and the relatedness and complexity of diversification outcomes. These mechanisms include indigenous creation, anchoring, branching, and clustering which confirm the propositions of the SLR and the single case study of Project-2.

The initial step for economic development is the cultivation and exploitation of endowed natural resources, e.g. fishing, farming and crude oil extraction. The creation of indigenous industries is directly influenced by path dependency on

natural resources, such as oil and gas as is the case for Norway and UAE. The path dependency on natural resources provides a comparative advantage for the growth of exports typically through small-scale firms and industries. However, for regions where the backbone of the economic structure is natural resources which are distanced from the technological frontier and complex product, the indigenous creation mechanism is associated with related and low complexity varieties of products and industries.

“Our remote ancestors did not expand their economies much by simply doing more of what they had already been doing: piling up more wild seeds and nuts, slaughtering more wild cattle and geese, making more spearheads, necklaces, burins and fires. They expanded their economies by adding new kinds of work. So do we.” (Jacobs, 1969:49 in Neffke et al., 2014).

Regions and countries evolve over time; they navigate through the product and industrial spaces, exploiting what is available from their natural resources. They do not abandon indigenous industries but create new products and industries that are either related or unrelated to the existing economic structure. They also strive to make complex products and industries to diversify their economies. “As countries become more complex, they become more diversified; they add more products to the export mix without really abandoning the products they started with” (Hausmann and Hidalgo, 2010). However, only advanced economies and a few developing countries have been able to transform their economically productive structure over the past four decades (Hidalgo, 2009), generating unrelated varieties of complex products and industries. The transformation is challenging; one aspect is accumulated knowledge and institutional capabilities are simple. Most importantly, local and international private firms are not taking risks in investing in new industries due to various uncertainties. Some of these uncertainties are a weak business environment, limited access to finance, and weak domestic demand.

Consequently, some governments pursue an entrepreneurial role to anchor new unrelated industries through SOEs as in the case of UAE and GCC countries or LPEs as in the case of Norway and provide the infrastructure and incentives for

the MNEs to anchor unrelated industries as in the case of Singapore. This finding extends the variations of the anchor approach or the “hub-and-spoke” structure, which have been characterized by many scholars in their discussions on current industrial organization (Gray et al., 1996). The anchor organizations can be SOEs, LPEs, MNEs as well as “non-profit such as a university, a medical center or a port authority, with a major role in structuring economic activity through spin-offs or management of a particular activity such as trade or research” (Gray et al., 1996).

In the anchoring mechanism, diversification progress takes place by adopting new knowledge and new technology through foreign direct investment (Koh, 2006). Moreover, the anchor approach creates major export-oriented industries that are dominated by one or a limited number of large, vertically integrated-firms or non-profit institutions that form its ‘hub’ or nucleus (Gray, 1996). It generates growth for countries distanced from the technological frontier as it “is likely to yield greater return ... because the benefits of technological progress can be realized quickly by moving up the technological ladder, as it is less costly and easier to absorb and adapt the existing body of knowledge than it is to invest and develop new technology with uncertainty of commercial success” (Koh, 2006). It anchor the economy closer to the technical frontier; however, it offers limited unrelated products and industries by the anchor firm thus the economy, knowledge and capabilities become concentrated in a few products such as basic metals (UAE) and electronics (Singapore).

Therefore, the long-term growth and diversification prospects for the anchoring mechanism would depend on two factors. First, for the anchor firm to build an infrastructure that enables new firms to form locally in related and unrelated industries or in other words “encourages growth within the region by spawning local suppliers, spinning off new businesses, or supplying labor or other factors of production to the local economy ... to diversify the region, providing alternative sources of growth and stabilizing regional economic activity in periods of cyclical setback or longer term decline in the hub organization’s industry” (Markusen, 1996). Second, the institutional capabilities, in particular

institutional collaboration arrangements amongst government, anchor firms such as SOEs, LPEs, MNEs, and SEZs as well as with SMEs to branch and cluster new firms, products, and industries around the anchor firm, become essential to sustain growth and create complex varieties of related and unrelated products and industries.

The branching mechanism of firms, products, and industries is one form of development that occurs through the self-organizing process in liberal market economies; however, for some countries it is coordinated deliberately to trigger the branching of targeted industries, as experienced in Singapore and Norway. It is highly conditioned by a free market business environment and institutional capabilities, in particular collaboration, funding, science and technology policies, and innovation policies coordinated by the government, as demonstrated in the cases of the biotech in Singapore and software and ICT businesses in Norway. The experience of UAE is, however, different; although the business competitive environment is comparatively high, the branching of firms and products out of the anchor firms or industries have been weak, e.g. polymer, aluminium and steel, which is mainly due to the absence of institutional collaboration capabilities amongst SOEs, SEZs and SMEs.

The clustering of firms, products and industries is another mechanism for economic diversification. There are different forms of clustering; one is when firms, or an industry and suppliers, cluster around one or several core firms (Gray et al., 1996) mainly around an anchor to produce related varieties, as in the case of Norway. Another form is when a special economic zone is established to provide the infrastructure and an enabling institutional environment for local and foreign firms to start up and produce related and unrelated industries that are targeted by policy makers, as in the case of Singapore and UAE. The clustering could also be self-generated through an agglomeration of firms in a geographical location, as in the case of Norway and to some degree in other free market economies.

In the anchor-based clustering, the anchor “hub” generates a second tier of companies that constitute, metaphorically, the spokes radiating from it (Gray et

al., 1996). An example would be the ability of small firms in a particular industry to start up and thrive in the shadow of a major firm, because the latter has built up a local skilled labour pool and a cadre of business services/traditional agglomeration economies. Such neighbouring activity could be conceived as riding on the shoulders of the hub firms, more or less with their acceptance but without imposing much of a burden (Gray et al., 1996). Many point to the wide range of economic conditions in which large firms still function and prosper, despite the proliferation of small firm networks. Examples range from the spatially concentrated network created by Toyota and its satellite of suppliers in Japan (Gray et al., 1996), to the core-ring system around Bosch in Germany (Cooke and Morgan, 1994). Some scholars even argue that the core-ring system, with small firms organized around powered lead firms, is becoming the dominant trend in regional economic structures (Harrison, 1994; Gray et al., 1996). Growth in these economies is associated with the position and success of anchor organizations in their national and international markets, and with their continued commitment to production and procurement within the district (Gray et al., 1996).

In the second form of clustering based on special economic zone, the success would depend on the infrastructure, such as logistics (air and sea), comparative advantage such as cheap energy sources (Norway and UAE), enhanced regulatory framework (Singapore and Norway), and investment awareness and promotion (Singapore and UAE). The institutional capabilities become essential, such as science and technology policies and programmes, as in Singapore, investment in R&D, national and regional innovation systems as in Norway, and collaboration among various economic actors, i.e. SOEs, LPEs, MNEs, SEZs and SMEs through dedicated organizations as in Singapore.

The third form of self-generated or agglomerated cluster, it is typical of liberal market economies. The success would depend on the competitive business environment associated with free market forces, which represent the formal Italian industries districts.

The clustering approach is associated with the creation of complex products and industries that are unrelated to the existing economic structure. It is also an approach pursued by countries to advance their economies towards global technological frontiers. “As the economy advances to the global technological frontier, the greatest potential for economic growth comes not from just catching up with the technological leaders through capital accumulation and imitation of their technology and growth strategies, but by investing in R&D and creating new technologies and products. Science and innovation policies at this stage are focused on the creation of new knowledge, through cutting-edge research at the frontier” (Koh, 2006). The case of the biotech cluster in Singapore is an illustration of this approach.

Table 36: P3 Tabulated Matrix for Path Creation Mechanisms

		Diversification Complexity	
		Simple Variety	Complex Variety
Diversification Relatedness	Unrelated Variety	<p>Anchoring</p> <ul style="list-style-type: none"> ▪ Anchoring around SOEs, LPEs and Institutions ▪ Limited number of simple unrelated products and industries ▪ Simple knowledge 	<p>Clustering</p> <ul style="list-style-type: none"> ▪ Coordinated clustering ▪ Self organizing clustering ▪ High variety of complex products & industries ▪ Complex knowledge
	Related Variety	<p>Indigenous</p> <ul style="list-style-type: none"> ▪ Natural resource-based products such as fishing and crude oil ▪ Very limited number of natural based basic products ▪ Simple knowledge 	<p>Branching</p> <ul style="list-style-type: none"> ▪ Branching out firms and products ▪ High variety of related complex products & industries ▪ Complex knowledge

In summary, the creation of indigenous products and industries is mainly related to path dependence conditions around natural resources that are characterized as simple in their complexity. Fishing and oil are examples of such indigenous industries. The anchoring diversification mechanism is associated with simple complexity unrelated products and industries. The focus is on knowledge and technology acquisition to move closer to the technological frontier. The branching of products and industries from existing industries is another form of

diversification mechanism. The clustering of complex industries that are unrelated to existing products and industries is one form of regional diversification mechanism pursued by some countries, such as Singapore and UAE.

“New paths for diversification are created through indigenous creation, anchoring, branching, and clustering path creation mechanisms that are associated with relatedness and complexity of diversification outcomes”

(Project-3 Proposition-2)

4.6.5 Economic Actors

In this research, and building on the discussions above, the main economic actors include government policy making organizations, government development organizations, SOEs, local private firms, MNEs, SMEs, as well as education and research institutions that play a crucial role in regional development.

The result restates the importance of understanding the roles of various economic actors, e.g. “experienced entrepreneurs and diversifiers” (Boschma and Frenken, 2009:), policy makers, (Fornhal et al. 2012; Essletzbichler 2012), SOEs (OECD, 2013), and others for harnessing, and matching regional assets to new market opportunities as part of path creation. These include existing establishments and new establishments that either belong to existing firms or entrepreneurs or originate from outside the region, and that act as agents of change (Neffke et al., 2014).

This research contributes further to the existing literature. It is found that different economic actors are associated differently with diversification mechanisms, relatedness and complexity of diversification outcomes and, in particular, the institutional capabilities as summarized in Table 37. First, the creation of indigenous industries is associated with resource endowments and geography. These are created by SOEs for capital-intensive industries, such as oil and gas, and SMEs for small-scale industries such as forestry and fishing

industries. Second, the creation of related varieties is mainly associated with SMEs that are linked to SOEs or LPEs and, to a lesser degree, to MNEs through the branching mechanism as “growth, decline and industrial reorientation of existing establishments all tend to reinforce a region’s existing resource base” (Neffke et al., 2014). The generation of complex related varieties through branching by SMEs is conditioned by the degree of institutional capabilities, particularly collaboration capabilities, linking SMEs to other economic actors around state funding, science and technology programmes, and innovation systems. Third, unrelated varieties are mainly generated by SOEs and LPEs that anchor new industries as “new establishments are often set up in more unrelated activities and hence induce more structural change” (Neffke et al., 2014). Fourth, the creation of complex unrelated varieties are generated by SMEs and MNEs associated with clustering mechanisms, often through the infrastructures provided by SEZs but more importantly through institutional capabilities, e.g. business environment, and once again collaboration across various economic actors.

Table 37: P3 Tabulated Matrix for Economic Actors

		Diversification Complexity	
		Simple Variety	Complex Variety
Diversification Relatedness	Unrelated Variety	Main Actors <ul style="list-style-type: none"> ▪ SOEs ▪ LPEs 	Main Actors <ul style="list-style-type: none"> ▪ SEZs ▪ SMEs ▪ MNEs
	Related Variety	Main Actors <ul style="list-style-type: none"> ▪ SOEs ▪ SMEs 	Main Actors <ul style="list-style-type: none"> ▪ SMEs

In other words, SOEs anchor low complexity unrelated industries, whereas MNEs anchor high complexity unrelated industries. This in line with what Neffke et al. (2014) envisage, i.e. that “radical structural change predominantly depends on non-local firms and entrepreneurs transferring new activities to the region” as “non-local firms and entrepreneurs generate most structural change” (Neffke et al., 2014). SMEs or “entrepreneur-owned establishments (i.e., start-

ups) induce most structural change in the short run in industries that are related to existing economic structure, but in the long run, this role is increasingly assumed by new subsidiaries of existing firms” (Neffke et al., 2014) i.e. LPEs. The underlying factor to create complex varieties of related and unrelated industries is found to be associated with institutional capabilities, e.g. state funding and collaboration amongst different economic actors on research, development and innovation.

“Economic actors drive diversification mechanisms, depending on institutional capabilities, to create complex varieties of related and unrelated diversification outcomes”

(Project 3 Proposition-5)

4.6.6 Institutional Capabilities

The primacy of institutional capabilities, particularly the collaboration capabilities to create and accumulate knowledge, are notably emerging as underlying factors for creating new paths for diversification. In this section, the relationships amongst the path creation elements are integrated and anchored on the institutional capability, consequently constructing a matrix framework that explains how regions create new paths for diversification and thus guiding policymaking organizations on diversification strategies.

There are different types of institutional capabilities; these are categorized as policy and strategy formulation, institutional environment, institutional arrangement, and institutional capabilities. Policymaking and strategic planning set the priorities and provide a platform to align different economic actors to march towards achieving desired diversification outcomes. Development strategies, industrial policies, national and regional innovation policies, science and technology policies, competitiveness policies are examples of policies and strategies; however, the translation of these policies and strategies into actionable agenda implemented by economic actors is what matters most for transforming the structure of the economy. The institutional environment is the outcome of policies and strategies, in particular establishing the right business

and competitive environment for a business to thrive and grow. These include, as an example, ease of doing business, laws and regulations. The institutional arrangement includes government leadership, policymaking organizations, investment awareness and promotion agencies, and of particular importance are the institutions of collaboration. It has been found in the case studies of Singapore, Norway and UAE, that the institutional collaboration capabilities through dedicated government organizations to coordinate the development of industries, implement science and technology programmes, oversee national and regional innovation systems, and orchestrate the collaboration amongst various economic actors, play an instrumental role in determining diversification mechanisms and outcomes.

Table 38: P3 Tabulated Matrix for Institutional Capabilities

		Complexity of Diversification Outcomes	
		Simple Complexity Varieties	High Complexity Varieties
Relatedness of Diversification Outcomes	Unrelated Variety	Anchoring <ul style="list-style-type: none"> ▪ Industrial policies & strategies ▪ SOEs governance ▪ Infrastructure investment ▪ Promotion of industries 	Clustering <ul style="list-style-type: none"> ▪ Institutional collaboration ▪ High R&D investment ▪ Highly educated workforce ▪ Science and technology programmes ▪ Government equity financing
	Related Variety	Indigenous <ul style="list-style-type: none"> ▪ Restructuring programmes ▪ Regional development agencies ▪ State funding ▪ External investment 	Branching <ul style="list-style-type: none"> ▪ Non-regional and international collaboration ▪ Low R&D investment ▪ Highly educated workforce

The underlying objective for institutional collaboration is creation and accumulation of knowledge. The argument is that the degree of complexity of knowledge is associated with the complexity level of institutional capabilities, in particular institutional collaboration capabilities. In a sense, the establishment of complex institutional collaboration aims to create and accumulate complex varieties of knowledge that are related or unrelated to existing knowledge,

which is probably the main explanatory factor for different diversification outcomes achieved by regions and countries. Capability and knowledge influence path dependence conditions, diversification mechanisms and relatedness and complexity of diversification outcomes.

Building on the findings of the SLR, the qualitative case study of UAE, and this qualitative multi cases research, there are different models theorizing the nature of knowledge, for example ranging from tacit to tangible, individual to collective, simple to complex, component to architectural (Ambrosini et al., 2009), analytic to synthetic (Asheim & Coenen, 2005), and embodied to disembodied knowledge (Keller & Yeaple, 2012). The tacit to explicit is based upon the actual characteristics of the knowledge. The individual to collective is based on the location of knowledge. The architectural to component addresses the focus of knowledge whether it is part of a product or encompassing an entire system. The embodied to disembodied knowledge is focused around mobility of knowledge in traded intermediates or direct communication. These are discussed in the SLR. We focus on this research on relatedness and complexity of knowledge. It is based on the concepts of “building blocks of economic complexity” (Hidalgo & Hausmann, 2009; Hidalgo, 2009); “related and unrelated variety” (Frenken et al., 2007; Boschma & Frenken, 2011); “industry relatedness” (Neffke & Henning, 2009; 2014; Neffke et al., 2011a); and “differentiated knowledge base” (Asheim & Gertler, 2005; Asheim & Coenen, 2005; Asheim, 2007). These rest on knowledge that impacts on the branching process and path creation (Martin & Sunley, 2006; Frenken & Boschma, 2007; Martin, 2010; Neffke et al., 2011a).

Knowledge and capability are viewed as being embedded in institutions, firms, industries, clusters, and regions. It is established that path dependence conditions impact on regional development. Path dependence can be thought of as the accumulated knowledge and existing institutional capabilities embedded in a regional economy. In a sense, path dependence explains why certain regions’ ‘lock-ins’ into certain development trajectories. This is due to accumulated knowledge and existing capability embedded within institutions,

firms, products and industries. These condition the creation of new knowledge because of their absorption capacity (Cooke, 2002) and the complexity of existing knowledge and capability (Hidalgo & Hausmann, 2009). This “capability and knowledge based path dependence” views path dependence as a condition that accumulates a specific set of capabilities and knowledge that either inhibits or enables the creation of new related or unrelated knowledge with different degrees of complexity for growth and development. Capability and knowledge range from simple to complex and from related to unrelated, and these are associated with the context of path dependency conditions, economic actors, diversification mechanisms, and relatedness and complexity of diversification outcomes.

The outcome from the case studies of Singapore, Norway and UAE are six findings. First, institutional capabilities range from the simple to industrial policies, as in UAE, to the RPs of Norway, to the national and regional innovation systems of Norway, to the science and technology policies and programmes of Singapore, to the complexity of the institutional collaboration capabilities of Singapore to coordinate the development of targeted sectors, e.g. biotech cluster among local and international economic actors. Second, the increased level of capabilities is associated with an increased complexity level of products and industries that demand complex varieties of knowledge. Third, basic capabilities and knowledge are associated with indigenous industries that are created by SMEs and LPEs. Fourth, anchoring diversification mechanisms is driven by SOEs and MNEs creating simple complexity of unrelated varieties of products and industries that are associated with simple capability and knowledge. Fifth, branching diversification mechanisms are driven by SMEs to create complex varieties of related and unrelated products and industries that are associated with complex capabilities and knowledge. Sixth, clustering by SEZs around SOEs and MNEs to create high complex varieties of unrelated industries is conditioned by a high level of capabilities, in particular institutional collaboration capabilities, to accumulate complex varieties of knowledge. (Table-13). In a sense the revised proposition is

“Institutional capabilities underpin diversification mechanisms and determine the relatedness and complexity of diversification outcomes”

(Project- 3 Proposition-4)

4.6.7 Diversification Strategies

Moreover, regions undertake measures and implement different strategies to create new paths for diversification. The choice of strategies would depend on the context of path dependence and existing conditions and the set of institutional capabilities that are driven by government organizations and other economic actors. The role of strategies and policies matter; however, what is crucial is that institutions for collaborations that create linkages, collaboration and coordination among economic actors to build knowledge and capabilities, such as innovation capacity, are instrumental in the creation of new paths for growth and diversification. The strategies deduced from the empirical cases are discussed below.

Indigenous creation strategy

The simplest form of institutional capabilities and knowledge is associated with the creation of indigenous industries within the context of path dependence conditions on endowments and natural resources. Consequently, the creation of new complex capabilities and knowledge and institutional capabilities to generate complex varieties of products is difficult. It may be sufficient to capitalize on the comparative advantage of these locally endowed industries through the enhancement of institutional arrangements and the institutional environment. These include regional development agencies overseeing restructuring and funding programmes. The institutional capabilities are limited to collaboration in small-scale indigenous industries, SMEs-driven and often in rural areas, between social and economic actors such as farmers, fishermen, ship owners, ship designers, and the mechanics of the small workshops with a common economic interest in introducing new technology, e.g. around small engines and vessels, as in the case of Norway. The outcome is low complexity

related products that reinforce path dependence and do not accumulate complex varieties of capability and knowledge in a region.

Anchoring strategy

However, regions evolve over time; while they do not abandon indigenous products, they add new products (Hausmann and Hidalgo, 2010) that are related and unrelated to path dependent conditions with varying degrees of complexity through the deliberate actions of economic actors to anchor, branch and cluster new products and industries. In the context of basic accumulated and embedded capability and knowledge, a region may eventually desire to transform the economic productive structure away from their path dependence conditions towards complex varieties of unrelated products and industries. The 'intervention(s)' undertaken by the government 'actor(s)' include providing the platform to 'anchor' these unrelated varieties through the establishment of SOEs to create low complexity unrelated varieties and by supporting LPEs through, for example, access to industrial lands and local content procurement regulations to create mainly related, but in some cases low complexity unrelated varieties, and building the infrastructure (utilities, telecommunications, transportation, and logistics services) to attract MNEs to anchor the high complexity of unrelated varieties. The range of institutional capabilities could include national and industrial development policies that define priorities and an institutional arrangement that focuses on implementing these policies, e.g. a single agency overseeing SOEs or a public-private board-based governance of SOEs. The institutional environment is enhanced by investment awareness and the promotion of targeted industries through dedicated state agencies, and state funding. This context enables limited accumulated knowledge and innovation capacity within SOEs, LPEs and MNEs.

