CRANFIELD UNIVERSITY

Amgad Badewi

# Investigating Benefits Realisation Process for Enterprise Resource Planning Systems

School of Aerospace, Transport and Manufacturing

Doctor of Philosophy (PhD)
Academic Year: 2015 - 2016

Supervisor: Dr Essam Shehab

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## ABSTRACT

This research aims to investigate the benefit realisation process for ERP systems so as to develop a benefit realization road map whereby organisations can realize the maximum potential of their ERP systems. This research covers two areas: mechanism of implementation and the destination to change (i.e. road map). It has been found that project management and benefits management approaches are necessary for recouping benefits from investing in Information Technologies (IT) projects. Thus, Project Benefits Governance Framework (PBGF) is developed, and later tested, by combining the two approaches for the sake of realising the expected benefits from investing in IT initiatives. Because ERP demands radical changes in organisations, the neo-institutionalisation theory was adopted to apply PBGF on ERP so that the ERP success is improved.

The key connecting element between PM and BM in PGBF is the blueprint design. ERP orchestration framework is developed to show how investments in ERP resources and organisational complementary resources shall be orchestrated so that ERP benefits can be realised effectively. Thus, benefits are classified into three levels (automating, planning, and innovating benefits), and each level needs a specific blueprint. All of these blueprints constitute the ERP benefits road map. Each blueprint consists of attitudes, skills, organisation characteristics, technologies, and ERP department human resources competencies. Based on these results, ERP Business Innovation framework is developed and tested. ERP benefits maturity assessment tool is developed for assessing organisations' status to show weaknesses and strengths in their ability to recoup different ERP benefits by benchmarking with the three blueprints.

This research has contributed by integrating and institutionalising benefits management practices and project management practices. Moreover, it is novel in adapting the orchestration theory to understand how ERP resources shall be composed to achieve benefits efficiently. Finally, it demonstrates that ERP can be a source of innovation if the innovating benefits are managed deliberately.


**Keywords:** ERP, Project Management, Benefits Management, Governance theories, institutionalisation theory, and Innovation

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"*Who doesn't thank others will not thank his god*" (Prophet Muhammad)

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*Amgad Badewi, 15th December 2015*

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| | |
|---|---|
| **AB** | Automating Benefits |
| **APICS** | Association of Operations Management |
| **APM** | Association for Project Management |
| **BA** | Benefits Auditor |
| **BCM** | Business Change Management |
| **BI** | Benefit Index |
| **BM** | Benefits Management |
| **BO** | Benefits Owner |
| **BRM** | Benefit Realisation Management |
| **CSF** | Critical Success Factors |
| **ERP** | Enterprise Resource Planning |
| **GTA** | Grounded Theory Approach |
| **GTM** | Grounded Theory Methodology |
| **HR** | Human Resources |
| **IA** | Innovating Attitude |
| **IB** | Innovating Benefits |
| **ITBV** | Information Technology Business Value |
| **OCR** | Organisational Complementary Assets |
| **OGC** | Office of Government and Commerce |
| **PA** | Planning Attitude |
| **PB** | Planning Benefits |
| **PBGF** | Project Benefits Governance Framework |
| **PgMP** | Programme Management Professional |
| **PM** | Project Management |
| **PMI** | Project Management Institute |
| **PMP** | Project Management Professional |
| **PRINCE 2** | PRojects IN Controlled Environments, version 2 |
| **SEM** | Structural Equation Modelling |

# LIST OF Publications

## Journal Papers

- Badewi, A. (2015), “The Impact of Project Management (PM) and Benefits Management (BM) Practices on Project Success: Towards developing a Project Benefits Governance Framework”, ***International Journal Of Project Management***, DOI doi:10.1016/j.ijproman.2015.05.005.
- Badewi, A. & Shehab, E. (2016) “The impact of Organisational Project Benefits Management Governance on ERP Projects success: Neo-institutional theory perspective”, ***International Journal Of Project Management***, vol. 34, no. 3, pp. 412- 428, DOI doi:10.1016/j.ijproman.2015.12.002.
- Badewi, A., Shehab, E., (2016), “ERP Benefits Capability Framework: Orchestration Theory Perspective” ***Business Process Management Journal*** (submitted).

## Peer Reviewed Book Chapters

- Badewi, A. (2015), “Project Management, Benefits Management and Program Management”, Book Chapter in “*Strategic Project Management: Contemporary Issues and Strategies for Developing Economies*” Edited by Barclay, C. & Osei-Brison, K-M, published in USA, ISBN 9781482225129, pp. 85-104.