In the anchoring approach, the anchor firm "extends relations and cooperation far beyond the local economy" (Gray et al., 1996) but "exercises monopsony over regional factors of production and regional economic development process" (Chinitz, 1960 in Gray al., 1996) and provides little collaboration with other economic actors particularly SMEs beyond "product specification, quality

standards and delivery schedule” (Gray et al., 1996). Moreover, the export basket becomes dominated by the basic products of the anchor firm, such as polymers, aluminium, and steel, as in Norway and UAE. Thus, there is an incentive for both the government and anchor firm to focus efforts around the product of the anchor firm through “the promotion and regulation of the core industries and the provision of infrastructure” (Gray et al., 1996). The government development agencies and “trade associations are not likely to provide mechanisms for sharing risk such as joint training and marketing or technical and financial assistance” (Gray et al., 1996) as experienced in UAE. Universities and research institutions play a very minimal role in the anchoring approach, which is associated with low R&D investment by both government and SOEs. The exception may be if the university or the research institution were to “play the role of the anchor often coordinating their activities with the largest firms” (Gray et al., 1996) as with the Petroleum Institute in UAE. The anchor SOE may also establish a research institution, such as the Innovation Centre (polymers) for Borouge in UAE; however, such research institutions serve mainly the anchor firms. Consequently, the anchoring approach not only introduces vulnerability to the economy, due to high dependence on basic products, but it does not provide the thriving environment for SMEs to start up and branch related products and industries that sustain growth and enable diversification.

The national and regional innovation systems, as in Norway, would therefore be instrumental in creating knowledge across the targeted industry through dedicated organizations, such as Innovation Norway, which collaborate on research, development and innovation programmes, and consequently, enabling radical innovation within the targeted industry leading to the creation of complex unrelated varieties of products and industries that serve the anchored industries.

Branching strategy

The branching mechanism is already established in the existing literature as discussed above. The main argument in brief is that, “regional diversification will

predominantly be related diversification” (Neffke et al., 2014), and regions branch into related varieties or industries (Frenken et al., 2007) or related capabilities and knowledge (Hausmann & Hidalgo, 2010). Therefore, new paths emerge in the context of existing path dependence conditions and accumulated capabilities, which can be “existing structures, and paths of technology, industry and institutional arrangements” (Martin & Simmie, 2008:186). The institutional capabilities associated with the branching diversification mainly focus on establishing the institutional environment for SMEs to grow and spin off to generate complex varieties of related products and industries. The institutional environment includes laws and regulations, ease of doing business, access to finance, labour mobility, and an educated workforce.

Clustering strategy

In cases where embedded capability and knowledge are complex, a region can move into complex unrelated varieties of products and industries through clustering. The clustering mechanism could be around an anchor SOE, LPE or MNE, triggered by infrastructure based on SEZs or through a self-generating agglomeration of firms in a geographical location. It is found that the complexity of institutional capabilities is increased with the clustering mechanism of creating complex varieties of unrelated products and industries. The clustering around an anchor is an extension of the anchoring mechanism, thus the collaboration around national and regional innovation systems should enable the creation of complex unrelated varieties that are mainly serving the anchor industries. The provision of infrastructure through SEZs accompanied by comparative advantages and enhancement of the business environment by itself is not sufficient. The institutional collaboration around science and technology programmes for targeted industries is essentially required to capitalize on the knowledge embedded in MNEs.

In a sense, the main overarching proposition generated from this research is as follows

“In the context of path dependence and existing conditions of a region, economic actors undertake measures to

influence the institutional capabilities that trigger indigenous creation, anchoring, branching, and clustering diversification mechanisms, in order to create complex varieties of related and unrelated diversification outcomes”

(Project 3 Main Proposition)

Table 39: P3 Research Contributions

	Existing	Contributions
Theory	Existing literature on evolutionary economic geography is focused on path dependence and recently on relatedness and path creation	<p>This research contributes to evolutionary economic geography. It integrates path dependence, path creation relatedness and capability, in particular the creation of new paths for growth and diversification.</p> <p>It formulates a set of propositions as follows:</p> <p>Proposition 1: The context of path dependence and existing conditions underpins the diversification mechanisms and impacts on the relatedness and complexity of diversification outcomes</p> <p>Proposition 2: New paths for diversification are created through indigenous creation, anchoring, branching, and clustering path creation mechanisms that are associated with relatedness and complexity of diversification outcomes.</p> <p>Proposition 3: Relatedness and complexity shape diversification outcomes.</p> <p>Proposition 4: Institutional capabilities underpin diversification mechanisms and determine the relatedness and complexity of diversification outcomes.</p> <p>Proposition 5: Economic actors drive diversification mechanisms depending on institutional capabilities to create complex varieties of related and unrelated diversification outcomes.</p>

		<p>It further consolidates propositions into one overarching proposition that “In a context of path dependence and existing conditions of a region, economic actors undertake measures to influence the institutional capabilities that trigger indigenous creation, anchoring, branching, and clustering diversification mechanisms, in order to create complex varieties of related and unrelated diversification outcomes”</p> <p>Moreover, institutional collaboration capabilities are found to be instrumental in determining the relatedness and complexity of diversification outcomes</p> <p>It develops a matrix that establishes the relationships amongst the elements of the path creation framework shaping regional diversification.</p>
Methodology	Quantitative	The research suggests a methodology approach to analyse regional economic diversification based on the constructed path creation framework that integrates context, actors, institutional capabilities, factors, mechanisms and outcomes
Practice	Existing literature calls for developing integrated platform policies for regional development	This research provides government organizations with a different set of strategies, in particular institutional collaboration capabilities to influence economic growth and diversification towards complex industries

4.7 Conclusions

In conclusion, this research contributes to theory, methodology and practice (Table 39).

First, it integrates existing theoretical foundations of evolutionary economic geography, path dependence, industry relatedness, economic complexity, and path creation into a unified conceptual path creation model. It generates propositions, build a framework and develops a matrix for path creation framework. These provide a better understanding on the pathways to diversification pursued by regions. The main overarching proposition generated from this research is that “in the context of path dependence and existing conditions of a region, economic actors undertake measures to influence the institutional capabilities that trigger indigenous creation, anchoring, branching, and clustering diversification mechanisms, in order to create complex varieties of related and unrelated diversification outcomes”.

It builds a path creation framework that integrates context, actors, institutional capabilities, mechanisms, and outcomes shaping regional economic growth and diversification. Additionally, it defines four categories of underlying institutional capabilities for path creation: policymaking, institutional environment, institutional arrangement and institutional collaboration. The institutional collaboration capabilities are found to be the main underlying factors that explain why some regions create high levels of complex varieties of related and unrelated products and industries. Furthermore, this research develops a matrix that establishes the relationships amongst the elements of the path creation framework shaping regional diversification.

Second, existing literature on evolutionary economic geography is predominantly based on quantitative research; in this research the research synthesis of published cases is applied in the context of regional development. The prescriptive knowledge of linking context, actors, interventions, factors, and mechanisms to the diversification outcomes synthesises previously published research in evolutionary economic geography. The logic is as follows: in the

'context' of a region, the 'intervention(s)' undertaken by 'actors' are to influence underlying 'factors' to trigger the 'mechanism(s)' to generate set of 'outcomes'. It is suggested that these elements and the generated propositions and constructed framework and matrix can be used as a foundation for a methodological approach to the research that explains the creation of new paths for regional growth and diversification.

Finally, this research provides a set of integrated platform strategies to guide policy makers on setting up the pathways to diversification. The components of institutional capabilities are considered to be guiding principles for policymaking organizations on strategizing national and regional diversification trajectories. These in a way enable an integrated and collaborative approach towards mobilizing various economic actors on building capabilities and knowledge, such as investment promotion, science and technology programmes, R&D, state funding, innovation capacity that are all instrumental in increasing diversification and economic complexity.

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APPENDICES

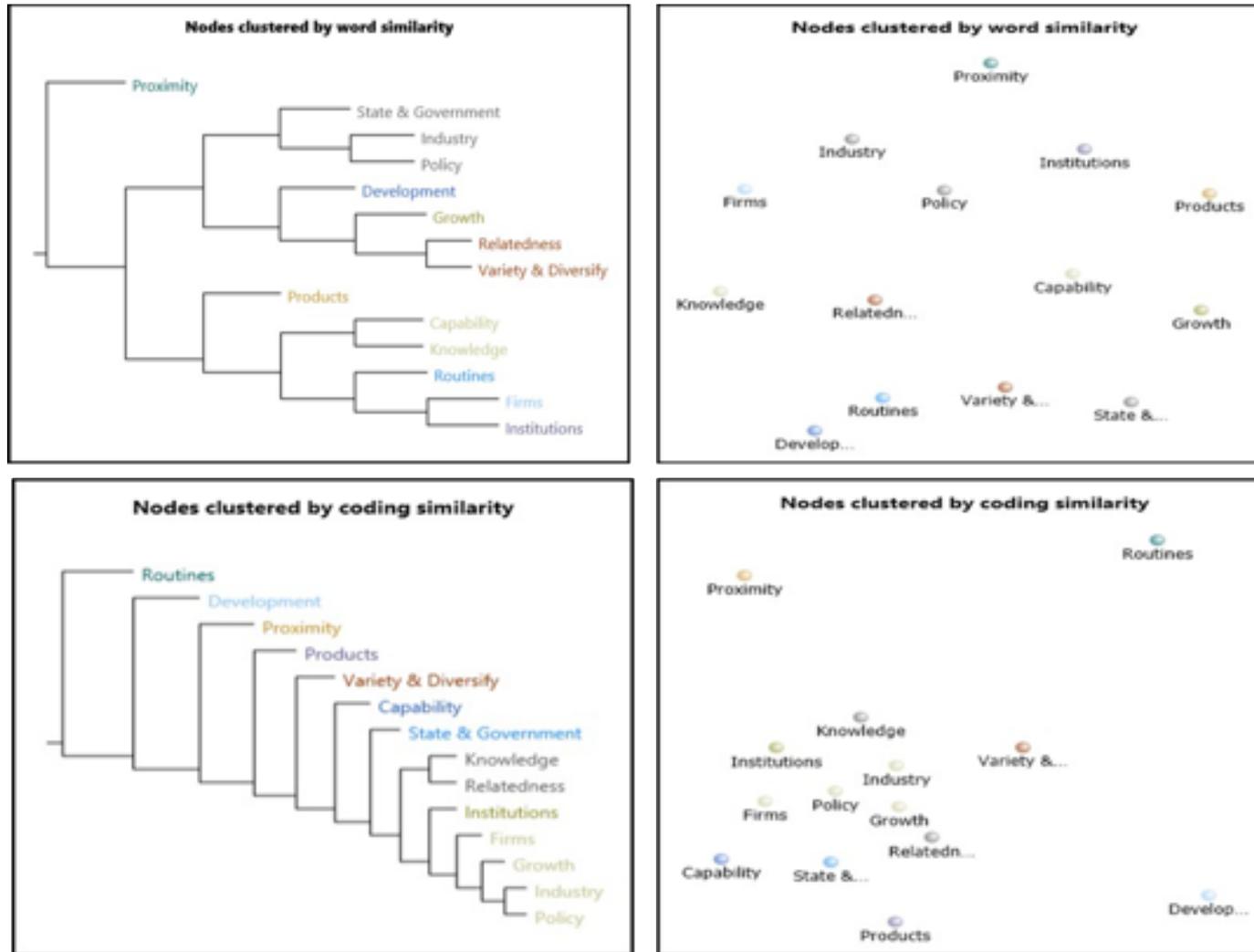
Appendix A SLR First Selection Process - Sample

Articles	Year	Evolutionary Economic Geography	Institutional Economic Geography	New Economic Geography	Path Creation	Path Dependence	Knowledge	Capability	Routines	State & Government	Institutions	Firms	Industry	Products	Variety & Diversify	Proximity	Relatedness	Policy	Growth	Selection	Citations	Key Words Frequency
404 : Steen, Karlsen_2014_Path creation in a single-industry town The case of Verdal and Wind	2014	1	0	20	39	17	18	14	1	5	10	60	98	3	19	1	10	12	13	1		264
295 : Martin, Sunley_2006_Path dependence and regional economic evolution	2006	34	1	45	23	240	24	25	1	5	69	28	145	5	18	1	19	10	32	1	305	382
195 : Henning, Stam, Wenting_2013_Path Dependence Research in Regional Economic Development	2013	8	0	0	14	169	18	2	2	0	29	0	104	1	11	0	29	2	21	1		219
92 : Cooke_2012_Transversality and Transition Green Innovation and New Regional Path Creation	2012	15	0	0	12	36	20	9	1	7	6	6	35	13	31	7	31	16	10	1		192
142 : Fornahl et al._2012_From the Old Path of Shipbuilding onto the New Path of Offshore Wind	2012	11	0	0	12	25	12	7	2	14	10	33	151	5	6	0	20	22	9	1		291
285 : Ma, Hassink_2013_AN EVOLUTIONARY PERSPECTIVE ON TOURISM AREA DEVELOPMENT	2013	35	0	4	9	27	3	11	4	12	43	1	30	45	2	0	10	11	5	1		177
410 : Sydow, Lerch, Staber_2010_Planning for Path Dependence The Case of a Network in the	2010	1	1	0	8	89	4	2	3	2	38	14	18	2	6	0	3	3	1	1		96
301 : Martin_2010_Roepke Lecture in Economic Geography-Rethinking Regional Path Dependence	2010	11	0	50	6	126	11	0	2	13	60	6	149	6	18	0	5	4	14	1	87	288
292 : Martin, Simmie_2008_Path dependence and local innovation systems in city-regions	2008	8	1	8	6	37	54	21	1	1	23	30	48	6	14	2	4	23	9	1	14	236
286 : MacKinnon et al._2009_Evolution in economic geography institutions, political economy, a	2009	68	12	34	5	26	8	5	26	6	112	1	30	0	24	1	13	4	11	1		241
80 : Cho, Hassink_2009_Limits to locking-out through restructuring the textile industry in Daegu	2009	9	0	0	3	10	7	9	0	34	18	22	230	9	13	0	25	19	9	1		395
148 : Fredin_2014_The Dynamics and Evolution of Local Industries - The Case of Linköping, Sw	2014	9	0	11	1	7	61	2	0	7	7	36	142	11	8	2	22	8	16	1		322
144 : Foxon_2011_A coevolutionary framework for analysing a transition to a sustainable low ca	2011	9	2	1	1	3	3	7	5	4	73	7	28	0	0	0	4	37	17	1		185
336 : Notteboom, De Langen, Jacobs_2013_Institutional plasticity and path dependence in sea	2013	6	5	5	0	42	1	10	32	12	134	21	15	0	2	4	12	7	7	1		257
298 : Martin, Sunley_2012_Forms of emergence and the evolution of economic landscapes	2012	15	0	0	0	35	13	9	5	11	8	3	29	5	3	2	7	6	9	1		110
118 : Essletzbichler, Rigby_2007_Exploring evolutionary economic geographies	2007	37	2	0	0	17	9	2	25	10	72	30	54	8	29	1	5	6	19	1		270
358 : Rafiqi_2009_Evolving economic landscapes why new institutional economics matters for	2009	30	27	5	0	14	13	2	15	0	271	5	14	0	0	0	2	4	14	1		340
44 : Boschma, Frenken_2006_Why is economic geography not an evolutionary science Toward	2006	89	22	166	0	12	46	5	61	5	176	75	57	1	15	1	12	14	36	1	210	504
180 : Hassink, Klaerding, Marques_2014_Advancing Evolutionary Economic Geography by Eng	2014	94	20	8	0	6	5	7	13	2	85	6	27	0	9	1	5	5	2	1		167
297 : Martin, Sunley_2011_Conceptualizing Cluster Evolution Beyond the Life Cycle Model	2011	3	0	13	0	5	24	8	1	4	10	5	104	18	7	0	15	10	41	1	12	247
150 : Frenken, Boschma_2007_A theoretical framework for evolutionary economic geography in	2007	23	0	0	0	5	18	2	38	1	9	48	41	12	32	5	7	4	67	1		284
324 : Neffke, Henning, Boschma_2011_How Do Regions Diversify over Time Industry Relatedn	2011	6	0	23	0	5	10	0	0	4	2	0	343	10	38	3	137	3	26	1		576
304 : Maskell, Malmberg_2007_Myopia, knowledge development and cluster evolution	2007	14	0	59	0	4	53	7	27	1	63	31	31	0	6	4	3	3	13	1		242
275 : Lin, Milhaupt_2013_We are the (National) Champions Understanding the Mechanisms of	2013	0	0	5	0	3	3	6	0	69	71	289	69	6	22	0	8	31	22	1		596
29 : Bathelt, Gluckler_2003_Toward a relational economic geography	2003	2	1	146	0	3	31	3	6	5	54	2	31	4	0	6	6	6	6	1	164	160
364 : Rigby, Essletzbichler_1997_Evolution, process variety, and regional trajectories of techno	1997	2	0	7	0	3	12	0	9	13	7	19	36	9	17	0	2	3	15	1		142
455 : Zhang_2013_Related Variety, Global Connectivity and Institutional Embeddedness Intern	2013	8	0	0	0	2	24	6	7	17	71	25	82	0	63	1	65	14	23	1		398
159 : Gertler_2010_Rules of the game the place of institutions in regional economic change	2010	0	9	43	0	2	14	4	1	20	164	1	30	2	16	0	6	9	3	1	47	270
130 : Fagerberg_2003_Schumpeter and the revival of evolutionary economics an appraisal of th	2003	43	2	25	0	2	26	6	10	4	27	3	44	1	17	0	12	21	73	1		244
143 : Foster, Metcalfe_2012_Economic emergence An evolutionary economic perspective	2012	29	0	0	0	2	33	10	3	12	14	3	5	5	1	0	2	3	45	1		136
58 : Brenner, M. Hlig_2013_Factors and Mechanisms Causing the Emergence of Local Industri	2013	4	0	6	0	2	28	1	0	18	9	7	269	3	1	1	16	42	16	1		411
207 : Hoffmann, Lopes, Medeiros_2014_Knowledge transfer among the small businesses of a B	2014	0	0	1	0	1	91	3	1	4	37	9	57	9	6	1	14	3	2	1		237
267 : Lambooy_2010_Knowledge Transfers, Spillovers and Actors The Role of Context and Soc	2010	11	0	1	0	1	190	15	7	3	17	2	17	8	5	4	9	4	30	1		311
264 : Lail_2000_The Technological Structure and Performance of Developing Country Manufac	2000	0	0	0	0	1	8	41	0	6	13	12	48	117	1	1	4	38	47	1		336
50 : Boschma, Minondo, Navarro_2012_The Emergence of New Industries at the Regional Leve	2012	6	0	17	0	1	18	43	0	1	9	0	110	83	24	24	82	6	16	1		416
419 : Ter Wal, Boschma_2011_Co-evolution of Firms, Industries and Networks in Space(2)	2011	9	0	3	0	1	86	73	12	3	6	27	197	3	24	17	21	8	23	1		500
54 : Boschma_2011_Related Variety , Trade Linkages , and Regional	2011	4	0	11	0	1	97	9	0	1	1	2	71	3	105	9	114	8	103	1		523
199 : Hidalgo, Hausmann_2009_The building blocks of economic complexity	2009	0	0	0	0	1	0	55	0	2	1	1	7	123	58	9	12	2	50	1		320
379 : Salvador, Ramirez_2004_The relevance of new industrial policy thinking to	2004	12	2	0	0	1	217	96	18	131	687	858	746	65	19	50	44	582	48	1		3561
346 : Peck, Theodore_2007_Variiegated capitalism	2007	2	3	14	0	1	2	8	4	10	273	18	36	1	180	1	3	18	7	1		561
98 : Cumbers, MacKinnon, McMaster_2003_Institutions, Power and Space Assessing the Limits	2003	0	11	0	0	1	28	5	3	11	134	20	16	2	1	2	4	27	9	1		262
359 : Rafiqi_2010_Varieties of capitalism and local outcomes A Swedish case study	2010	0	0	0	0	1	4	2	0	3	82	126	85	7	28	1	6	3	3	1		350
89 : Cooke_2001_Regional innovation systems, clusters, and the knowledge economy	2001	1	0	0	0	1	58	15	1	29	17	51	48	3	5	7	3	30	12	1		279
382 : Saviotti, Frenken_2008_Export varieties and the economic performance of countries	2008	1	0	2	0	1	5	10	1	0	13	1	19	5	132	1	74	5	84	1		350
374 : Rodriguez-Pose_2013_Do Institutions Matter for Regional Development	2013	0	5	15	0	0	5	16	2	5	261	1	13	0	2	1	3	39	47	1		395
45 : Boschma, Frenken_2009_Some notes on institutions in evolutionary economic geography	2009	20	2	40	0	0	10	2	35	1	77	1	36	1	9	0	0	3	4	1	151	179