## Peer Reviewed Conference Papers

- Badewi, A. & Shehab, E. “Do IT investments lead to business innovations?”, *Proceedings of the 28th British Academy of Management Conference*, University of Ulster, Belfast, 9-11 September 2014, pp. 135-147.
- Badewi, A. “Project Management, Benefits Management and IS Business Success”, *Proceedings of the 28th British Academy of Management Conference*, University of Ulster, Belfast, 9-11 September 2014, pp. 240-251.
- Badewi, A. & Shehab, E. (2013) “Cost, Benefit and Financial Risks (CoBeFR) of ERP Implementation”, *Proceedings of the 11th International*

*Conference on Manufacturing Research*, Cranfield University, 19-20 September 2013, pp. 207-212.

- Badewi, A., Shehab, E., Peppard, J. "Benefit Realisation Modelling for ERP Systems Using System Dynamics", *Proceedings of the 11th International Conference on Manufacturing Research*, Cranfield University, 19-20 September 2013, pp. 135-147.

**Academic Rewards**

- Best research poster at Cranfield University, 2014.
- Acknowledged Reviewer at International Journal Project Management, May, 2015.
- Research Fund from Project Management Institute (PMI) for defining benefits realization management based on project management literature.

# 1 Chapter One: Introduction

## 1.1 Introduction

Enterprise Resource Planning (ERP) is an information system that enables organisations to integrate various information and business technologies operating in different functional departments into a single interactive system. ERP system implementation not only costs millions of pounds sterling, but also poses great risks to organisations (Davenport, 1998). However, a great deal of research has been devoted to ERP implementation since 1998. The kind of research required is that which focuses on the Critical Success Factors (CSF) of ERP implementation (Holland and Light, 1999; Akkermans and van Helden, 2002; Bhatti, 2005; Al-Turki, 2011).

After a couple of decades of research and effort devoted to the effectiveness and efficiency of ERP implementation, the success rate in implementing the system on time and on budget has increased significantly (Panorama, 2013). Accordingly, the research on CSF has gradually declined since the success rate became significantly high (Schlichter and Kraemmergaard, 2010). Nevertheless, the problem is no longer implementing the system on time and on budget; it has changed to achieving the business benefits targeted from the ERP system. Actually, about 60% of ERP adopters are unsatisfied by the results achieved by the system in terms of achieving the targeted business benefits (Panorama, 2013).

The problem has many facets. One facet describes this phenomenon as the implementation mechanism (i.e. project management approach) that may neglect the users' needs, because ERP is considered to be a technical project, not an organisational change enabled by technology (Ram et al., 2014; Lech, 2013). In other words, when technocrats from the IT department are put in charge of ERP, they perhaps forget how the users may translate these technological artefacts into business benefits (Davenport et al., 2004; Maklan et al., 2012; Marchand and Peppard, 2013).

The second facet lies in the inability to manage ERP benefits, or unawareness of what these are. Since ERP is an information system, it has no value in itself. Its entire value comes from the way that it is used (Ward and Peppard, 2002). One of the basic principles of information economics is that “information has no economic value if it does not change a decision” (Brynjolfsson and Saunders, 2010). Accordingly, to be realised, the potential benefits of ERP must be managed (i.e. identified, planned, owned, and reviewed) (Davenport et al., 2004; Ward and Daniel, 2006; Breese et al., 2015; Badewi, 2015b; Badewi, 2015a). To manage these benefits, the users must first know what they are. Researchers have listed the benefits of ERP in many papers (Shang and Seddon, 2002; Gattiker, 2007; Annamalai and Ramayah, 2011; Koh et al., 2008). Nevertheless, the benefits management as approach to realised ERP benefits has not been investigated yet. Therefore, this research aims to investigate how ERP benefits can be realised.

Whether the current known practices of benefits management (which are listed in professional books (Bradley, 2010; Melton et al., 2008), academic books (Ward and Daniel, 2006) and compilations of professional standards such as the Managing Benefits Certificate (Jenner and APMG, 2014), Managing Successful Programmes (OGC, 2011) and Program Management (Project Management Institute, 2013)) are valid in the ERP context has not so far been tested. Thus, it would be helpful to find which practices are currently used by practitioners, and which matter and in what conditions each is effective.

The third facet is the IT capability perspective. Indeed, heavy investment in IT only does not guarantee superior performance (Pang et al., 2014). However, it has been found that the main method of differentiating one organisation from the rest in the use of its IT resources is to check its organisational capital (Brynjolfsson and Saunders, 2010). Organisational capital can take many forms such as psychological capital (Newman et al., 2014), social capital (Kor and Mesko, 2013), intellectual capital, knowledge capital, and organisational capabilities (Daniel et al., 2014; Rauffet et al., 2014). The present research takes a perspective which allows organisational capability to be judged; Information

Technology (IT) capability, for instance, is the ability of an organisation to make use of its IT resources (Wang et al., 2012). Additionally, a firm's IT capabilities could enable organisations to earn competitive advantage from using technology when it is synchronized with organisational resources (e.g. culture, processes and business practices) (Piccoli and Ives, 2005). Therefore, the present research project spotlights how the ERP resources accumulation strategies (i.e. upgrading plans, deploying more ancillary technologies) can be synchronized with investment strategies in organisational resources.