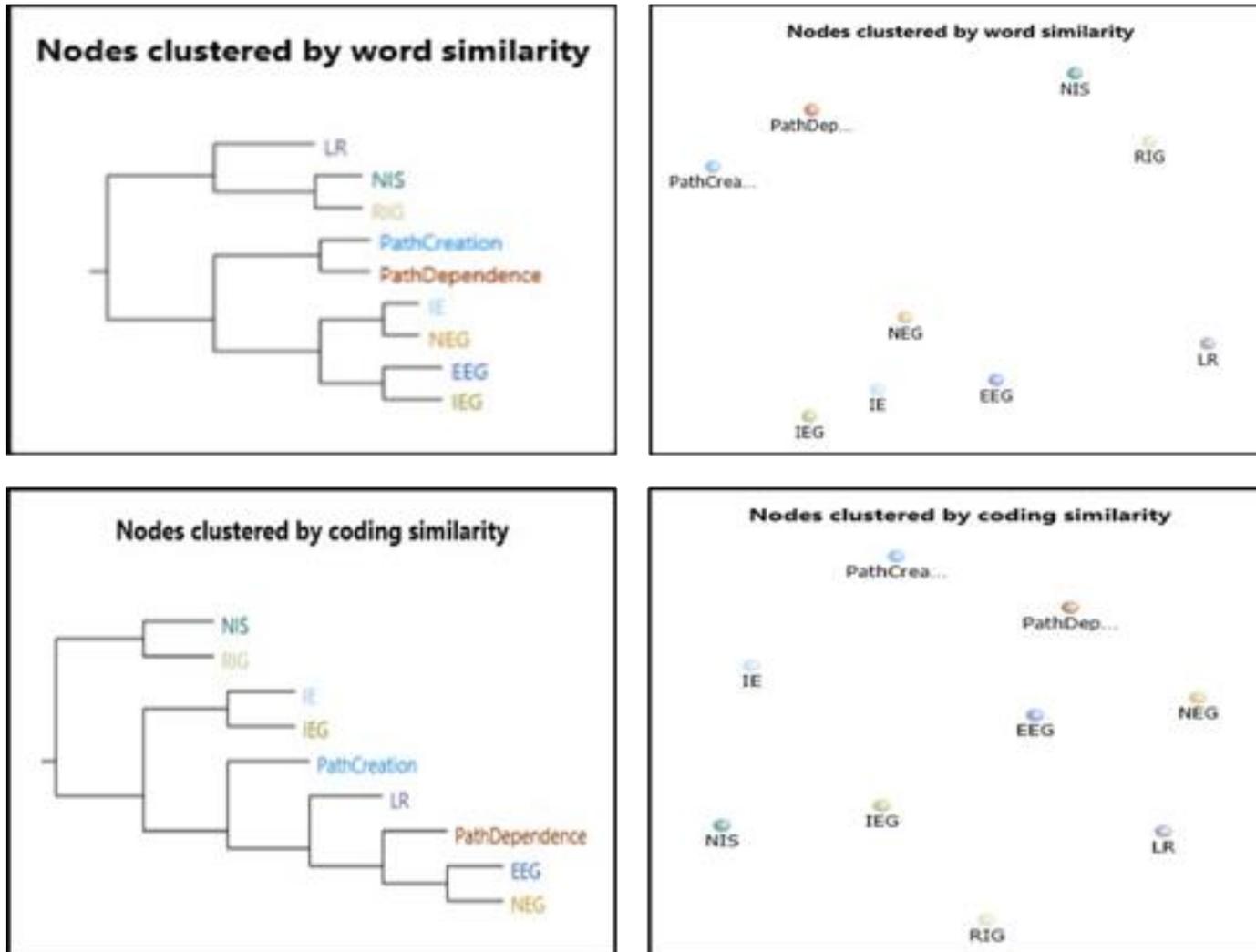
Appendix B SLR Second Selection Process-Sample

Articles	Year	Type of Research	Methodology	Bases of Data	Outcome	Unit of Analysis	Literature Review	Theory2	Methodology3	Contribution	Data Analysis	Score	Journal Ranking	Inclusion	Location
404 : Steen, Karlsten, 2014_Path creation in a single-industry town The case of Verdal and Wind	2014	Empirical	Case & Qualitative	Interviews & Interviews	Proposition	Single Industry Town	9	9	5	9	9	41	?	Y1	Norway
295 : Martin, Sunley, 2006_Path dependence and regional economic evolution	2006	Theoretical	Literatures	Literatures	Proposition		9	5	9	9	3	35	3	Y1	UK
195 : Henning, Stam, Wenting, 2013_Path Dependence Research in Regional Economic Devel	2013	Theoretical	Literatures	Literatures	Proposition		9	9	5	9	3	35	4	Y1	Sweden
92 : Cooke, 2012_Transversality and Transition Green Innovation and New Regional Path Crea	2012	Theoretical	Literatures	Literatures	Proposition		9	9	5	9	3	35	?	Y1	UK
142 : Fornahl et al., 2012_From the Old Path of Shipbuilding onto the New Path of Offshore Wir	2012	Empirical	Qualitative	Case	Proposition	Single Industry	5	5	5	9	5	29	?	Y1	Germany
285 : Ma, Hassink, 2013_AN EVOLUTIONARY PERSPECTIVE ON TOURISM AREA DEVELO	2013	Theoretical	Literatures	Literatures	Model	Region	5	5	3	9	3	25	?	Y1	Germany
410 : Sydow, Lerch, Staber, 2010_Planning for Path Dependence The Case of a Network in the	2010	Empirical	Qualitative	Interviews & Interview	Proposition	Single Industry	9	9	9	9	9	45	?	Y1	Germany
301 : Martin, 2010_Roepke Lecture in Economic Geography-Rethinking Regional Path Depend	2010	Theoretical	Literatures	Literatures	Concept		9	9	5	9	3	35	?	Y1	UK
292 : Martin, Simmie, 2008_Path dependence and local innovation systems in city-regions	2008	Theoretical	Literatures	Literatures	Concept		9	9	5	9	3	35	?	Y1	UK
286 : MacKinnon et al., 2009_Evolution in economic geography institutions, political economy, a	2009	Theoretical	Literatures	Literatures	Proposition		9	9	5	5	3	31	?	Y1	UK
80 : Cho, Hassink, 2009_Limits to locking-out through restructuring the textile industry in Daegu	2009	Empirical	Interviews	Case	Proposition	Industry	9	9	5	9	3	35	4	Y1	Korea
148 : Fredin, 2014_The Dynamics and Evolution of Local Industries - The Case of Linköping, Sw	2014	Empirical	Qualitative	Interview & Interview	Proposition	Single Industry	5	5	5	5	3	23	?	Y1	Sweden
144 : Foxon, 2011_A coevolutionary framework for analysing a transition to a sustainable low ca	2011	Theoretical	Literatures	Literatures	Proposition		3	3	3	9	5	23	3	Y1	UK
336 : Notteboom, De Langen, Jacobs, 2013_Institutional plasticity and path dependence in sea	2013	Empirical	Case	Literatures	Proposition	Single Industry	5	5	5	9	3	27	?	Y1	Netherlands
298 : Martin, Sunley, 2012_Forms of emergence and the evolution of economic landscapes	2012	Theoretical	Literatures	Literatures	Concept		9	9	5	9	3	35	2	Y1	UK
118 : Essletzbichler, Rigby, 2007_Exploring evolutionary economic geographies	2007	Empirical	Quantitative	Secondary	Proposition		9	9	9	9	3	39	3	Y1	UK
358 : Rafiqi, 2009_Evolving economic landscapes why new institutional economics matters for	2009	Theoretical	Literatures	Literatures	Concept		9	9	5	9	3	35	3	Y1	Sweden
44 : Boschma, Frenken, 2006_Why is economic geography not an evolutionary science Toward	2006	Theoretical	Literatures	Literatures	Concept		9	9	9	9	3	39	3	Y1	Netherlands
180 : Hassink, Klaerding, Marques, 2014_Advancing Evolutionary Economic Geography by Eng	2014	Theoretical	Literatures	Literatures	Proposition		9	9	5	9		32	4	Y1	Germany
297 : Martin, Sunley, 2011_Conceptualizing Cluster Evolution Beyond the Life Cycle Model	2011						9	9	5	9		32	4	Y1	UK
150 : Frenken, Boschma, 2007_A theoretical framework for evolutionary economic geography in	2007	Empirical	Quantitative	Secondary	Model		9	5	5	5		24	3	Y1	Netherlands
324 : Neffke, Henning, Boschma, 2011_How Do Regions Diversify over Time Industry Related	2011	Empirical	Quantitative	Secondary	Model	Region	9	5	9	9	9	45	?	Y1	Netherlands
304 : Maskell, Malmberg, 2007_Myopia, knowledge development and cluster evolution	2007	Theoretical	Literatures	Literatures	Proposition		5	5	5	5	3	23	3	Y1	Denmark
275 : Lin, Milhaupt, 2013_We are the (National) Champions Understanding the Mechanisms of	2013	Empirical	Quantitative	Secondary	Concept		9	9	9	9	5	41	?	Y1	US/China
29 : Bathelt, Gluckler, 2003_Toward a relational economic geography	2003	Theoretical	Literatures	Literatures			9	9	5	5		28	3	Y1	Germany
364 : Rigby, Essletzbichler, 1997_Evolution, process variety, and regional trajectories of techno	1997	Empirical	Quantitative	Secondary	Proposition	Region	9	9	9	5		32	?	Y1	US
455 : Zhang, 2013_Related Variety, Global Connectivity, and Institutional Embeddedness Intern	2013	Empirical	Quantitative	Secondary	Proposition	Single Industry	5	5	9	9	3	31	4	Y1	China
159 : Gertler, 2010_Rules of the game the place of institutions in regional economic change	2010	Theoretical	Literatures	Literatures	Concept		9	5	5	5	5	29	4	Y1	Canada
130 : Fagerberg, 2003_Schumpeter and the revival of evolutionary economics an appraisal of th	2003	Theoretical	Literatures	Literatures	Proposition		9	9	5	3	5	31	3	Y1	Norway
143 : Foster, Metcalfe, 2012_Economic emergence An evolutionary economic perspective	2012	Theoretical	Literatures	Secondary		Single Industry	9	9	5	5	5	33	2	Y1	Australia
58 : Brenner, M hlig, 2013_Factors and Mechanisms Causing the Emergence of Local Industr	2013	Empirical	Qualitative	Secondary			5	3	5	5	5	23	4	Y1	Germany
207 : Hoffmann, Lopes, Medeiros, 2014_Knowledge transfer among the small businesses of a B	2014	Empirical	Qualitative	Mixed	Proposition		9	5	9	5	5	33	3	Y1	Brazil
267 : Lambooy, 2010_Knowledge Transfers, Spillovers and Actors The Role of Context and Soc	2010	Theoretical	Literatures	Literatures	Proposition		9	9	9	5	5	37	N/A	Y1	Netherlands
264 : Lall, 2000_The Technological Structure and Performance of Developing Country Manufac	2000	Empirical	Quantitative	Secondary	Proposition		9	5	9	9	9	41	1	Y1	UK/World
50 : Boschma, Minondo, Navarro, 2012_The Emergence of New Industries at the Regional Leve	2012	Empirical	Quantitative	Secondary	Proposition		9	9	9	9	9	45	N/A	Y1	Spain
419 : Ter Wal, Boschma, 2011_Co-evolution of Firms, Industries and Networks in Space(2)	2011	Theoretical	Literatures	Literatures	Concept		9	9	9	5	3	35	4	Y1	Netherlands
54 : Boschma, 2011_Related Variety , Trade Linkages , and Regional	2011	Empirical	Quantitative	Secondary	Proposition		9	9	9	9	9	45	N/A	Y1	Italy
199 : Hidalgo, Hausmann, 2009_The building blocks of economic complexity	2009	Empirical	Quantitative	Secondary	Proposition		9	9	9	9	9	45	?	Y1	US/World
379 : Salvador, Ramirez, 2004_The relevance of new industrial policy thinking to	2004	Empirical	Mixed	Case	Concept		9	9	9	9	9	45	PhD	Y1	Argentina
346 : Peck, Theodore, 2007_Variiegated capitalism	2007	Theoretical	Literatures	Literatures	Proposition		9	9	9	9	9	45	?	Y1	US
98 : Cumbers, MacKinnon, McMaster, 2003_Institutions, Power and Space Assessing the Limits	2003	Theoretical	Literatures	Literatures	Proposition		9	9	9	9	5	41	?	Y1	UK
359 : Rafiqi, 2010_Varieties of capitalism and local outcomes A Swedish case study	2010	Theoretical	Quantitative	Case	Proposition		9	9	3	5	5	31	?	Y1	Sweden

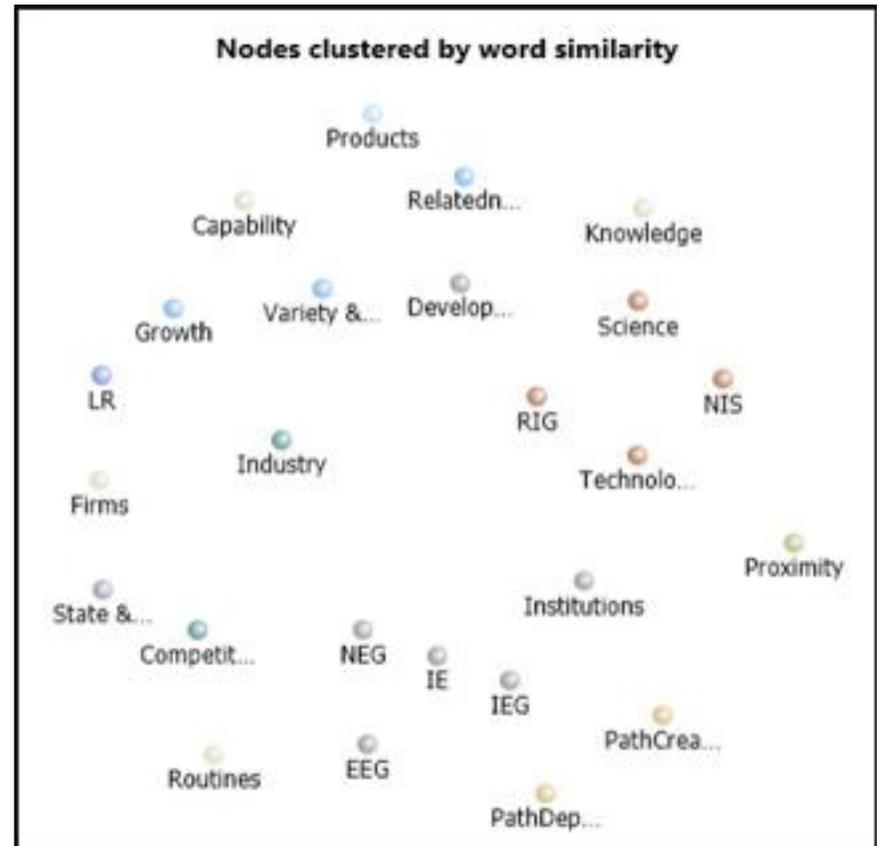
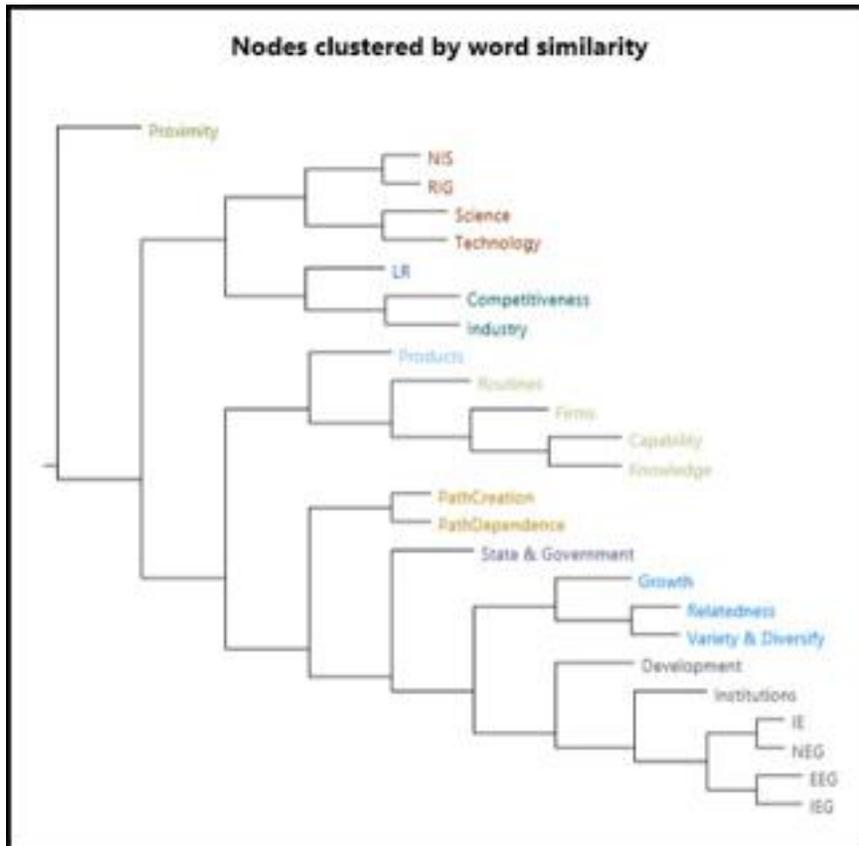
Appendix C Nvivo 10 Content Analysis Figures



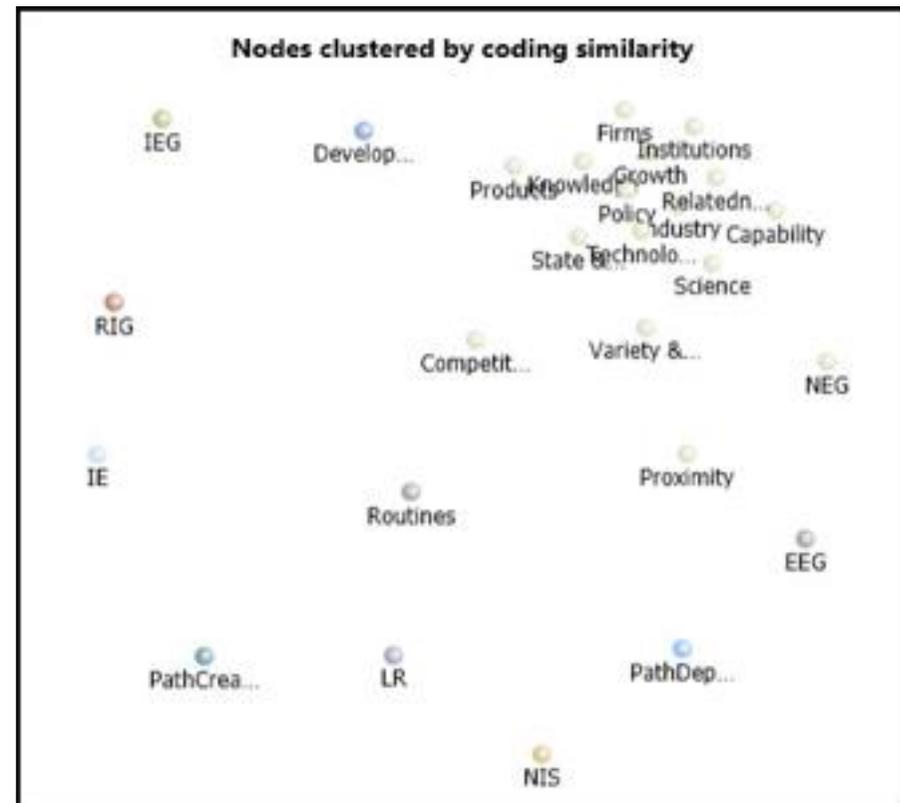
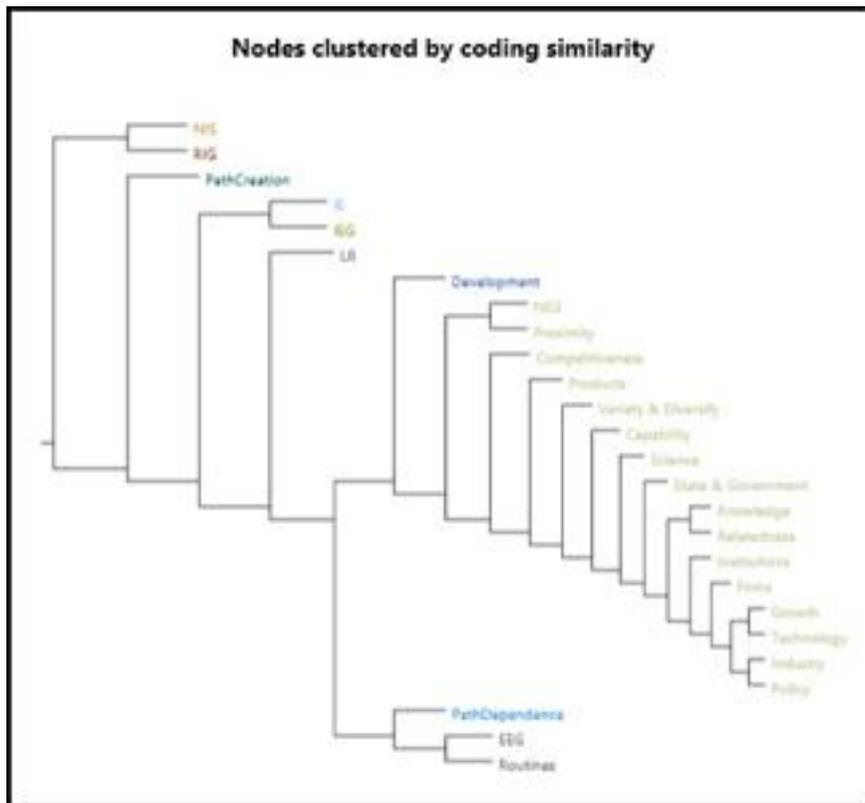
Figure_Apx 1: Analysis of Actors and Factors by Words and Coding



Figure_Apx 2: Analysis of Theoretical Themes by Words Coding



Figure_Apx 3: Analysis of Actors, Factors and Themes by Words



Figure_Apx 4: Analysis of Actors, Factors and Themes by Coding

Appendix D Example of Interview Transcript

Interview with a Senior Advisor in the Government

Q Thank you first of all for participating in my doctorate research. Now my research is about how institutions influence economic diversification. Within the context of Abu Dhabi, we have the main economic actors. We have the SOEs, we have the government institutions like the Chamber of Commerce, the Economic Council. We have the private sector at large, including the SMEs, and we have also special economic zones.

I have done already around ten interviews. The main themes that are coming out of these interviews, that we lack coordination and collaboration, to make sure that whatever we set to achieve economic diversifications is not happening. So what the government has to do in terms of influencing economic diversification, is there a role for the government or someone else has to do this kind of coordination.

So maybe we'll start with your view about how Abu Dhabi evolved in their economic structure from oil and gas to something else, to the current situation, and who were the main players and what the government should do in the future.

A Okay. This is a very interesting topic and the question you raise is not an easy question to answer. There are several forces at play that are shaping the economic scene and the development of the economic landscape in Abu Dhabi today. I wouldn't say that there is a total lack of coordination. There is, I think, a good amount of coordination.

I think the government is aware, to a large extent, of the key issues facing economic development in general and development at the level of the target sectors. But *the main obstacle we face is in bringing about a higher degree of coordination and collaboration among the different players is basically the existing decision making approach.*

I would call it a consensual decision making approach, okay. I think it has both advantages and disadvantages, as we learn in management. The main disadvantage here is that it's time consuming to bring about consensus among the different key stakeholders around proposed policy or regulatory change or some sort of introduction of a new incentive or something of that respect takes a lot of time. Time is money.

Beyond that even, *beyond the cost to the economy and investors and all that, people lose interest, investors lose interest.* Things that might have happened don't happen, so you lose on economic value that would otherwise have been generated.

You have really to weigh the cost and benefits of the decision making approach and to determine whether it is the most suitable approach for you at this stage of development or not, and then decide how to move forward. But I definitely believe that something needs to be done in this area and evaluating the decision making approach and the time it takes and its impact on the decision-making of the different players and the actions of the different players.

So that's, in a nutshell, where I see the key issue. But again, I think there is a good level, as I said again from the beginning, there is a good level of coordination. I think there is a good level of understanding of what the issues are, but what's delaying things is the type of decision making approach that we take today.

Q Could you give an example of decision making that was delayed, that you think was not that [inaudible 05:45]?

A For example, when we talk about economic zone, you have two entities, ZonesCorp and Kizad. They're both involved in developing manufacturing industries or attracting manufacturing industries to the Emirate.

A key question that arose at the beginning when Kizad was established, because it was established after ZonesCorp, is what role Kizad is going to play in that respect. What industries are going to be targeted by Kizad versus

ZonesCorp, so what are the manufacturing industries that are best suitable for Kizad versus the manufacturing industries that are best suited for ZonesCorp.

It's a very legitimate question because you're deploying resources as a government in both zones and you want to make sure that you get the maximum benefit out of the investment you've made, so you want to target the right industries suitable for each one of them.

When you look at the studies done for ZonesCorp, by consultants or internally, they've selected certain manufacturing industries that they want to attract. But that was done in a silo, away from Kizad. Kizad did the same exercise on their own. They ended up selecting many similar industries, so they are competing for the same tenants with two different sets of incentives.

So the Emirate now is competing with itself. That creates confusion in the mind of investors – where do I go, Kizad or ZonesCorp? Why the incentives here are different from the incentives there? Why these guys are telling me they have [cash if 07:48] they're not sure if they're going to get the [cash 07:51] or not?

Is that confusion or is it just that these guys are better at marketing themselves than the other guys? Are they using the same contract? Well, these guys are giving me like a 50 year contract, these guys are giving me a 30 year contract. That contract is financeable, this contract is not financeable.

Then the investor might go somewhere else because of this confusion. He's afraid now. These guys, do they really know what they're doing or not? It's the same industry, automobiles, and both are saying we will take you but the incentives are different, and they're saying different things about what they can do for me and what they can't do for me, so why build two?

There needs to be an agreement among the two entities about the type of industries that each will try to attract and the incentive package that will be used by each one of them. This was discussed on several occasions, but the decision was not made around that so they continued to compete with each other. You must have lost a lot of economic value, I mean there is no doubt in my mind, because of that.

Now, maybe a certain investor might have thought that ZonesCorp is much better for them location wise, but because the incentives that were being offered by Kizad were better than those being offered by ZonesCorp, with Kizad not having the right location for them they ended up going nowhere. They might have wished that the incentives being offered by Kizad were at ZonesCorp so that they can get both the incentives and the location, so they go somewhere else.

This is one sort of thing. Another example has to do with, for example, *you look at other zones like [inaudible Masdar 10:03], like the Airport Free Zone, like twofour54. Each one of them is supposed to be specialised in a certain type of business, attracting a certain type of business or anchoring a certain type of industry. But, at the end of the day, when you go and see what's actually on the ground, you find out that the three of them are competing with each other over the same type of business. Even if they are a legal firm, you'll be able to get a licence at the Airport Free Zone and even twofour54 would compete with them to get the same type of business.*

Again, that creates the same sort of lack of clarity in the minds of investors. Investors require clarity. You need a clear and stable policy vision. So if there's lack of clarity in terms of the policy and regulatory regime and there's lack of stability in the policy and regulatory regime, that will scare off investors and they will go somewhere else.

The decision-making approach today is not helping in clearing the scene and providing more clarity for investors around where to go and why to go there. So I think a lot of value is being lost in Abu Dhabi because of that, definitely. A lot of value in terms of not only the investment that would otherwise have been made by private investor, but also in terms of the depreciation of the infrastructure that you've put in place and that is waiting for investors. It is big values.

Put aside the employment opportunities that could have been generated and the spill over to other sectors, transport sector and tourism sector and telecommunication sector. Now, to go back to your original question about how

Abu Dhabi evolved, in my mind, *I think the key player, I would call it even the black horse that have been driving Abu Dhabi's diversification for most of the past 30 to 40 years is ADNOC.*

Many people will not be happy to hear this. But it's an irony that the main oil producer itself has been the main player driving the diversification of the Emirate away from oil production.

Q How is that?

A ADNOC has been the economic powerhouse and still the economic powerhouse of Abu Dhabi until this minute. I think ADNOC is a world class organisation. It's run according to world class standards. *I think that by establishing sister companies that are not directly involved in upstream activities, oil and gas production but rather midstream, downstream activities and all that.*

ADNOC has played, and petrochemicals has played the bigger role in driving the diversification of Abu Dhabi. Most of the businesses that have been created in other sectors, be it in the hospitality sector, in the transportation sector, even telecommunications sector and so forth, have been largely financial services sector, have been largely driven by the activities of the ADNOC sister companies, no one else.

ADNOC is not only the oil powerhouse of the Emirate, it is the economic powerhouse of the Emirate. It has been driving economic activities literally in almost every sector and not, as many people think, through government spending. That's not true. That has changed a lot over the past 30 or 40 years.

Consumer spending today is a major chunk, I don't remember the exact percentage today but it's a major chunk of Abu Dhabi's GDP. So private consumption is a major chunk and private investment also is a significant chunk of Abu Dhabi's GDP.

So it's not government spending that is [inaudible 15:46]. Private consumption is not directly affected by oil prices. If oil price goes up, oil price goes down, I

need 10,000 dollars to sustain my standard of living. It is not going to change. I will still try to spend the 10,000 dollars, as a private consumer. I'm not the government, if the oil price goes down then I have to pull the ropes.

So the economic history of Abu Dhabi has been written by ADNOC and ADNOC policies and ADNOC strategies. I think ADNOC has been a great boom to this Emirate and the way it has been run. Now of course, thinking forward beyond what ADNOC has done, and there are limits to what ADNOC can do, of course I don't want to go into a lot of detail about what different entities and all that that have been created, have tried to do and not to, but I would say people have talked about a lot of type of industries that can be used as drivers of diversification in the Emirate.

I think all of these types of industries that we have heard about over the past 10 to 15 years boil down to two, beyond what ADNOC and its sisters have been doing. It boils down to two: manufacturing and tourism because – I might add financial services but it's not going to be like financial services in its broad sense.

If Abu Dhabi is to become a financial centre, it will become a financial centre specialised in a certain type of financial services. It's not going to be like the broad type of financial centre like New York or Frankfurt. So I think, inshallah, Abu Dhabi global market will become that type of – or will provide that type of specialised and unique financial services that can put Abu Dhabi on the international map as provider of financial services internationally.

Go back again, you have oil, upstream oil, midstream oil, downstream oil and gas and then you have manufacturing and tourism.

Q When you say manufacturing, what kind of manufacturing?

A Yes, well manufacturing – look, people have been talking about capital intensive mostly and energy intensive industries but I think we can go beyond that. I think we can also talk about manufacturing based on –

Q If you see the figures, I mean the main manufactures, they're base metals, the aluminium, you have the steel.

A Yes, it's mostly energy intensive and capital intensive industries.

Q Yes, and basic metals.

A Yes, basic metals, yes.

Q Yes, basic metals. But you don't have other kinds of downstream manufacturers.

A Yes. *I think, for example, some of the manufacturing activities that could do well in Abu Dhabi and have not been given a lot of attention is pharmaceutical. Now there is I think one or two companies and they're doing very well, but they were only established – well they were established by a private sector and they seem to be doing well, and I think they will do well.*

Look, for example, at [inaudible Galfar 20:29]. Galfar was established in [inaudible 20:31] with very little government support, very little private sector investment and they've managed to grow globally and compete globally. I think the Galfar model can very easily be emulated.

I'm talking about the type of manufacturing industry that are driven by human brain and by educated manpower. If we go there, I think Abu Dhabi might do well. Pharmaceutical is certainly one of them, certain types of manufacturing industries that are related to renewable energies like solar energy and things like that also might do well.

We've talked for some time about manufacturing related to water equipment also can do well in the Emirates. So specialised type of products, you don't have to go into the full range. Food manufacturing, food stuff manufacturing is doing well, the people that are here. Packaging is an important –

Q What normally decides the sectors that should be here?

A See you have to go through – we've built at some point, while we were looking at the industrial strategy, we built a very robust, extensive prioritisation

model to determine which manufacturing industries are best suited for Abu Dhabi. The industries I mentioned to you are some of the industries that were selected by the model itself and it was not like – even the input that went into the model was not the decision of one guy.

It was an approach through, we had like 10 or 15 consultants with varied expertise and they all were deciding on every value that's going to go for every value in the model until we came out with a list of prioritised manufacturing industries for Abu Dhabi. The basic metals will do very well in Abu Dhabi.

So you have steel, you have aluminium, it can go into copper. Now beyond those, you've got food stuff, you've got pharmaceuticals, you've got packaging. Now there were a couple of other, two or three, industries, renewables –

Q The aerospace are also one of –

A Aerospace of course because of aluminium and all that it can do well.

Q Renewable energy.

A Renewable, yes, were one of them. So you've got about seven that looked really good for Abu Dhabi. So it's not a subjective matter. You have to look at your competitive –

Q Advantages.

A Advantages. I want to mention something here that's very important. I think one of the key things that is delaying the development, or even blocking maybe the development of manufacturing industries in Abu Dhabi is the fact that Abu Dhabi has two key competitive advantages, which are basically energy and capital. These are not sufficiently being turned into – what's the other word they use?

Q Valuables?

A Competitive –

Q Advantage? Competitive positioning?

A No, they're not being turned into – there is a competitive advantage and there is another word, competitive advantages you –

Q Comparative?

A Ah yes.

Q Comparative.

A Yes, now these two comparative advantages – sorry, I got it wrong. You have two *key comparative advantages at the national level*. These are energy and oil. Now, one of the key reasons, maybe the most critical reason why industrialisations are not happening as quickly as you want it to happen in Abu Dhabi and manufacturing industries are not happening as quickly as we want them to happen, is the fact that these two comparative advantages, energy and capital, are not being turned into competitive advantages at the firm level so that investors can capitalise.

So saying that, *it's very clear that cheap gas is not available, cheap fuel is not available, cheap finance is not available. With those three being not available for industries, they're not going to happen.*

Q Yes, because you don't have anything else.

A But when you look at the international model used by several countries for the successful development of manufacturing industries, it's a three layer model. Then it explains to you why what we've just mentioned is very relevant, critically relevant. This is so critical for Abu Dhabi, turning your competitive advantages into competitive advantages at the firm level.

The three layered model tells you that in countries where industrialisation has been successful, the overarching policy and regulatory umbrella was very effectively put in place, providing all the general enablers required by target industries to grow and flourish. So that's the first layer.

In the lower layer, leave the middle bit, *in the lower layer they looked at SMEs. Without SMEs you're not going to have any manufacturing.* There is no

industrial landscape that is made up of only large manufacturers. There are only a few large manufacturers.

All the other manufacturers around them are small to medium size manufacturers who buy and sell each other and the big players and people outside. So in a sense, what we're saying is that clustering is not an object that you go and buy from somewhere and put it in place.

Clustering is a process. It is an organic process that needs to be kicked off. Once it's kicked off it will fuel itself. How do you kick it off? You put that overarching policy, policy and regulatory umbrella in place. *You put the anchor investments in place, the target industries in the second layer and then you put the SMEs in place.* How do you put the SMEs in place?

The SMEs have to create themselves. SMEs are known to have an average age of five years. 90% of SMEs die before the age of five. Sorry, that was wrong 90%. I got it wrong. They don't have an average of five. 90% of SMEs die before the age of five. So how do you create a sustainable SME, vibrant SME environment?

You have to put the right things in place for SMEs to grow around the target anchor, the anchor target industry. *What SMEs require are three things and that's what has to be in the lower layer. They require finance. SMEs do not happen without external finance. Commercial banks in the country are not willing to provide equity finance for SMEs so the government must step in and provide equity finance for SMEs.*

SMEs require training and basic business management skills. So we have to create these centres that can provide basic training in accounting skills and business management and marketing and all that so these small business owners begin to understand how better to operate and drive their business. You can even have incubators and all that, have them work jointly and learn from each other.

The third thing, which is also very important, is marketing. SMEs cannot go and market themselves outside, it's very costly for them.

Q Outside the country?

A Outside the country. *So what governments do is they look at the SMEs they have, their SME portfolio. So they have a large number of SMEs operating in the food stuff manufacturing, they look at the different events that take place worldwide and bring together food stuff manufacturers.*

The government goes and rents a big space for all the SMEs that want to participate from the country. They tell them okay you are invited, your space is reserved. All you have to do is buy an economy class ticket and find a cheap hotel and come there. *So that encourages them to go and market themselves outside.*

Many of them might succeed because they have a product that would have a market, food stuff product that might have a market somewhere and someone will find them at the show and say I'd like to sign a contract with you and you can ship. So if the three layers are not in place, you're going to have issues in industrialisation.

I think we have gaps in both the overarching policy and regulatory umbrella and some lack of clarity around it and that's because of the decision making approach we talked about earlier. We have gaps in the lower layer because of the type of support that's available for SMEs, especially in terms of financing. I don't know much about the training and marketing. In terms of the anchor industries, I think they're clear.

Q But how will the anchor industries help the SMEs?

A *Look, the way SMEs develop around anchor industries is basically by looking at the type of supply chain required by the anchor industry and how they can participate in that supply chain, or looking at downstream activities that can be generated by working closely or buying the output of the anchor industry.*

So SMEs will develop around either the supply chain of the anchor industry or the downstream activities that can be developed from that type of industry.

Q But if we look at the examples that you mentioned –

A For example, look at aluminium. Even packaging can be one industry.

Q But why is it not happening?

A I told you.

Q Because of the three areas, the finance –

A I told you, financing and some issues have to deal with the overarching policy and the clarity around it. Look at ZonesCorp, at Kizad, it's not clear, their identities are not clear to investors. Even if investors go beyond that and establish themselves then it's –

Q Is there a role for these anchor industries to support [inaudible 35:34]?

A Oh definitely the anchor industry has to support. The government's role –

Q I mean the anchor industries.

A Yes, but *the government has to step in and exert pressure on the anchor industries to provide a certain amount of their procurement to local suppliers so that they can participate in the supply chain. You cannot buy everything from outside as an aluminium manufacturer here in Abu Dhabi.*

If some of your contracts are not going to the small players here in Emirate, they're not going to survive, so there has to be. In many countries they allocate, even the [inaudible 36:21], the WTO allows you to, I think to set the percentage around 10%. Not discount on price or whatever, no, a specific 10% out of your total procurement can go to local manufacturers.

So the government has a role to play there, they must play that role. *Also, on the downstream side, instead of these guys sitting there, we're aluminium guys and we play in the global commodity market and we're just going to sell the raw aluminium and ship it outside. You can't do that. If someone can take this aluminium and add value to it here in the country, why not.*

So if someone wants to buy some raw aluminium from you and use it to manufacture building material, frames for windows or whatever, or furniture or

medical tools, then you should be selling some of that aluminium locally, even if it's at a lower price or whatever to give them some competitive advantage, or some air space manufacturer.

So the government has a role to play here also and that might not be also happening. So this is why you see things are not maybe shaping up at the speed that you want them to do so.

Q I mean you have been now with the government for a long time, you know the ins and outs, the constraints, the difficulties. If the government wants to build the SMEs and the ecosystem around anchor industries, what will be the crucial things that they need to do in terms of institution, reconfiguration, rearrangement or someone has to do this role, the new role, differently or totally new entity? How should it go about it because we have not actually that yet?

A Yes. I don't know. I'm not the type who ever looked at things in terms of – I think institutions are very important and *I think Abu Dhabi has a very neat institutional set up, really. I think the government has a very neat institutional set up but it's about, as I said, it's about getting people to do the right thing at the right time and clarifying mandates and preventing entities from competing with each other. So it's sad if we can't do that because it's like we've put in place all the necessary ingredients, now it's just about managing it right.*

Q So how to manage it right because the government, they have done everything, they established the special economic zones, they established the anchor industries, they put the laws but then things are not really – do they need to go to second level of coordination, collaboration?

A Yes, exactly. I think second level of collaboration, cooperation is very much –

Q Could you elaborate, what do you see this – how this could be shaped?

A *It requires leadership mainly and somebody needs to assume or some entity or figure or whatever needs to directly assume the leadership of the economic scene and begin to unite people around the common vision and*

cause and take quick decisions over small issues and get people to do what they were actually established in the first place to do. So leadership is key to all of this.

Now, beyond leadership what you need also is, within the institutions themselves, stakeholders. They need to somehow develop a 'reach out' mentality, instead of I'm working with that guy from that entity, let me get in my car and go to him and visit him in the office, sit with him and talk it out and come back.

It's like the one team spirit needs to be enhanced among the various key stakeholders, so less bureaucracy is very much required. It's not always – there are also some misconceptions. I'm talking now within the government institutions themselves, there are also a lot of misconceptions about how best things can be done. It's not always about resources but, unfortunately, a lot of people think it's always about resources. Many countries have done it without any resources, so it's like not everything requires a budget. A lot of things require a well-meaning heart and a good deal of effort.

So we create that team spirit and you hire the right middle management within these institutions. The middle management are the guys who drive these institutions. They need to be the right people. They need to be well-meaning people who are willing to exert effort and go the extra mile to make things happen. So I think if we require any sort of reform, I think we require some reform around the middle management within some of the institutions and I mean that.

Q Those who are delivering [inaudible 44:26]?

A Yes, they are dealing the delivery of the initiatives that are required because you might see that some of the real good, young talent end up leaving these institutions because they don't find the right environment that they would like to have. If anyone is to blame it's the middle management. The leadership wants this, the top management wants this but the middle management is not

delivering. The middle management is still old fashioned and we need to work hard on that.

Q Okay. You raise good points.

A So the last thing I would like is the private sector, what they have done, the private sector, and their role in all that. *The private sector, I mean they've done a lot of good things and we can see it, but there is still an aspect to the character of the private sector in Abu Dhabi which is not compatible with the long term goals of Abu Dhabi. That's the [inaudible 45:48] mentality. The government needs to do something. Find out how we can work on the private sector to limit the opportunities for rent seeking activities by the private sector. Once you limit the opportunities for rent seeking activities by the private sector, the private sector, I think, will be better incentivised to think about real investment opportunities. But as long as rent seeking activities are available, they will continue to run after them before they think of a meaningful investment.* [inaudible 46:38].

Q Okay, good point.

A Yes, rent seeking.

Q Yes, rent seeking [inaudible 46:45] binding constraint to move forward basically. Now let's go back to the – okay, private sector whether rent seeking or not, SMEs, SOEs, special economic zones, you mentioned that leadership is needed, the middle management is needed.

A Yes, team spirit.

Q The team spirit. On the ground, what do you think needs to be done?

A On the ground [inaudible 47:12].

Q Still the special economic zone is a separate entity. When we did the survey within the firms, I surveyed around 60 firms and we had a focus group with them, operating within the three economic zones, twofour54, ZonesCorp and [inaudible 47:30].

One of the things that they said, okay, now we've come, we are happy that we established our business in Abu Dhabi, we have no complaint. But then it's like an island, I'm sitting in the zone, I don't know what is happening in the other industries. Nobody is helping me to connect me with the business – I'm not aware about the opportunities, the investment and all of that so they feel that they are isolated.

A Yes, but that's because it's an engine and you have different parts and all the parts need to start moving together. Now the engine, there is some sort of jam in some parts of the engine.

Q [inaudible 48:17] engines, you need them to synchronise.

A You need them to work together in tandem.

Q Yes, in tandem. How to do that?

A Again, I think it's about leadership bringing them together and – once they see that the momentum to move is being – what's the right word? Once they see that the momentum is –

Q Is it direction?

A Yes, it embodies a clear political world and support, they will all see an opportunity to participate, not only an incentive to participate and they will begin to try and fit themselves properly into the system.

Now, I think the government is playing a role. The role the government is playing is, and this also might be a misconception by the way on the behalf of the government, when reforms began in Abu Dhabi and liberalisation, the government began to play its [role 50:04] as a regulator rather than a provider. That might have translated into the minds of many people, or certain people in the government, as the role that they should play should be limited to being a monitoring and evaluation and guiding. If that's the case, then that's a big misconception. They are being passive. You've done the right thing by pulling out and letting the private sector provide services as you regulate these services.

But the big picture level, you are the guiding, leading force behind the efforts that everyone is going to do and you cannot sit there and play passive and wait for things to happen and react, you have to play an active role. So it's your directives, it's your vision, it's your directives, it's your blessings, it's your – what can I say? You need to lead, move and shape and guide.

Q So lead, guide and deliver?

A Exactly, and award and all that.

Q All of my interviews, I mean the main elements coming, everybody still sees the government to do all of this, the anchor industries they guide and drive and monitor and do all of that. So is it because we have a failure in the market that it's not really able to build by itself?

A No, *we're still at an early stage of development. As I said, the critical issues are basically what we've identified and you cannot separate one issue from the other, they all come together. It's the lack of clarity in the overarching policy umbrella. It's the competition between the different sectors, stakeholders within the government. It's the lack of team spirit among them.*

It's the middle management issue within some of the key institutions. It's the lack of equity finance for SMEs and all that and the availability of rent seeking activities for private sector and all that. If you fix all of that together, some economists will tell you then it will happen on its own. It will not happen on its own, that's my belief.

Q Why is that, it's not going to happen by itself?

A It's not going to happen on its own.

Q What is binding?

A *I look at experience. I look at Singapore, I look at Malaysia, I look at that. You might say it has happened on its own in Europe, it has happened on its own. In America it's happened. Well it didn't happen on its own. I mean maybe to a large extent it happened on its own, but the government did play a*

major role. I mean look at Japan, the government played a major role. It didn't happen on its own. Germany, the government played a role, it didn't happen on its own. Look at Malaysia, look at Vietnam today. I mean not at Singapore. It's not happening on its own, even China. The government basically did almost everything until it began to happen on its own.

So that's why I say it's not about market failure, it's just the nature of things. As I said, at one point it will begin to happen on its own and you will begin to need to shape it and guide it.

Q But not yet.

A *But not yet, we have not – because we have not yet kicked off the clustering process. I'd say the clustering process is an organic process.*

Q Once all the elements are there then it will...

A *Yes, and it's kicked off and you've provided the vision, the leadership, the guidance, the direction, the directives and all that, and you've sold yourself fully to the market as being like fully behind this process, then the market will engage in it.*

Q Okay.

A It's about sentiment also.

Q But the government, you said that - ?

A *You have to create the sentiment in the mind of investors and to create that level of positive sentiment in the mind of investors so that they come to you and begin to make, as I say, an investment. You have to do these little fixes here and there. But you're almost there. I think today Abu Dhabi –*

Q But does it create for the government? Do you think the government are clear about what they need to do?

A Is it clear to them? Yes, but it might be – even sometimes at family level we are clear about what we want to do –

Q Yes, but then how to operationalise all of this [inaudible 56:05]?

A I think they are clear. I think from my dealing with some of the figures that I've come across, I think they are clear about what they want to do but again, we go back here to that most basic thing called consensual decision-making, which is part of the deeply entrenched and political culture of them.

Q Okay, which is hindering the...

A Absolutely.

Q Now, okay, let's take another point which is now we talk about innovation and –

A Let me tell you one thing also before we – there is a difference, and people fail to see this and it saddens me, but I'm going to mention it for the first time. I've not mentioned it to anyone before. It's my own thinking and I could be totally wrong. But *I think when Singapore does it is one thing, or when Dubai does it it is one thing. When Abu Dhabi tries to do it it's another thing. It's completely a different thing. Why? Because when Dubai tries to do it, or begins to do it, there will be far less people coming to Dubai to take advantage - and I mean here in a negative way - of what Dubai is trying to do because they know Dubai has limited resources and, by default, it's going to be very poorer in the way it's going to manage itself as it embarks on such a journey.*

But when Abu Dhabi tries to do it, the number of opportunists who are going to come and try and take advantage, misguide, misadvise and even play games and all that, are going to be far bigger. That's why managing the process, the political process, with an eye open and a lot of prudence, becomes far more critical for Abu Dhabi and Abu Dhabi's situation than it is in Dubai. This is just the way things are.

We have to find a way to deal with it, but people try to take advantage of us and try to capitalise on what we're doing and misadvise us, misguide us. It's different because they know we have resources.

Q But also in Dubai the type of economic activities are different than –

A Of course. Abu Dhabi doesn't need to do what Dubai did. It doesn't even need to go where Dubai did. Abu Dhabi needs to do what's good for itself and go where it needs to go itself. I see them as two different models.

Q Abu Dhabi is selected to go into the industries, the manufacture –

A Yes, which is very, very fair.

Q Maybe [inaudible 59:38] are different, completely downstream rather than [inaudible 59:40] which is by nature you need to have the network and –

A Yes. Dubai especially, I mean I see it as a logistic centre and everything is built around that, world class logistic centre. I mean with Dubai when they tried to do a financial centre they got it all wrong. But when Abu Dhabi tried to do a financial centre, I think they got it right. But everybody makes mistakes. There is no journey without –

Q If we take the example that you mentioned before, ADNOC and how they drove the –

A ADNOC is beautiful.

Q Things happened naturally right?

A Yes, because ADNOC – the decision-making, that's why. The decision-making with ADNOC is much smoother. If you can generalise ADNOC [inaudible 1:00:41], you'll have the most successful experience because ADNOC reports to the spring petroleum council. They get the decision and then they go back and implement it.

Q Which is not happening in the other sectors.

A No.

Q Okay. What is the link between innovation and diversification? Which is about the knowledge and all of that. Now we want to go into – I mean this is the declaration from the country that – knowledge-based industry and also to be –

A But the city attract talents, this is very basic for me.

Q But is it related to the type of industries that we have and how difficult you can get there and the constraints? It's one thing that you diversify from oil to polymer, and anchoring a new industry like semi-conductor or aerospace. I have nothing, I have no knowledge but yet I want to be innovative and I want...

A Yes, but *innovation comes from SMEs, so you need to create the right ecosystems for SMEs. SMEs thrive through innovation.* It's not easy to run an SME. As I told you about my friend, I'm giving him some advice and all that. It's not easy. I mean I've looked at everything he's done.

The guy has been working day and night, really hard to understand things and reading into books and the internet and all of that, and going back and arguing with the people at the company and his financial manager and operations manager and all that. He's learnt so much in the process. He's become, oh my God, his mind is full of trivia. He's read so much, unbelievable. He's trying to be innovative. He's trying to do something different to survive, to generate recurring revenues. It's like he said, I cannot wait until the beginning of the year until the steels team comes to me and gives me the years forecast about how much sales they are going to make over the coming year. I want to go into the year with a cushion of recurring revenue and then let them come with their forecast. But the real value of the company is in that cushion. It's not in the forecast that they're going to give me because the minute I decide to sell this company or I bring in a partner on board or whatever, I say okay, you've made so much sales this year, how much sales are you going to make next year? Is it going to be a bad year? But if I have this recurring revenue that I have sustained for the past four or five years and they've grown at 5% or 10%, then that's where the real value they're going to see in the company. They know that this thing beats a bad market or a good market next year. This company is not going to fall apart.

So innovation is about human passion, it's about human skill, it's about human ambition. It's also about having an entrepreneurial culture among your young people before even as you put the ecosystem in place for SMEs.

Q Is there a role for the government?

A Of course, to create entrepreneurial culture and to put the ecosystem...

Q The innovation.

A Of course all these are very important ingredients for bringing about innovation. *Innovation is the final stage, you have knowledge, you go to creativity and then innovation when you really begin to produce things out of your ideas, not just producing ideas. A creative person can give you a million ideas but is he really being innovative?*

You're being innovative actually in a business sense, I think, when an idea can translate into a product or a service that is commercially viable or that makes sense commercially. So the government role is there. The government role is, as I said, it's providing people with the education system, with the right type of skills and mentality and ambitions and it's an entrepreneurial culture and then building the right ecosystem for SMEs.

Q Okay. Now, the last question, very clear the part of development for Abu Dhabi which very much relies on the anchor SMEs. Then we reach a stage where we get stopped, we cannot go further now.

The reform of Abu Dhabi started in 2004 where we have seen a lot of entities helping the, in different areas, economic, social and all of that. Do you think that we as government institutions, are they realising the change into –

A That has been made?

Q What has been made and what needs to be done because now it's not about the anchor industry, it's about an ecosystem that has been created around these anchor industries.

A I think they need to be educated further. There is, I think there is a realisation.

Q Are they evolving with the demand of - ?

A *Some have evolved faster than the others and there are some white elephants. When I say white I mean they are well-meaning elephants. They want to move but they can't, they're not able to move.*

Q Could you give an example, one of the institutions that have something really helped or gave us an indication that they are really evolved with the new demand?

A I mean look at the Abu Dhabi police, unbelievable, honestly. The way they've evolved, oh my God, unbelievable really. Recently the municipality over the past four or five years, I mean from where they were, it's a massive improvement. I mean it is mind boggling. Honestly, if someone goes and does a case about Abu Dhabi police, a case study, and the municipality and amount of change that has taken place within these two entities...

Q What about the economic sector?

A Unfortunately, I think with the economic sector there's much more needs to be done, the Abu Dhabi Council for Economic Development and the Abu Dhabi Chamber... I think these three players need to shape up, really.

Q Thank you.

A Thanks. You forced me to think about things –

[ENDS]

Appendix E Content Analysis of Interview and Focus Groups

Main Theme/ Sub Themes L1	Sub Themes L2	Sub Themes L3	Data Sources	Statements
Path Dependence				
Natural Resources	Impact of natural resources	Economic vulnerability	Interview FG1	<p>“diversifying its economy due to its oil abundant state and its high dependence on oil revenues, and seeing the fluctuation of oil prices globally, this impacted directly our GDP” (Inv1)</p> <p>“What we are trying to achieve in the economic vision and in the overall vision of the United Arab Emirates is to further diversify the economy into sectors that will help reduce the turbulence that would occur in the energy market. (FG1 ADCED)</p>
Natural Resources	Impact of natural resources	Path creation	FG1	<p>“There are direct and indirect impacts of the oil and gas sector on the economy ... the existing non and oil gas industries are still somewhat relatively dependent on energy sector” (FG1 Masdar)</p> <p>“There is always a direct and an indirect impact or relevance of our GDP that comes from our oil and gas and energy sector. We cannot under any circumstances underestimate or undervalue the impact of our spinal cord, the world economy, which is oil and gas, and there are of course direct impacts that probably totals into the 51%; and the 49% when we say these are the non-energy or non-oil and gas GDP, it is still somewhat indirectly relevant and very much dependent on the</p>

				<p>strength of our spinal cord, which is the hydrocarbon sector.” (FG1 Masdar)</p> <p>“Some industries are directly related to the oil and gas industry, because we have to be realistic as well, we are an energy producing country, energy is one of our competitive advantages and it will remain so for the upcoming future.” (FG1 ADCED)</p> <p>“I think when it comes to industry, we will continue to have industry which is directly related to energy, because what is steel or aluminium? Aluminium and steel are all about energy as well; I think aluminium is 70% maybe energy. So you will continue to see these types of projects, but also these types of projects help create employment, help import technology or develop technology, help import brains and develop local talent as well to benefit and to participate in the overall development.” (FG1 ADCED)</p> <p>“So you will continue to see different sectors in energy, different sectors in the industry, but we cannot eliminate the energy or the oil-driven industry and say we will just discount that and focus on developing new sectors that do not involve energy.” (FG1 ADCED)</p>
Natural Resources	Comparative advantage	Opportunity value	FG1	<p>“We have an economy of which its fundamentals that differ from other areas in the world ... we need to find a model that best suits our needs and requirements ... and identify industries that we would like to develop ... existing or new ... and have certain advantage”. (FG1 ADCED)</p>
Demography			FG1	<p>“we have a demography that is different that we have to take into consideration” (FG1 ADCED)</p>
Path Creation				
Path Creation	Factors	Policy	Interview	<p><i>“the international model used by several</i></p>

		Regulation Anchor Firm SME		<i>countries for the successful development of manufacturing industries, it's a three-layer model. Turning your competitive advantages into competitive advantages at the firm level. First, the overarching policy and regulatory umbrella was very effectively put in place, providing all the general enablers required by target industries to grow and flourish. Second, you put the anchor investments in place, the target industries in the second layer and. Third, you put the SMEs in place in the lower layer. Without SMEs you're not going to have any manufacturing. There is no industrial landscape that is made up of only large manufacturers. (Inv1)</i>
Path Creation	Strategy	Targeting	Interview	"we've built at some point, while we were looking at the industrial strategy, we built a very robust, extensive prioritized model to determine which manufacturing industries are best suited for Abu Dhabi. The industries I mentioned to you are some of the industries that were selected by the model itself and it was not like – even the input that went into the model was not the decision of one guy" (Inv1)
Path Creation	Competitive advantage	Comparative advantage	Interview	<i>I think one of the key things that is delaying the development, or even blocking maybe the development of manufacturing industries in Abu Dhabi is the fact that Abu Dhabi has two key competitive advantages, which are basically</i>

				<i>energy and capital. These are not sufficiently being turned into – comparative advantages .. at the firm level so that investors can capitalize ... it's very clear that cheap gas is not available, cheap fuel is not available, cheap finance is not available. With those three being not available for industries, they're not going to happen.” (Inv1)</i>
Path Creation	Strategy	Targeting	Interview	<i>“I would say people have talked about a lot of type of industries that can be used as drivers of diversification in the Emirate. I think all of these types of industries that we have heard about over the past 10 to 15 years boil down to two, beyond what ADNOC and its sisters have been doing. It boils down to two: manufacturing and tourism because – I might add financial services but it's not going to be like financial services in its broad sense.” (Inv1)</i>
Path Creation	Private Sector	Unrelated Variety	Interview	<i>“I think, for example, some of the manufacturing activities that could do well in Abu Dhabi and have not been given a lot of attention is pharmaceutical. Now there is I think one or two companies and they're doing very well, but they were only established – well they were established by a private sector and they seem to be doing well, and I think they will do well. (Inv1)</i>
Anchoring	Government	Confidence	Interview	<i>“when it comes to entering into a new economic</i>

	investment			<p><i>opportunity or, let's say industry ... Entering into a new industry. I think the government when it has by itself invested heavily in it, it becomes an anchor in which it attracts the private sector to contribute, and the private sector will become more confident in being in that sector as it's seeing the government by itself contributing to that. There is only one worry here: that the government shouldn't become a competitor" (Inv9)</i></p> <p><i>Sameer: "increase confidence of investors, build projects, commitment, remove risk away from investors ... In a sense mitigate or remove risks associated with self discovery" (Sameer)</i></p> <p><i>"the private sector will not come because maybe the risk is very high ... so the government, you see that it was a necessary step for the government to take it." (Inv9)</i></p>
Anchoring	Government investment	Opportunity value	Interview	<p><i>"The government also should be very careful when it comes to taking the decision to enter into a certain sector or industry and ensure that it's not a top-down approach. It should also be based on a thorough analysis and detailing the opportunities, and I think this is what the Abu Dhabi is doing. Because at the end of the day, yes you will be attracting the private sector to contribute, but also the private sector will do their own analysis and due diligence to ensure</i></p>

				<i>that there is an opportunity and value added. Even if you are also taking the risk and you are leading, it's not necessarily that the private sector will follow you because they have their own... So you have also to be sure that you can convince and you can assure that there is a value added" (Inv9)</i>
Anchoring	Government investments	Unrelated Variety	Focus Group	<i>"the government invested 10 billion dirhams to built Emirates Steel for certain reasons; a couple of those reasons are to really participate in the development of the infrastructure in UAE, and also to be part of the 2030 vision to diversify the economy of Abu Dhabi, and also to facilitate the development of the downstream sectors." (FG1 Steel)</i>
Anchoring	Branching	Clustering	Focus Group	<i>"the government starts with the anchor industry as EMAL and DUBAL ... Now the next step is to build a cluster around this main industry ... This is now where the policy should be focused to build the cluster around this anchor company, or the big company like EMAL and DUBAL on aluminum Emirate Steel Company. This will be the next step maybe, and this is maybe the focus in the next industrial strategy for Abu Dhabi, this focus is directly to the medium industry, or the light industry, which can benefit from or benefit to what we already have, this is</i>

				<i>what we feel.” (Inv4)</i>
Anchoring	Branching	Local Demand	Focus Group	<i>“from the steel point of view we don’t really have a downstream industry to really support Emirates Steel. Let me share with you one of our projects, the wire rod, where we have a lot of downstream applications can be done; we sell in the UAE only 20%, the rest goes elsewhere, mostly in Saudi Arabia. So there are a lot of things to be done here, I think.” (FG1 Steel)</i>
Anchoring	Linkages	Capability Knowledge &	Interview	<i>“they used to use some special screws for some parts of the tails. They usually import these screws, and we found a local company that is interested to put around 50 million dirhams to establish a manufacturing company to supply to Strata. Then the issue is the company wanted a full endorsement from Strata. Why? Because their supplier will be Strata, full stop. If Strata doesn’t buy they are out of the market.” (FG1 Strata)</i>
Anchoring	Linkages	Clustering	Interview	<i>“You build anchors and then leave the rest to be built organically” (Inv3)</i>
Anchoring	Linkages	Capability Knowledge &	Focus Group	<i>“since I have become the chief executive of Strata, I have only had three entrepreneurs come to me in my office and say, we would like to do something for you, we would like to sell you parts, we would like to be a supplier to you,</i>

				we would like to do business with Strata. Only three! “ (FG1 Strata)
Anchoring	Linkages	Local Content	Focus Group	I cannot find the product cheaper in the local market. What does that mean? That somebody, somebody out there, somebody between all of you can come and set up a business and understand what is my price point and tell me whether I can manufacture this part for you if you give me an offtake for five years, if you give me an offtake for 10 years. (FG1 Strata)
Anchoring	Linkages	Collaboration	Focus Group	“If the entrepreneurs are not going to come to me, I cannot reach out; I can reach out at events like this and there is an opportunity for me to speak to everyone, but we need people to come to us and say, I am willing to invest, I am willing to invest in your vision, you want to become one of the top three by 2020, I would like to align my vision with yours and I am willing to invest in it. We get an opportunity like that, I can assure you I am personally willing to sign an offtake agreement to make sure that not only am I successful by having a local supplier, but the local supplier is just as successful.” (FG1 Strata)
Anchoring	Related variety	Access to finance	Focus Group	“I think there is a challenge here when it comes to this (referring to downstream industries). When you want to encourage the entrepreneurs and private sector you need to get the

				government funds, like the Khalifa Fund as an example, on board to know what the downstream opportunities are to attract the entrepreneurs to contribute. Yet we don't see clearly that Khalifa Fund, as an example, has a clear strategy which is directly correlated and linked to those anchor sectors when it comes to the business opportunities, to the investment opportunities for entrepreneurs." (Inv9)
Anchoring	Related variety	Opportunity value for services	Interview	"When Strata started in Al Ain it created all the rent increases in the city because there is a demand now for the housing units, so you are creating another opportunity for the landlords. So knowing what will happen will help also to create opportunities for the services which will support that economic [inaudible 0:24:41]." (Inv9)
Ease of doing business	Laws and regulations	Ownership	Focus Group	"I know a lot of investors accept the 51/49 ownership agreement as a sugar coating but behind it there is other arrangement which is fair enough because this investment would not have happen because of the structure" (FG1 ZC)
Ease of doing business	Laws regulation and	Transparency and Consistency	Interview and Focus Group	"Number one is those policies, meaning today we have over ten new laws that have been in the UAE cabinet for the last, I don't know what, ten years now, back and forth, especially trade law, investment law, bankruptcy law. These are

				<p>ABC, laws that any international investor, before coming to any country should see in front of him. So I am not saying that we are slow, but nevertheless we are not fast, meaning usually such laws take years and years, even in the developed world, because you have different interest parties, you have lobbying” (Inv3)</p> <p>The problem that sometimes small and medium size businesses are facing is there is a lot of rules and regulations that are made by the government, and every rule and regulation that comes out, sometimes you feel... Okay, I have to be perfect, I have to do a good job (FG1 Salwa)</p>
Ease of doing business	Laws and regulations	Access to land	“Interview”	“Investors have to know what to do with investment lands ... and know the requirements ... and processes” (FG1 ZonesCorp)
Ease of doing business	Laws and regulations	Access to Finance	“Interview”	“Regulations dealing with finding new access to finance are being studied in order to ensure that there is a proper environment for the private sector to grow and succeed. We have to accept that there will be some setbacks, but generally, these regulations will enable private businesses to become more successful” (DED)
Institutional Environment	Enablers	Access to Finance	Interview	I think we have gaps in both the overarching policy and regulatory umbrella and some lack of clarity around it and that’s because of the

				decision making approach we talked about earlier. We have gaps in the lower layer because of the type of support that's available for SMEs, especially in terms of financing. I don't know much about the training and marketing. In terms of the anchor industries, I think they're clear. (Inv1)
Ease of doing Business	Processes	Simplicity	"Interview"	"It used to take 365 days to issue a license, and now 50 days ... so there is an improvement. However the system has to be integrated together to help investors" (FG1 ZC)
Ease of doing business	Laws and regulations	Ownership	Focus Group	"I know a lot of investors accept the 51/49 ownership agreement as a sugar coating but behind it there is other arrangement which is fair enough because this investment would not have happen because of the structure" (FG1 ZC)
SMEs	Access to finance	Government funding	Interview	"There's no doubt also that the Abu Dhabi government is supporting entrepreneurs through the Khalifa Fund, and it also has a role in providing the entrepreneurs and the investors with investment opportunities and providing them with the launch funds and support to encourage them to contribute in the Abu Dhabi economic development." (Inv9)
Access to Finance	Support of banking sector		'Interview"	"SMEs play a major role in the economic development. Together with Khalifa Fund,

				<p>banks should step in to provide the urgently needed financial support for the SMEs. However, financial institutions are not structuring providing funding to the industrial sector. Local banks should take the initiative and be an active player in funding our industrial sector, and especially the SMEs within it” (FG1 ZC)</p> <p>“banking sector are not looking at a very important sector, which is industry and are not structuring proper funding options to the industry” (FG1 ZC)</p> <p>“One of the critical things for SMEs to flourish is an enabling financing environment. Now banks in the region are very cash rich, they also have not been hit by the problems which banks were hit with worldwide; why are they reluctant to lend? The problems with banks’ balance sheets are not related to lending to SMEs, so how does one make that enabling environment for banks to actually reach out to SMEs so that they can flourish? “ (FG1 Samera one of attendees)</p>
Access to Finance	Support of banking sector	Government funding	Focus Group	<p>Abu Dhabi does not need injection of foreign capital as “local banks are really rich enough to initiate it by themselves. But this is a culture, I believe, so that needs to be offset by the government; government have to step in, direct the local bank and to look at this sector –</p>

				industrial SMEs completely different.” (FG1 ZC)
Investment Promotion		Knowledge and capability	Interview	“most of the international firms and companies want to expand their operations and get opportunities here because the capital or the money is here. What you get from there is the knowledge. This is what we need actually from the international investors, not the money. They contribute with the knowledge and Abu Dhabi contributes with the investment and the infrastructure and the support.” (Inv9)
Investment Promotion	Joint venture Partnership		Interview	“We are working on the partnerships [inaudible 0:27:33]. This is a partnership. Formula one is what? It’s a partnership. Strata is what? It’s a partnership? Masdar is what? Mostly partnerships. So we are actually operating a country on [inaudible 0:27:48]. So we talk about marketing and promotions; we should market and promote this because this is a concept that we are applying here already.” (Inv9)
Government	Regulating		Interview	The role the government is playing is, and this also might be a misconception by the way on the behalf of the government, when reforms began in Abu Dhabi and liberalisation, the government began to play its [role 50:04] as a regulator rather than a provider. That might have translated into the minds of many people, or certain people in the government, as the role that they should play should be limited to being

				a monitoring and evaluation and guiding. If that's the case, then that's a big misconception. They are being passive. You've done the right thing by pulling out and letting the private sector provide services as you regulate these services. (Inv1)
Government	Leadership		Interview	But the big picture level, you are the guiding, leading force behind the efforts that everyone is going to do and you cannot sit there and play passive and wait for things to happen and react, you have to play an active role. So it's your directives, it's your vision, it's your directives, it's your blessings, it's your – what can I say? You need to lead, move and shape and guide. (Inv1)
Government	Leadership	Clarity of Policy and Strategy	Interview	<p>we're still at an early stage of development. As I said, the critical issues are basically what we've identified and you cannot separate one issue from the other, they all come together. It's the lack of clarity in the overarching policy umbrella. It's the competition between the different sectors, stakeholders within the government. It's the lack of team spirit among them. (Inv1)</p> <p>It's the lack of equity finance for SMEs and all that and the availability of rent seeking activities for private sector and all that. If you fix all of that together, some economists will tell you then</p>

				it will happen on its own. It will not happen on its own, that's my belief. (Inv1)
Government	Collaboration Platform	Approach	Interview	“the main thing that we need to change is how we look at the investors and entrepreneurs as a government. Unfortunately, we are not giving the impression that we are a service provider and we want to satisfy the investor. Most of those entrepreneurs, they run after the government entities to get the approvals and get the licence, and they face challenges, and they stand in the queue to meet the executives of those entities for certain, let's say meetings, where actually from the other side it should be that we should run after them. We should please them. We should be always trying to facilitate things because they do have the capital to invest and they can save a lot for the government.” (Inv9)
Government	Exports	Collaboration Platform	FG1	“we are trying to build up an agency towards encouraging exports, this will help the SMEs to find also their way to the international market and to find also the right partners (FG1 ZC)
Government	Leadership	Coordinating	Interview	I look at experience. I look at Singapore, I look at Malaysia, I look at that. You might say it has happened on its own in Europe, it has happened on its own. In America it's happened. Well it didn't happen on its own. I mean maybe to a large extent it happened on

				<p>its own, but the government did play a major role. I mean look at Japan, the government played a major role. It didn't happen on its own. Germany, the government played a role, it didn't happen on its own. Look at Malaysia, look at Vietnam today. I mean not at Singapore. It's not happening on its own, even China. The government basically did almost everything until it began to happen on its own.</p> <p>So that's why I say it's not about market failure, it's just the nature of things. As I said, at one point it will begin to happen on its own and you will begin to need to shape it and guide it. (Inv1)</p>
Economic actors	Collaboration Platform	Supply chain	"Interview"	"coordinate, work together across entire value chain" (Inv8)
Economic actors	Collaboration Platform		"Interview"	"Collaboration among regional economic councils" ED1
SOEs ADNOC	Path Creation	Natural resources	Interview	<i>"the economic history of Abu Dhabi has been written by ADNOC and ADNOC policies and ADNOC strategies." ... "I think the key player, I would call it even the black horse that have been driving Abu Dhabi's diversification for most of the past 30 to 40 years is ADNOC. Many people will not be happy to hear this. But it's an irony that the main oil producer itself has been the main player driving the diversification of the Emirate away from oil production." (Inv1)</i>

SOEs	Path Creation	Anchoring	Interview	<i>We knew that the government relied a lot on the government firms when they are starting specific industries; aerospace they created Strata, when it comes to base metal they created EMAL (Inv4)</i>
SOEs	Anchoring	Unrelated variety	Interview	<i>“the challenge is working on changing the concept that there are certain economic activities or industries the government should lead to attract the private sector to contribute, and there are certain areas also the government should step back and not to be competing with the private sector.” (Inv9)</i>
SOEs	Anchoring	Join venture with foreign companies	Interview	<p>“I can see that there’s a sort of focus mainly on the joint ventures, like most of Mubadala’s projects when it comes to [inaudible 0:15:47]. We talk about, let’s say, from the other side the Strata and also the... There is a partnership with international industries to use their knowledge and their expertise and apply it here within the region. I think the offset programme of the Abu Dhabi government is also one of the main key inputs to many products, like Tabreed and many other projects also, in which those [inaudible 0:16:26] I think the military contracts and how those contracts can... There should be an offset of certain investments within Abu Dhabi in certain industries.” (Inv9)</p> <p>“The offset would help mainly in bringing</p>

				expertise and let's say, new projects that were not there within Abu Dhabi earlier, like Tabreed as an example project. .. new technology" (Inv9)
SOEs	Anchoring	Competition	Interview	<p>the private sector and the public sector are in competition, and I wonder if we agree that this is a cross cutting challenge? Will we see anytime soon a competition or an anti-trust law that would treat or create a level playing field in Abu Dhabi? (FG1)</p> <p>"We should be very careful when it comes to balancing between leading the economic direction in those sectors and also enable the private sector, from the other side not being a competitor. The best example for that maybe is the TDIC. The TDIC started the process by developing the newer resorts and hotels, but we have to be careful that this will not become as a government a competitor to the private sector within the same..." (Inv9)</p> <p><i>"anchoring helps attract investors but also makes SOEs with a competitive positions that crowd off private sectors" (Inv9)</i></p>
SOEs	Linkages	Collaboration platform	Interview	<i>I need to encourage the downstream industry really to come and sit down with us. I know we are almost there with five companies in our portfolio today, three of them are aluminum based companies, that means they're going to use our product, but two of them are a process</i>

				<p><i>type service provider for our, I would call it the environmental side of the story, so we will be able really to promote a zero, a green aluminum in Abu Dhabi, and this is the first time and we are proud, and shall, when we finish the cycle of agreement and terms and conditions, we are almost there, it will be the first inception that an aluminum company or a smelter that will have a zero landfill from an environment impact. (FG1 Emal)</i></p>
SOEs	Linkages	Policy Local content	Interview	<p><i>Because of the gaps in overarching policies, regulatory, and finance; the government has to step in and exert pressure on the anchor industries to provide a certain amount of their procurement to local suppliers so that they can participate in the supply chain. You cannot buy everything from outside as an aluminum manufacturer here in Abu Dhabi. Also, on the downstream side, instead of these guys sitting there, we're aluminum guys and we play in the global commodity market and we're just going to sell the raw aluminum and ship it outside. You can't do that. If someone can take this aluminum and add value to it here in the country, why not. So if someone wants to buy some raw aluminum from you and use it to manufacture building material, frames for windows or whatever, or furniture or medical tools, then you should be selling some of that aluminum locally, even if it's at a lower price or</i></p>

				<i>whatever to give them some competitive advantage, or some air space manufacturer. (Inv1)</i>
Strategy	Anchoring	Evaluation	Interview	“Good to establish new industries or new sectors, yet we have to assess the performance and maybe in certain areas we need to step back and not to continue just because we want to assure we don’t want to be a loser or we don’t want to fail in this. It’s not wrong to step back if you feel that it’s not strategically, economically viable to continue in those let’s say, uncertain investments. “ (Inv9)
Strategy	Anchoring	Joint Venutre Public Private Partnership	Interview	“But there is a challenge here, Hamed, the mind of the government usually when they enter into a project is they don’t want to fail ... so they might invest into a project to make it successful though it is not successful. But the investor, no. He will stand back in the stage where he feels that he’s really losing ... so we have to be very careful when it comes to competing or investing in certain sectors, and we need also to get the feedback and the sense also from the private sector. And maybe the partnership with the private sector is also important.” (Inv9)
SOEs ADNOC	Branching	Related variety Unrelated variety	Interview	<i>“I think that by ADNOC establishing sister companies that are not directly involved in upstream activities, oil and gas production but rather midstream, downstream activities and all</i>

				<i>that. ADNOC has played, and petrochemicals has played the bigger role in driving the diversification of Abu Dhabi. Most of the businesses that have been created in other sectors, be it in the hospitality sector, in the transportation sector, even telecommunications sector and so forth, have been largely financial services sector, have been largely driven by the activities of the ADNOC sister companies, no one else.” (Inv1)</i>
SOEs	Linkages	Collaboration	“Interview”	<p><i>“Absence of industrial collaboration institutions” ED1</i></p> <p><i>“Lack of partnership and collaboration between SOEs and downstream industries” ED1</i></p>
SOEs		Collaboration	Interview	<p>“at the end of the day if you are even indirectly owned, or if you are a government-owned company, you automatically have a power and you have advantage. Competitive advantage .. so you have to be very careful where you should be contributing... and collaborating” (Inv9) hence influencing collaboration</p>
SOE	Collaboration	Capability building	Interview	<p>“Strata located in Al Ain. They do have a high need of engineers and certain specialisations for the coming years, yet are they communicating this clearly to their institutions? [Location 0:22:23] institutions and Al Ain as an example to ensure that UAE nationals graduates from Al Ain itself have good</p>

				opportunities to join, let's say as an example, Strata." (Inv9)
SOEs	Autonomous	Collaboration	Interview	"having clear communication channels between the government and state-owned government entities is a must, and very important, but nevertheless ... the stronger the channels the more bureaucracy you are going to see ... hence give them the flexibility to run their businesses as any other businesses ... and not engage them on a regular basis with government bureaucracy," (Inv3)
SOEs	Autonomous	Self financed	Interview	"most of the state owned companies are financed independently, meaning they have not been subsidised or given loans directly by the government, they have built their own internal structure, internal departments, finance departments, and depending on their strength got commercial loans from local and international banks" (Inv3)
SOEs	Autonomous	Monitoring	Interview	"give them the highlights of what you need ... monitor from time to time on a yearly basis their outcomes, that's very important, but you don't go into day by day work" (Inv3)
SOEs	Innovation	Building local capability	Interview	"companies, even state owned companies look for growth and profits. If this hinders or touches their growth, meaning if they have to invest or take a risk or wait longer, so it could support

				other companies to innovate or them to innovate. No they will not apply, they will wait for support from overseas, I mean support by government bringing overseas talents to come and help them” (Inv3)
Government	Regulating		Interview	The role the government is playing is, and this also might be a misconception by the way on the behalf of the government, when reforms began in Abu Dhabi and liberalisation, the government began to play its [role 50:04] as a regulator rather than a provider. That might have translated into the minds of many people, or certain people in the government, as the role that they should play should be limited to being a monitoring and evaluation and guiding. If that’s the case, then that’s a big misconception. They are being passive. You’ve done the right thing by pulling out and letting the private sector provide services as you regulate these services. (Inv1)
Government	Leadership	Clarity of Policy and Strategy	Interview	It’s the lack of equity finance for SMEs and all that and the availability of rent seeking activities for private sector and all that. If you fix all of that together, some economists will tell you then it will happen on its own. It will not happen on its own, that’s my belief. (Inv1)
Government	Collaboration Platform	Approach	Interview	“the main thing that we need to change is how we look at the investors and entrepreneurs as a

				<p>government. Unfortunately, we are not giving the impression that we are a service provider and we want to satisfy the investor. Most of those entrepreneurs, they run after the government entities to get the approvals and get the licence, and they face challenges, and they stand in the queue to meet the executives of those entities for certain, let's say meetings, where actually from the other side it should be that we should run after them. We should please them. We should be always trying to facilitate things because they do have the capital to invest and they can save a lot for the government." (Inv9</p>
Government	Leadership	Coordinating	Interview	<p>I look at experience. I look at Singapore, I look at Malaysia, I look at that. You might say it has happened on its own in Europe, it has happened on its own. In America it's happened. Well it didn't happen on its own. I mean maybe to a large extent it happened on its own, but the government did play a major role. I mean look at Japan, the government played a major role. It didn't happen on its own. Germany, the government played a role, it didn't happen on its own. Look at Malaysia, look at Vietnam today. I mean not at Singapore. It's not happening on its own, even China. The government basically did almost everything until it began to happen on its own. (Inv1)</p>

Economic actors	Collaboration Platform	Supply chain	Interview	“coordinate, work together across entire value chain” (Inv8)
Economic actors	Collaboration Platform		Interview	“Collaboration among regional economic councils” ED1
SOEs	Path Creation	Natural resources	Interview	<i>“the economic history of Abu Dhabi has been written by ADNOC and ADNOC policies and ADNOC strategies.” ... “I think the key player, I would call it even the black horse that have been driving Abu Dhabi’s diversification for most of the past 30 to 40 years is ADNOC. Many people will not be happy to hear this. But it’s an irony that the main oil producer itself has been the main player driving the diversification of the Emirate away from oil production.” (Inv1)</i>
SOEs	Path Creation	Anchoring	Interview	<i>We knew that the government relied a lot on the government firms when they are starting specific industries; aerospace they created Strata, when it comes to base metal they created EMAL (Inv4)</i>
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SOEs	Anchoring	Unrelated variety	Interview	<i>“the challenge is working on changing the</i>

				<i>concept that there are certain economic activities or industries the government should lead to attract the private sector to contribute, and there are certain areas also the government should step back and not to be competing with the private sector.” (Inv9)</i>
SOEs	Anchoring	Join venture with foreign companies	Interview	“Strata as an example, also. It’s another, let’s say investment area in collaboration between I think General Electric and Mubadala . another one is Masdar and its projects in renewable energy also contribute to diversify the energy sources ... So we can see clearly that there are different capital investments, [inaudible 0:07:37] can see investments in those areas.” (Inv9)
SOEs	Anchoring	Join venture with foreign companies	Interview	“I can see that there’s a sort of focus mainly on the joint ventures, like most of Mubadala’s projects when it comes to [inaudible 0:15:47]. We talk about, let’s say, from the other side the Strata and also the... There is a partnership with international industries to use their knowledge and their expertise and apply it here within the region. I think the offset programme

				<p>of the Abu Dhabi government is also one of the main key inputs to many products, like Tabreed and many other projects also, in which those [inaudible 0:16:26] I think the military contracts and how those contracts can... There should be an offset of certain investments within Abu Dhabi in certain industries.” (Inv9)</p> <p>“The offset would help mainly in bringing expertise and let’s say, new projects that were not there within Abu Dhabi earlier, like Tabreed as an example project. .. new technology” (Inv9)</p>
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Appendix F Content Analysis of Published Cases

In this appendix, examples are provided on the content analysis and synthesis of published cases

The Oil and Gas Manufacturing Sector in Norway

Context

In the mid 1900s, both Aker and Kavaener were the anchors of oil and gas industry with activities in shipbuilding, hydro power, wood processing and other process operations, mechanical workshops and other industries. is the? Through the 1970s, 80s and 90s, they developed their capabilities and experience as suppliers of complete solutions to offshore and onshore oil and gas and processing projects. They each grew – organically and through international acquisitions – to be leaders in their markets. In March 2002, the former Kvaerner group and the Aker Maritime group (comprising the oil and gas activities of the wider Aker group) were merged, and started to operate as one company under the name Kvaerner. In 2004, following a restructuring of both Aker and Kvaerner, Aker Kvaerner was established and the parent company of this group – Aker Kvaerner – was listed on the Oslo Stock Exchange. Four years later, Aker Kvaerner changed its name to Aker Solutions. In December 2010, Aker Solutions announced a decision to cultivate its core businesses. Kvaerner was established, through a demerger, as a specialized EPC (engineering, procurement and construction) company addressing the global market. On 6 May 2011, the shareholders' annual general meeting approved the establishing of Kvaerner as a separate company.

Aker main branch is located in Verdal, a small industry town with c.8000 inhabitants and is within commuting distance of Trondheim, the 'technology capital' and third largest city in Norway. The Aker branch plant grew to become a large vertically integrated company and the dominating employer in the area, and Verdal became a single-industry town (Karlsen 2009).

Verdal experienced first exogenous shock in 1999 as a result of low oil prices and a second shock as the result of the financial crisis in 2008. These exogenous shocks triggered responses by the firms and most importantly through government led restructuring programs (RP) in a way to adapt to existing conditions (Steen & Karlsen (2014). The Aker parent company responded reactively by restructuring its portfolio of plants in Norway and abroad to focus on certain core functions or competencies, typical of the vertical disintegration corporate strategies that were popular at the time. As a

result, 400 employees lost their job, a major shock for the local community.

The Restructuring Program

The government responded through the restructuring program (RP) triggered by Verdal Municipality. RPs are a policy instrument for municipalities and regions facing major challenges and significant decline in their employment and/or population levels, and are jointly funded by the state, county, and municipal levels and locally administered (Carlsson et al. 2014). The state approved the application and granted Verdal an RP that ran in the period 2002–2008.

Institutional Capabilities

The central government set up a public-private development agency named 'IndPro' to administer the RP for Verdal. It has developed as an industrial business development agency that became a model for similar policy initiatives in many other places in Norway. The RP covered three elements. The first was a comprehensive training programme aimed at laid-off workers, workers at the Aker plant, and individuals who had left to work in spin-offs or other new firms. Second, diversification of the local economy was to be stimulated by the provision of entrepreneurial support and by attracting new (external) firms to Verdal Industrial Park. The third element was to develop the infrastructure at Verdal to facilitate new ventures (Steen and Karlsen, 2014).

Verdal Industrial Park

In 1969 the public agency SIVA (Industrial Development Corporation of Norway) established an 'industry growth facility' for housing a mechanical engineering workshop in the area referred to as Verdal Industrial Park. In 1970 the workshop was acquired by the large Norwegian manufacturing firm Aker. Aker Verdal (renamed Kværner Verdal in 2011, hereafter referred to as Aker) quickly developed competencies within engineering and the fabrication of steel foundation structures for the offshore O&G activities that had just begun at the time on the Norwegian continental shelf.

The RP training courses focused on project management and certification in, for example, welding, inspection, and engineering, resulting in many workers at Aker and in other firms becoming multiskilled.

Outcomes

The RP program to upgrade the local knowledge base and diversify local firms by both entrepreneur support and acquisition strategies paid off was a success. By 2009, Verdal Industrial Park was populated by more than 150 firms with a total of c.3000 permanent employees, of which 650 were at Aker. Verdal had grown to become one of the three largest

industry sites in Norway.

The efforts of the RP project to upgrade the local knowledge base and diversify local firms by both entrepreneur support and acquisition strategies paid off. When the restructuring process began in 1999, there were c.50 firms with 1700 employees at Verdal Industrial Park, of which 1000 worked at Aker (Proneo 2010). By 2004, 30 new firms (including Aker spin-offs, local start-ups, external start-ups), with a total of 200 employees, had been established on the area previously used by Aker (Proneo 2010).

Sources:

Isaksen, A. & Trippi, M., (2014). Papers in Innovation Studies New Path Development in the Periphery. *Papers in Innovation Studies*, 2014(20), pp.1–39.

Steen, M., & Karlsen, A. (2014). Path creation in a single-industry town: The case of Verdal and Windcluster Mid-Norway. *Norwegian Journal of Geography*, 68(2), 133–143

The Case of Arendal and Grimstad (Norway)

Context

The electronics and software industry in Arendal and Grimstad (Norway) is a demonstration of anchoring a large private enterprise (Elektrisk Bureau (EB) and Stratonic) to create new unrelated paths for growth and diversification.

The software and ICT industry in Arendal-Grimstad (Norway) is a form of anchoring diversification mechanism by LPEs. The arrival of Elektrisk Bureau (EB) from Oslo in 1962, building of a factory in Arendal supported by the Development Fund for Rural Areas (DU) whereby the main customer for the factory was the state own telephone company (Televerket). The main industries in Arendal-Grimstad were smelters, pulp, ship and boat building, which made female resources reserved for other industries, thus provided the human capitals for the creation of the new paths for development in electronics. The factory was then upgraded in 1980s to extend its product portfolio. In late 1980s, the Swedish company Ericsson as the main shareholder in EB took over the factory in Arendal while dividing the factor into a development department owned by Ericsson and an electronic contract supplier.

LPEs

The electronic contract supplier of Ericsson then merged in 2000 with Stratonic and former telephone factory in Risør forming Kitron. Stratonic was founded in 1966 by a local shipbuilding entrepreneur aiming to produce electronics equipment to ships and in 1971 made a decision to focus on contract production of electronics.

Branching

The development department became a key actor in education, offering bachelor, master, and Phd programs in ICT engineering tailored to mobile systems. This resulted into the development of analytical knowledge of mobile communication that supplemented long-standing experience in mobile phone technology as well as creating academia-industry linkages. The Ericsson department has gradually downsized in line with Ericsson's loss of competitiveness on the mobile phone market. The downsizing has, however, led to establishment of several IT consulting companies by groups of former Ericsson employees. Thirteen persons in the development department started three firms based on the technology and customers from Stratonic. Two of the spin-offs still exist as medium sized firms, however, one of these have been

through a number of takeovers and is now part of a larger Norwegian company.

The spin-offs and local co-operation resulted in forming a cluster organisation “Digin” for ICT firms (which includes a wider region than Arendal-Grimstad) that achieved status as an “official cluster by the Arena programme in Innovation Norway. Digin consists of about 65 firms and organizations in the larger Agder region. About 50 of the members in the cluster organizations are private ICT-firms, mostly small software firms, and 11 of these are located in Arendal-Grimstad.

Limited Institutional Capabilities

The industry emerged and developed as part of the wider value-chain as the firms are first of all contract manufacturers, subcontractors and component manufacturers which benefited from the external growth impulses derived in particular from outsourcing by Nokia in the mid-1990s. The ICT industry in Agder however remains undeveloped as a regional cluster as a result of little cooperation between industry, university and other regional knowledge organizations. The local impact of the transformation and institution building is rather limited because many firms link up to partners outside the region and have few local suppliers and knowledge links.

The history of the two pioneer firms demonstrates that the emergence of the new path in Arendal-Grimstad had exogenous sources that demanded policy actions through state funding and content strategy that were pivotal in nurturing new industries in structurally and institutionally weak regions. Moreover, the anchoring mechanism through LPEs generated limited unrelated varieties and it was associated with basic institutional capabilities.

Source:

Isaksen, A. & Trippel, M., (2014b). Papers in Innovation Studies New Path Development in the Periphery. *Papers in Innovation Studies*, 2014(20), pp.1–39.

Successful SOEs of UAE in their own right

The success of SOEs in GCC particularly in UAE moved beyond heavy industry into telecommunications, military, aviation, tourism, media, renewable energy, and healthcare. The creation of these industries through SOEs has been mainly associated with foreign joint venture due to limited locally accumulated capabilities. Most of these sectors would not have been emerged through local private sector thus it was essentially required for the government to pursue an entrepreneurial role.

Abu Dhabi landscape is marked by three large SOEs, Abu Dhabi National Oil Company (ADNOC), Abu Dhabi Investment Authority (ADIA) and Mubadala Development Company each with distinct a mandate that reflects the trajectory of Abu Dhabi Economy. ADNOC remarks the oil and gas era and continues till now as a backbone of the economy. ADIA had been established to invest the revenue of oil and gas outside the country and remarkable its asset are valued close to US\$900 billion. Abu Dhabi's Mubadala Development Company is an example of agglomerate that undertook the role for diversifying the economic structure of Abu Dhabi through the creation of new paths for growth that are both related and unrelated to sources of path dependence, i.e. oil and gas.

Mubadala, a holding entity established in 2002, owns a wide variety of local and international assets, the only common denominator of which is that they are expected to contribute to the diversification and technological development of Abu Dhabi's economy. Mubadala now is invested in fields as diverse as gas trade, aluminium, real estate, semiconductors, healthcare, renewable energy and aerospace manufacturing. It has also been used as a tool to temporarily acquire struggling private companies. It owns shares in General Electric, chip maker AMD, commodities company EBX, and private equity company The Carlyle Group. Mubadala's reports its total assets to be valued at more than 50 billion USD and has created 10 000 jobs in Abu Dhabi in the past decade. Mubadala continues to rely on regular capital injections from the government, however and although it has reported profits for most recent years, these appear to be largely driven by its "Dolphin Energy" daughter company which imports cheap gas from Qatar under a long-term supply contract. The commercial viability of it ventures into semiconductors and renewable energy remains yet to be proven and has come under some criticism from sectoral experts. The sustainability of its success is also sometimes questioned since it relies heavily on foreign expertise. Whatever the eventual fate of Mubadala's ventures might be, it is an alternative model to the more narrowly focused, gradual and methodical build-up that companies such as SABIC witnessed already from the 1970s

onwards.

Source:

OECD, 2013. State-Owned Enterprises in the Middle East and North Africa: Engines of Development and Competitiveness?
OECD Publishing.

The Biotech Industrial Cluster in Singapore

Context

The government vision is to make Singapore as the premier hub for biotech research in Asia as an integral part of its national science and technology program. EDB identified biotechnology, pharmaceuticals, medical devices, health care services, and bioinformatics as the targeted sub-clusters identified under the biomedical sciences cluster by the policy-makers within the EDB as its next key cluster alongside chemicals, engineering, and electronics.

Multiple Mechanisms

Singapore pursued a radical diversification strategy towards achieving its goal to achieve a 'knowledge based economy' or 'innovation based economy'. The biotech industrial cluster is an example of a development strategy to create new paths of growth that are unrelated to existing economic structure and accumulated knowledge and capabilities (Parayil, 2005).

Singapore since independence had relied on MNEs to jump start new industries and biotech industrial cluster is not different but the caveat is leveraging these MNEs to conduct research in Singapore. However, for biotech cluster, the strategy was to build local capabilities by making local universities involve in live science research. Thus, the government established joint ventures with international organizations. For example, S*Bio (<http://www.sbio.com/>), a joint venture between Chiron Corporation and the EDB, AndMerLion Pharmaceuticals (<http://www.merlionpharma.com/>), a joint venture between GlaxoSmithKline and EDB.

Singapore's strategy is to branch, nurture and develop SMEs in the biotech industrial cluster, a strategy distinct from the earlier approach of building-up large state-linked firms in the electronics industry. The biomedical sciences cluster saw a significant increase in the formation of several local startups in pharmaceutical, medical technology, health care services, and biotechnology sub-clusters. Startups such as ES Cell International, S*Bio, Genset and Oculex are engaged in a wide range of activities such as basic R&D, product and process development, clinical trials, and production of diagnostic devices.

Institutional Capabilities

The biotech cluster is a case of how nations build unrelated and complex varieties through institutional collaboration to create a "national innovation capacity" (Parayil, 2005) where various economic actors are at interplay to develop an industry.

The clustering of biotech industry is coordinated by EDB and dedicated government organizations were set up to oversee different aspects of the industry and set up the cluster. Bio*One Capital, the investment arm of EDB which manages investment funds for strategic biomedical technology and start-ups. A*STAR is the main organization entrusted for 'creation and utilization of intellectual capital, and the training of research manpower in the transition to a knowledge-based economy'. It was established in 2001 by the former National Science and Technology Board in order to charting the course of Singapore's Science and Technology progress' (<http://www.a-star.edu.sg>). It comprised the Biomedical Research Council, the Science and Engineering Research Council, Exploit Technologies Pte Ltd (<http://www.exploit-tech.com>) and the A*STAR Graduate Academy.

One North and the Biopolis

In 2000, the government announced the development of S\$15 billion new science park – the One-North project – to strengthen the technological infrastructure as Singapore targets life sciences.

The JTC Corporation (<http://www.jtc.gov.sg/>) as the organization in charge for developing infrastructure for industries developed the Tuas Biomedical Manufacturing Park for bioscience manufacturing, it cost the government SGD 550 million (USD 330 million as per rates on 31 Dec 2005) and currently occupies 183 ha. Since 1997 it has successfully attracted six global biomedical firms: Merck Sharp & Dohme (Singapore) Ltd, Wyeth Nutritionals (Singapore) Pte Ltd, Pfizer Asia Pacific Pte Ltd, GlaxoSmithKline Biologicals (Singapore) Pte Ltd, CIBA Vision Asian Manufacturing and Logistic Pte Ltd, and Novartis Singapore Pharmaceutical Manufacturing Pte Ltd.

The JTC Corporation opened in October 2003 the state-of-the-art "Biopolis" (a biomedical-research-park-cum-residential-and-recreational-complex) in the Buena Vista Science Hub adjacent to the National University of Singapore/National University Hospital campus spreading over eight hectares with seven architecturally unique buildings. The Biopolis is intended to be a research campus within an urban park for biomedical researchers to "work, live, play, and learn." as one of the most conducive and integrated innovation centers in the world offering cutting-edge facilities for developing the biomedical industry cluster (Parayil, 2005). The facilities of the Biopolis include research institutes, incubator centers for start-ups, medical facilities, and space for private firms. Manufacturing activities related to pharmaceutical and biotech products are located at the Tuas Biomedical Park, formerly known as Tuas View Pharma Park.

The EDB, meanwhile, worked to attract MNCs, including Novartis, GlaxoSmithKline, and Pfizer. The chairman of A*STAR, Lim Chuan Poh highlights that "Biopolis was conceived as part of a bold vision to establish the BMS as a key pillar of Singapore's economy. That vision has become a reality. Today, Biopolis is a thriving eco-system of public research institutions and corporate labs and a vibrant community of local and international biomedical scientists carrying out world-

class R&D.” (Koh, 2005, Vietor, 2015)

State Funding

The government took a lead role in directly running a number of life-science related funds, under the fourth Science and Technology Plan 2010, the MTI committed SGD 7.5 billion for economic-oriented R&D activities over the years 2006–10. Of this sum, SGD 5.4 billion was pledged towards the promotion of economically relevant public sector R&D by A*STAR and another SGD 2.1 billion towards promoting private sector R&D investments by the EDB.

Additionally, Bio*One Capital, which manages funds of SGD 1.2 billion, administers four dedicated biomedical funds – the Biomedical Sciences Investment Fund, PharmBio Growth Fund, Life Sciences Investment Funds and Singapore Bio-Innovations Fund (see further at <http://www.bio1capital.com/fund.html>) – as well as the Biomedical Sciences Innovate ‘N’ Create scheme (BMS INC), which provides seed funding (in the form of equity between SGD 250 000 and SGD 2 million) to local biomedical start-ups and encourages joint ventures to convert biomedical research into viable products and services.

To-date, Bio*One Capital reported investment in 36 portfolio companies in the area of drug discovery/ development, cellular therapy, medical technology, and protein therapeutics/ monoclonal antibody. Bio*One also invested funds in five other life-science VC funds. Through support activities such as Bio*One, a fledgling dedicated biotechnology firms a sector comprising over twenty firms has emerged in Singapore (Wong, 2007).

Institutional Environment

In addition to direct commitment of public funding, the government also significantly changed the regulatory and promotional landscape for life science industry development in Singapore. Exploiting the ban on new stem cell lines in the US, the Singapore government allowed, and indeed strongly promoted, the establishment of stem-cell research in Singapore, enabling the island state to gain a beachhead for stem-cell based work (Chang, 2001 in Wong, 2007)

Singapore state has put in place a supportive environment for commercial exploitation of intellectual assets created within the public research institutes. Regulatory policies have been introduced to protect intellectual property (IP) and risk-taking. In December 2000, the Cabinet appointed a Bioethics Advisory Committee (<http://www.bioethics-singapore.org/>) ‘to address the ethical, legal and social issues arising from biomedical sciences research’ and its applications.

The National University of Singapore Enterprise (NUS Enterprise)

The National University of Singapore (NUS) plays an essential role in building capabilities in both education and entrepreneurship. The Industry and Technology Relations Office (INTRO) at the National University of Singapore (NUS) reports the formation of scores of spin-off firms since its inception in 1992, while the Innovation and Technology Transfer

Office (ITTO) at Nanyang Technological University (NTU) is currently incubating numerous high-tech start-ups. In addition to collaborating with the twelve Research Institutes under the A*STAR, there are several university-level research centres at NUS and NTU.

The broad mission for NUS Enterprise is to inject a more entrepreneurial dimension to NUS education and research. NUS Enterprise began to re-shape a number of key university policies with respect to governance of technology commercialization. Among the key changes introduced, the technology licensing office was re-organized to become more “inventor friendly”, with less emphasis on maximizing licensing revenue, and greater focus on getting greater deployment of NUS technology to the marketplace, whether through licensing to existing firms or spinning off new firms. A new Venture Support (NVS) unit was also created with the explicit aim of providing assistance to NUS professors to commercialize their inventions and knowledge. Besides the provision of Incubator facilities, NVS also launched a seed fund that providing seed funding to NUS spin-off companies. A student start-up fund was also established to provide seed funding to new ventures started by students. In terms of education program, a university level Entrepreneurship Centre was also established within NUS Enterprise with the mission to teach entrepreneurship to all students on campus, particularly students in engineering, computing and science, including life science and medical students. The centre was also given the task of building a network of entrepreneurs, venture capitalists and angel investors to provide NUS spin-offs with mentoring by practitioners and access to external venture funding (Wong, 2007).

A new initiative that integrated both dimensions of globalism and entrepreneurship was introduced via NUS Enterprise—the so-called NUS Overseas College Program (NOC), under which the university would send her brightest undergraduate students to five entrepreneurial hubs in the world to work as interns in high-tech start-up companies for one year, during which they would also take courses related to entrepreneurship at partner universities in each of the regions. The first NOC program was launched in Silicon Valley in 2002, followed by Philadelphia in 2003, Shanghai in 2004, Stockholm in 2005, and Bangalore in India in 2006. The choice of Philadelphia is noteworthy, as it was deemed a major hub for pharmaceutical companies and hence serves to nurture entrepreneurial interest in life sciences in particular (Wong, 2007)

An Office of Life Sciences (OLS) was set up formally in 2001 with the mission to make NUS into a world-class hub for life sciences. It aims to accomplish its mission by coordinating, integrating and facilitating Life Science throughout the University and affiliated institutions (Wong, 2007)

NUS represents the single largest biomedical patent holder in Singapore, accounting for 25 out of 86 US patents granted in the field of biomedical technology over the period 1996–2004, or nearly one-third (Wong, 2007). In terms of spin-off companies, 11 out of over 40 companies (25%) that were spun-off by NUS up to 2004 were in biomedical related fields

(Wong, 2007). In terms of technology licensing, NUS' market reach has been somewhat more extensive. There were 31 active licensees (excluding number of prior of biomedical related patents, ranging from NUS spin-offs to local DBFs and global pharmaceutical companies at the end of 2004 (Wong, 2007)

Education, R&D and Building Knowledge

In June 2000, the Singapore Government formed a high-level Ministerial Committee chaired by Deputy Prime Minister Dr. Tony Tan to oversee the development of biomedical sciences in Singapore. The Ministerial Committee included the Minister of Education, the Minister of Trade and Industry, and the Minister of Health. The mandate of the committee was to oversee the various aspects of education, R&D, and industry development. The Ministerial Committee was supported at a working level by the EDB, A*STAR, JTC, NUS, NTU, and senior bureaucrats from a few other ministries and statutory boards and agencies. An International Advisory Council (IAC) chaired by Richard Sykes, Rector of Imperial College and former Chairman of the Board of GlaxoSmithKline Plc., was also established to advise the Ministerial Committee and the working groups. At the level of actually formulating and implementing programs and imparting funds, EDB acts as the nodal agency. A Biomedical Research Council (BMRC) formed in October 2000 within A*STAR supervises and supports biomedical R&D work in Singapore. A*STAR provides local and global linkages for Singapore-based firms and research institutes through its signed MOUs with the objective of developing research cooperation and collaboration with world-class universities and research organizations. EDB/BMS Group and BMRC/A*STAR work together to create the intellectual, industrial, and human capital in the bio-medical sector to nurture and sustain industrial enterprises. Enhancing core capabilities in biomedical sciences is entrusted to the five A*STAR research institutes Bioprocessing under BMRC—Institute of Molecular and Cell Biology (IMCB), Technology Institute (BTI), Bioinformatics Institute (BII), Genome Institute of Singapore (GIS), and the recently founded Institute of Bioengineering and Nanotechnology (IBN).

Outcomes

Since 2000, the output of the BMS sector increased fivefold to S\$29.4 billion in 2012, surpassing electronics as the biggest contributor to manufacturing in terms of value added. The biomedical sciences industry cluster showed marked increase in manufacturing output in 2002 despite the global recession. Biomedical industry cluster manufacturing output in 2002 was S\$9,700 million, a 47 percent increase from the output level of 2001. The value-added from this cluster stood at 18 percent of total manufacturing value-added, although it accounted for only 7 percent of total manufacturing output in 2002. The manufacturing output was S\$11,300 million in 2003 and it is expected to be over S\$12,000 million in 2004.

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Mo i Rana	Amot	Alvik
<p>Context</p> <p>Mo i Rana is a town of Rana Municipality in the northern part of Norway. It is rich in iron ore and hydroelectric power resources.</p> <p>In 1946, the Norwegian Government selected Mo i Rana for the location of an iron mill.</p> <p>The state-owned enterprise Norsk Jernverk AS was established in 1955, and it began producing steel for the Norwegian and international markets. Although the economic business case was not promising, the motive was to protect the domestic iron and steel industries. However, in June 1988, the government decided to phase out state ownership of the company due to economics of</p>	<p>Context</p> <p>Åmot is a municipality in eastern Norway. Rena Kartonfabrikk AS, a paper and cardboard manufacturer, had been the cornerstone company in the town since it was established in 1916.</p> <p>The company experienced financial problems in the 1990s because of intense competition in the market as a result was forced to shut down in October 1998. Thus, the government responded by a restructuring program</p> <p>Restructuring Program</p> <p>Åmot was granted a six-year restructuring programme (1999–2004). The total funding for the programme was NOK 48 million (EUR 5.7</p>	<p>Context</p> <p>Ålvik is a small rural town in the western part of Norway.</p> <p>Fossekompagniet AS Bjølvefossen was established in 1905 to build a hydroelectric power plant at Bjølvefossen (the site of a waterfall).</p> <p>Since the 1920s, Bjølvefossen has produced ferro-alloys for the international iron and steel industry. The factory was acquired by Elkem in 1986. In 2005, Elkem was integrated into the Norwegian industrial conglomerate Orkla. Because of developments in the international iron and steel market, and considering the price of hydroelectric power, Orkla announced in</p>

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<p>the facilities, thus introduced a restructuring program.</p> <p>Restructuring Program</p> <p>The 'Rana package' ('Ranapakken'), was the largest restructuring programme Norway had ever undertaken.</p> <p>The purpose of the five-year (1988–1993) restructuring programme was to produce a less vulnerable and more diversified local economy and to maintain employment rates.</p> <p>Institutional Environment</p> <p>The restructuring programme comprised several policy mechanisms, including restructuring funds, early retirement, cheap electric power, and a reduced employer tax for a period of five years in Rana and neighbouring municipalities. New national public services were to be located in Rana, and the local employment council was granted extra funds in anticipation of massive local unemployment.</p> <p>In addition to 'ordinary' restructuring funding, the government granted a large sum of additional funds to Rana. The cash value of the Rana package was approximately NOK 1660 million (EUR 196 million), which included a grant of NOK 500 million (EUR 59 million) to the Rana community (for 'ordinary restructuring'), a NOK 1030 million (EUR 122 million) restructuring grant to Norsk Jernverk, and NOK 130 million (EUR 15 million) to cover early retirement expenses at the cornerstone company. This was combined with other non-</p>	<p>million), shared by local municipality and national government.</p> <p>Institutional Arrangement</p> <p>Åmot Municipality was the owner of the restructuring programme however was organised as a separate programme with its own board of directors while.</p> <p>The restructuring programme concluded that Åmot had a relative strength in information and communications technology (ICT).</p> <p>Three strategies were formulated:</p> <ol style="list-style-type: none"> 1. ICT, both as a tool for developing existing businesses and as a base for start-up firms. 2. Entrepreneurship and innovation in existing sectors. 3. Entrepreneurship in tourism. <p>The goal of the restructuring programme was strengthening the foundation and development capacity in existing businesses and encouraging new businesses. Particularly, increasing the effectiveness and professionalism of development work in the municipality, strengthening networks and cooperation between key actors in the community, and enhancing competence in project management. Thus, the restructuring programme took a broad approach to building local capacity for development.</p> <p>Institutional Environment</p> <p>The programme in Åmot promoted economic development in broader sense. It was focused</p>	<p>2006 that the production of ferro-alloy at the Elkem plant in Ålvik was to cease and that production would be moved to a new factory in Iceland.</p> <p>Restructuring Program</p> <p>Kvam took the initiative in 2006 to start a restructuring programme in Ålvik. It was funded at NOK 14 million (EUR 1.7 million) and was initiated in 2007.</p> <p>The main objective of the Åv restructuring programme was to replace existing industry with three large industrial businesses that are modern, progressive, and environmentally friendly, and they will not be dependent upon a specific economic trend.</p> <p>Institutional Arrangement</p> <p>In 2007, the government established a local development agency, Ålvik vekst Kvam KF (abbreviated Åv), to promote new economic development in Ålvik. The board of the development agency consisted of local business interests, the mayor and city manager of Kvam, and a representative from Elkem.</p> <p>Mechanisms-Branching and Clustering</p> <p>The development agency adopted an acquisition strategy as its main instrument, encouraging large external business interests to move into the vacant industrial areas in Ålvik.. Elkem wanted to develop new products based on recyclable waste from aluminium production. The strategy focused more on developing SMEs</p>

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<p>cash benefits, such as reduced payroll taxes for employers and subsidised electric power for companies. A local development agency was established to initiate and coordinate the process.</p> <p>The steel plant was expected to reduce its workforce from 3000 to c.1000, mainly through vertical disintegration. Former divisions of the company were converted into separate business units, and the remaining steel plant was privatised. These companies were guaranteed three years of deliveries to the rest of the steel plant, but it was expected that they would obtain access to new markets in addition to the local market.</p> <p>In addition, many of the new jobs (c.400) were expected to come from the relocation of existing public services to Rana. New jobs were also expected to come from growth in existing enterprises, the establishment of new small and medium-sized companies, and growth in power-based projects (in total, c.1000 jobs).</p> <p>Institutional Arrangement</p> <p>The establishment of public offices was the main contributor to new jobs from 1988 to 1992, including the National Collection Agency (Statens innkrevingsentral), the Norwegian National Broadcasting Licence Office (NRK Lisenskontor), the Post Office Ticketmaster System (Postens billettbestillingssystem), and the accession and storage section of the National Library (Nasjonalbiblioteket). These</p>	<p>on strengthening the conditions for economic development (e.g. SMEs, skills, and networks) and promoted Åmot as a place to live and work.</p> <p>Mechanisms-Branching</p> <p>The focus was on stimulating endogenous growth by mobilising local resources to start-up and innovate in existing firms.</p> <p>Collaboration</p> <p>The program facilitated networking between actors with community including business representatives, entrepreneurs, public-sector representatives, college, the military base, and other local citizens</p> <p>Proposition: <i>creation of new unrelated paths through branching where collaboration paly an underlying factor for development</i></p>	<p>and fostering entrepreneurship.</p> <p>Outcomes</p> <p>Åv achieved some success during its second phase, when the scope of the restructuring process was broadened to include all of Kvam Municipality, including increased networking between people and businesses in the municipality, and growth in existing SMEs through development projects.</p> <p>Proposition: <i>new paths can be created through hybrid mechanisms such as anchoring and branching whereby collaboration is underlying factor for change.</i></p>

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<p>public offices created c.420 new stable jobs (status in 1992). In addition, new jobs in small and medium-sized enterprises (SMEs) were created, but fewer than anticipated (c.260).</p> <p>Mechanisms: Branching around an anchor Vertical disintegration played a major part in the restructuring of the steel plant. In Rana, c.40 former units of the steel plant were converted into separate companies. The main competitive advantage was cheap energy and availability of local expert resources on industrial processing.</p> <p>Outcomes Although the restructuring project was not considered a complete success, a significant number of jobs were created.</p> <p><i>Proposition: Restructuring an anchor SOE and industry generating limited varieties and diversification.</i></p>		
<p>Source: Jakobsen, S.-E., & Høvig, Ø. S. (2014). Hegemonic ideas and local adaptations: Development of the Norwegian regional restructuring instrument. <i>Norsk Geografisk Tidsskrift - Norwegian Journal of Geography</i>, 68(2), 80–90</p>		

Appendix G Export Data for Singapore, Norway and UAE

Source WITS UN COMTRADE HS2014 H4 Downloaded on 22 July 2016

Code	Product Name	Singapore		Norway		UAE	
		2014 in 1000 USD		2014 in 1000 USD		2014 in 1000 USD	
1	Live animals	5264.46	0.00%	9078.204	0.01%	32484.459	0.02%
2	Meat and edible meat offal	114178.39	0.03%	35552.668	0.03%	9906.765	0.01%
3	Fish and crustaceans, molluscs and other aquatic invertebrates	231826.338	0.06%	10545402.13	7.58%	74783.613	0.05%
4	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included	426100.174	0.11%	109721.743	0.08%	308412.06	0.21%
5	Products of animal origin, not elsewhere specified or included	25154.422	0.01%	44412.281	0.03%	731.216	0.00%
6	Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage	32170.629	0.01%	2083.605	0.00%	5151.688	0.00%
7	Edible vegetables and certain roots and tubers	28052.353	0.01%	1195.228	0.00%	9526.629	0.01%
8	Edible fruit and nuts; peel of citrus fruit or melons	195439.884	0.05%	8831.884	0.01%	85330.085	0.06%
9	Coffee, tea, maté and spices	408980.527	0.11%	7524.571	0.01%	245171.757	0.17%
10	Cereals	84980.218	0.02%	763.358	0.00%	1190.627	0.00%
11	Products of the milling industry; malt; starches; inulin; wheat gluten	35949.339	0.01%	4656.791	0.00%	39838.252	0.03%
12	Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal plants; straw and fodder	99931.831	0.03%	3095.548	0.00%	2433.127	0.00%
13	Lac; gums, resins and other vegetable saps and extracts	35976.616	0.01%	1673.559	0.00%	19243.887	0.01%
14	Vegetable plaiting materials; vegetable products not elsewhere specified or included	11850.928	0.00%	25.028	0.00%	342.422	0.00%
15	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes	375749.636	0.10%	229605.83	0.17%	355745.065	0.24%
16	Preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates	97378.86	0.03%	65035.691	0.05%	35104.611	0.02%
17	Sugars and sugar confectionery	92579.179	0.02%	11813.031	0.01%	427996.778	0.29%
18	Cocoa and cocoa preparations	815508.219	0.22%	40432.568	0.03%	343647.133	0.24%

19	Preparations of cereals, flour, starch or milk; pastrycooks' products	1648654.767	0.44%	39636.351	0.03%	197124.316	0.14%
20	Preparations of vegetables, fruit, nuts or other parts of plants	143605.914	0.04%	11852.928	0.01%	262433.408	0.18%
21	Miscellaneous edible preparations	1851654.664	0.49%	201737.494	0.15%	218902.053	0.15%
22	Beverages, spirits and vinegar	2797957.833	0.74%	98945.179	0.07%	137727.397	0.09%
23	Residues and waste from the food industries; prepared animal fodder	219079.774	0.06%	280513.313	0.20%	241740.912	0.17%
24	Tobacco and manufactured tobacco substitutes	998800.538	0.26%	509.531	0.00%	1541164.713	1.06%
25	Salt; sulphur; earths and stone; plastering materials, lime and cement	80915.831	0.02%	463971.099	0.33%	1129431.579	0.78%
26	Ores, slag and ash	59117.459	0.02%	434708.634	0.31%	25837.041	0.02%
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes	68688160.59	18.19%	93026266.09	66.87%	104351485.5	71.85%
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rareearth metals, of radioactive elements or of isotopes	443174.403	0.12%	725486.585	0.52%	32614.647	0.02%
29	Organic chemicals	18349856.59	4.86%	967561.112	0.70%	27108.47	0.02%
30	Pharmaceutical products	7135997.789	1.89%	906158.12	0.65%	233124.299	0.16%
31	Fertilisers	23974.593	0.01%	12851.758	0.01%	73309.567	0.05%
32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring matter; paints and varnishes; putty and other mastics; inks	1329820.055	0.35%	131307.42	0.09%	233596.543	0.16%
33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations	4570667.452	1.21%	57150.067	0.04%	436050.697	0.30%
34	Soap, organic surfaceactive agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, 'dental waxes' and dental preparation	710665.499	0.19%	87149.463	0.06%	207136.141	0.14%
35	Albuminoidal substances; modified starches; glues; enzymes	304335.994	0.08%	30782.491	0.02%	10869.344	0.01%
36	Explosives; pyrotechnic products; matches; pyrophoric alloys; certain combustible preparations	34750.844	0.01%	8047.905	0.01%	16193.731	0.01%
37	Photographic or cinematographic goods	166780.106	0.04%	525.922	0.00%	2156.365	0.00%
38	Miscellaneous chemical products	4956155.15	1.31%	673579.863	0.48%	265197.999	0.18%
39	Plastics and articles thereof	16389203.59	4.34%	537010.118	0.39%	3404209.468	2.34%
40	Rubber and articles thereof	1382404.685	0.37%	130513.338	0.09%	45541.635	0.03%
41	Raw hides and skins (other than furskins) and leather	138412.878	0.04%	51096.998	0.04%	7134.277	0.00%

42	Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silkworm gut)	748747.809	0.20%	15630.665	0.01%	12049.072	0.01%
43	Furskins and artificial fur; manufactures thereof	3910.028	0.00%	85825.418	0.06%	0	0.00%
44	Wood and articles of wood; wood charcoal	127965.301	0.03%	614267.633	0.44%	28761.931	0.02%
45	Cork and articles of cork	848.572	0.00%	64.071	0.00%	26385.26	0.02%
46	Manufactures of straw, of esparto or of other plaiting materials; basketware and wickerwork	1409.538	0.00%	278.867	0.00%	813.697	0.00%
47	Pulp of wood or of other fibrous cellulosic material; recovered (waste and scrap) paper or paperboard	449477.549	0.12%	359983.079	0.26%	83200.282	0.06%
48	Paper and paperboard; articles of paper pulp, of paper or of paperboard	1622970.25	0.43%	501501.383	0.36%	300201.331	0.21%
49	Printed books, newspapers, pictures and other products of the printing industry; manuscripts, typescripts and plans	5708674.779	1.51%	85850.972	0.06%	733174.15	0.50%
50	Silk	5685.806	0.00%	78.531	0.00%	1613.228	0.00%
51	Wool, fine or coarse animal hair; horsehair yarn and woven fabric	21523.159	0.01%	42152.215	0.03%	119.05	0.00%
52	Cotton	55632.879	0.01%	5043.992	0.00%	43558.043	0.03%
53	Other vegetable textile fibres; paper yarn and woven fabrics of paper yarn	1243.697	0.00%	617.832	0.00%	17.54	0.00%
54	Manmade filaments; strip and the like of manmade textile materials	260485.835	0.07%	5040.151	0.00%	184555.841	0.13%
55	Manmade staple fibres	125707.618	0.03%	2658.864	0.00%	29747.974	0.02%
56	Wadding, felt and nonwovens; special yarns; twine, cordage, ropes and cables and articles thereof	104047.548	0.03%	50794.759	0.04%	31898.91	0.02%
57	Carpets and other textile floor coverings	17986.939	0.00%	743.579	0.00%	81091.946	0.06%
58	Special woven fabrics; tufted textile fabrics; lace; tapestries; trimmings; embroidery	32392.777	0.01%	1170.702	0.00%	5162.613	0.00%
59	Impregnated, coated, covered or laminated textile fabrics; textile articles of a kind suitable for industrial use	120932.839	0.03%	28764.614	0.02%	6644.791	0.00%
60	Knitted or crocheted fabrics	63698.489	0.02%	1618.724	0.00%	4255.994	0.00%
61	Articles of apparel and clothing accessories, knitted or crocheted	755257.997	0.20%	62967.124	0.05%	167342.721	0.12%
62	Articles of apparel and clothing accessories, not knitted or crocheted	511720.86	0.14%	38437.805	0.03%	110870.693	0.08%
63	Other madeup textile articles; sets; worn clothing and worn textile articles; rags	147100.537	0.04%	51468.527	0.04%	39495.389	0.03%
64	Footwear, gaiters and the like; parts of such articles	1091552.095	0.29%	19720.937	0.01%	11353.687	0.01%

65	Headgear and parts thereof	15523.894	0.00%	8783.184	0.01%	2114.969	0.00%
66	Umbrellas, sun umbrellas, walking sticks, seatsticks, whips, ridingcrops and parts thereof	1771.218	0.00%	276.149	0.00%	2976.719	0.00%
67	Prepared feathers and down and articles made of feathers or of down; artificial flowers; articles of human hair	1872.398	0.00%	797.357	0.00%	147.751	0.00%
68	Articles of stone, plaster, cement, asbestos, mica or similar materials	144989.174	0.04%	55300.773	0.04%	174711.704	0.12%
69	Ceramic products	78715.719	0.02%	20791.728	0.01%	324857.87	0.22%
70	Glass and glassware	250825.818	0.07%	93499.96	0.07%	407460.252	0.28%
71	Natural or cultured pearls, precious or semiprecious stones, precious metals, metals clad with precious metal, and articles thereof; imitation jewellery; coin	8154743.13	2.16%	620926.425	0.45%	12263578.75	8.44%
72	Iron and steel	2316453.419	0.61%	1350112.28	0.97%	1439222.187	0.99%
73	Articles of iron or steel	3352488.756	0.89%	1353967.077	0.97%	1505586.353	1.04%
74	Copper and articles thereof	741679.468	0.20%	397693.228	0.29%	1780064.398	1.23%
75	Nickel and articles thereof	816923.708	0.22%	1456153.189	1.05%	7106.941	0.00%
76	Aluminium and articles thereof	994821.58	0.26%	4226968.583	3.04%	4190883.749	2.89%
78	Lead and articles thereof	61421.84	0.02%	3152.885	0.00%	50423.241	0.03%
79	Zinc and articles thereof	60014.954	0.02%	372149.592	0.27%	50364.072	0.03%
80	Tin and articles thereof	1060674.886	0.28%	569.961	0.00%	11788.722	0.01%
81	Other base metals; cermets; articles thereof	130026.653	0.03%	124362.87	0.09%	1378.613	0.00%
82	Tools, implements, cutlery, spoons and forks, of base metal; parts thereof of base metal	1149836.104	0.30%	94514.737	0.07%	3375.868	0.00%
83	Miscellaneous articles of base metal	632753.722	0.17%	58102.203	0.04%	131754.035	0.09%
84	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof	53959322.98	14.29%	7419471.637	5.33%	1965005.254	1.35%
85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles	124874631.2	33.08%	3381617.193	2.43%	1763552.405	1.21%
86	Railway or tramway locomotives, rolling stock and parts thereof; railway or tramway track fixtures and fittings and parts thereof; mechanical (including electromechanical) traffic signalling equipment of all kinds	140332.655	0.04%	92301.168	0.07%	42059.695	0.03%
87	Vehicles other than railway or tramway rolling stock, and parts and	4249739.92	1.13%	843672.367	0.61%	538717.431	0.37%

	accessories thereof						
88	Aircraft, spacecraft, and parts thereof	5847434.292	1.55%	413511.608	0.30%	260773.112	0.18%
89	Ships, boats and floating structures	1645082.451	0.44%	1424819.829	1.02%	926806.566	0.64%
90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof	15915042.98	4.22%	2277879.459	1.64%	93368.867	0.06%
91	Clocks and watches and parts thereof	1757668.693	0.47%	14753.851	0.01%	5040.618	0.00%
92	Musical instruments; parts and accessories of such articles	26768.335	0.01%	1410.824	0.00%	370.6	0.00%
93	Arms and ammunition; parts and accessories thereof	1092.232	0.00%	287038.686	0.21%	1767.517	0.00%
94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting fittings, not elsewhere specified or included; illuminated signs, illuminated nameplates and the like; prefabricated buildings	471490.658	0.12%	611818.089	0.44%	260929.267	0.18%
95	Toys, games and sports requisites; parts and accessories thereof	644105.104	0.17%	68806.79	0.05%	16513.221	0.01%
96	Miscellaneous manufactured articles	217642.614	0.06%	6116.286	0.00%	7616.153	0.01%
97	Works of art, collectors' pieces and antiques	304461.717	0.08%	67032.611	0.05%	12139.067	0.01%
All		377540544.1	100.00%	139121318.5	100.00%	145241900.4	100.00%

Appendix H P3 Search Strategy

Table_Apx 1: Search Strings

	Search Strings	Rationale
Singapore	“singapore” AND ('econ*' OR "regional development*") AND ('chang*' OR 'transform*' OR 'reform' OR 'restruct*' OR "struct* change" OR 'emerg*' OR 'evolution*' OR 'branch*' OR 'divers*' OR 'spillover*' OR "create path*" OR "path depend*" OR 'mechanism' OR 'innovat*' OR 'learn*')	The object of this search string is to identify articles that cover change and diversification to economy or regional development.
Norway	“norway” AND ('econ*' OR "regional development*") AND ('chang*' OR 'transform*' OR 'reform' OR 'restruct*' OR "struct* change" OR 'emerg*' OR 'evolution*' OR 'branch*' OR 'divers*' OR 'spillover*' OR "create path*" OR "path depend*" OR 'mechanism' OR 'innovat*' OR 'learn*')	
United Arab Emirates	Abu Dhabi" OR "Dubai" OR "United Arab Emirates") AND ('econ*' OR "regional development*") AND ('chang*' OR 'transform*' OR 'reform' OR 'restruct*' OR "struct* change" OR 'emerg*' OR 'evolution*' OR 'branch*' OR 'divers*' OR 'spillover*' OR "create path*" OR "path depend*" OR 'mechanism' OR 'innovat*' OR 'learn*')	

Table_Apx 2: Search Results

	ABI/ ProQuest	EBSCO	Web of Science	Total (no duplicates)
Singapore	1129	950	1086	2091
Norway	1498	799	1248	2639
United Arab Emirates	584	146	256	792
Total Articles	3211	1895	2590	4919
Cross Referenced & Other Sources	86			

Table_Apx 3: Selection Criteria

Criterion	Inclusion	Exclusion	Rationale
Publication Type	Scholarly journals	All others	In order to ensure high quality review
Publication Date	All	None	
Journal Ranking	Journals ranked 3 star and above	Journals ranked 2 and below	Many articles on regional economies are generated by local based journals associated with local institutions that may not ensure the quality of research adopted by international associations
Language	English	All others	English is the universal language
Theoretical and Literature Domains	Evolutionary economic geography, Institutional economic geography, Path dependence, Path creation, Diversification actors, Diversification mechanisms, Diversification outcomes	Social welfare, Trade and trade cost, Income disparity, Environment, Housing, Income, Inequality, Poverty, Immigrants, Markets, Population, Tax	Emergence, evolution, reform, transformation, growth of regional economies and industries products, as well as role of institutions
Research Type	Theoretical and Empirical	None	All are relevant as a source for body of knowledge
Methodology	Qualitative and Quantitative	None	All methodologies will be considered for the review

Table_Apx 4: Quality Assessment

Criterion	Low	Medium	High
Literature Review	Literature review is inadequate	Basic understanding of the issues around the topic being discussed	Excellent review of previous literature
Contribution	The paper adds little to the body of knowledge in this area	Contribution to knowledge is trivial in importance and significance	Significant addition to current knowledge and fills an important theory gap
Theory	No underlying theory base	Theoretical base is not well articulated	Strong theoretical basis
Methodology	The idea of study is poorly executed with inappropriate methods	Justified research design but not fully executed	Strong research design and solid methodological execution
Data Analysis	The data sample is insufficient. Inconclusive findings and weak connection between results and theory	Limited data sample. The results relate to the theoretical framework.	Adequate data sample. Well-explained results and linkage to theory. Includes limitation analysis

Table_Apx 5: Selection Process

Criterion	Number of Articles	Examples of articles
Total Articles for three cases	4919	<ul style="list-style-type: none"> ▪ Sobczyk, W., 2015. Sustainable Development of Middle East Region. <i>Problems of Sustainable Development</i>, 10(2), pp.51–62. ▪ Abdelal, R., 2009. Sovereign wealth in Abu Dhabi. <i>Geopolitics</i>, 14(2), pp.317–327. ▪ Tan, K.Y. et al., 2015. Shifting Drivers of Growth: Policy Implications for ASEAN-5/Summary of General Discussion on ‘Shifting Drivers of Growth: Policy Implications for ASEAN-5’. <i>Asian Economic Papers</i>, 14(1), p.157.
Outcome of titles and abstract assessment	38	<ul style="list-style-type: none"> ▪ Aarset, B. & Jakobsen, S.-E., 2015. Path dependency, institutionalization and co-evolution: The missing diffusion of the blue revolution in Norwegian aquaculture. <i>Journal of Rural Studies</i>, 41, pp.37–46. ▪ Asheim, B.T.B.T. & Coenen, L., 2005. Knowledge bases and regional innovation systems: Comparing Nordic clusters. <i>Research Policy</i>, 34(8), pp.1173–1190. ▪ Ewers, M.C., 2013. From knowledge transfer to learning: The acquisition and assimilation of human capital in the United Arab Emirates and the other Gulf States. <i>Geoforum</i>, 46, pp.124–137.
Cross referenced articles and other sources	86	<ul style="list-style-type: none"> ▪ Vietor, R.H.K. & White, H., 2015. Singapore’s ‘Midlife Crisis’? <i>Harvard Business School</i>, 9-714–39, pp.1–34. ▪