The main advantage of using any technology is to enable an organisation to have a continuous innovation routine (Zuboff, 1985; Uwizeyemungu and Raymond, 2012; Bunduchi et al., 2015). However, ERP is perceived in the literature as a transactional software application (Marchand and Peppard, 2013), restrictive software (Trott and Hoecht, 2004a; Trott and Hoecht, 2004b) and/or it is a commodity (i.e. not a source of a competitive advantage nor of innovation) because any organisation can have it (Seddon, 2005). Therefore, it is believed important to highlight, as part of the benefits investigation process, how and when ERP can enable organisations to innovate in their products, businesses and processes.

It can be extrapolated from the above arguments that benefits should be managed by identifying, planning and auditing the benefits from ERP. However, implementing the management by integrating benefits management with project management, as a critical success factor in implementation may improve the benefits realisation process. Furthermore, benefits cannot be enjoyed without bearing in mind two considerations: the organisational resources required to absorb an ERP system with its attached features and technologies, and synchronisation between different ERP resources and different organisational resources. Therefore, the present research aims to develop ERP Orchestration Theory to orchestrate ERP resources, e.g., features; information technologies and systems; and IT department competences, with the required organisational resources to realize the benefits of the ERP system. Finally, the thesis seeks to shed light on the way in which the synchronising of certain ERP resources with certain organisational resources can create an innovative organisation.

## 1.2 Research Motivation

Since the return on investment in Information Systems projects has been found disappointing (Clegg et al., 1997; Carr, 2003; Chae et al., 2014), research streams concerned with IT business value (Schryen, 2013) and critical success factors (Koh et al., 2011; Ram et al., 2013) have been established to address and deal with the reasons for failure. The failure does not necessarily relate to the delivery of an IT project, i.e. ERP, on time and within cost; it actually involves delivering the benefits expected from it (Mir and Pinnington, 2014).

Indeed, benefits do not come from deploying a technology; rather they come from changing an organisation's way of doing things. It follows from this argument that "people" are the main reason for the failure of an IT-enabled business transformation (Kotter, 1995). Thus, research is divided into two schools: the soft and the hard. The soft school deals mainly with the perception of, attitude to and behavior towards IT (DeLone and McLean, 1992; Petter et al., 2008a; Venkatesh et al., 2012b; Venkatesh and Bala, 2008).

Although the soft approach is important, research on managing the process of changing people's culture and their behavior toward a specific measurable objective is still missing (Badewi, 2014). Therefore, the hard approach, benefits management, is posited as this missing element (Remenyi and Sherwood-Smith, 1998). Despite an early call to implement benefits management (Ward et al., 1996; Thorp, 1998), little empirical evidence has been brought out to show out how benefits management confirms the ubiquitous tendency of IT projects to fail. Organisations that use ERP for decades without realizing its full value provide the key motivation for conducting the present research.

Finally, ERP has different effects on organisations (Uwizeyemungu and Raymond, 2012). It enables organisations to automate its current business processes so that the business operations efficiency is improved. Moreover, it enables the organisation to plan its activities because of the data availability so that the business operation effectiveness is improved. Efficiency and effectiveness of the business processes can be measured and bounded because efficiency means doing the same with less cost whereas effectiveness is doing more with the same or less. Nevertheless, the innovation is to shift the performance curve up with radical changes in performance indicators. Therefore, innovation benefits are unbounded and unlimited. This is what is called maximum benefits from the ERP. Therefore, the main research motivation is to develop a road map for achieving this maximum benefits from the ERP.

## 1.3 Research Aim and Objectives

The aim of this research is

***"To investigate the benefit realisation process of ERP systems so as to develop a benefit realization road map whereby organisations can realize the maximum potential of their ERP systems"***

By attaining the research aim, the thesis can develop an ERP Benefits Maturity Model that could help organisations to identify the weaknesses and strengths of their accumulation of ERP assets and build strategies for making best use of ERP benefits. Thus, in order to fulfil this aim, the research question is formulated as

***"How organisations can realise the maximum benefits from the ERP system?"***

Because benefits is defined as "advantage perceived from the change" (Ward and Daniel, 2006), this research question has two main sub questions. While the first sub question is about the change process (i.e. implementation mechanism to deliver the benefits), the second sub question is about the destination (the roadmap required to deliver different blueprints for realising different benefits). Therefore, the sub research questions are:

**RQ1:** *What is the implementation mechanism to deliver maximum benefits from the ERP system?*

Because project management is the current and traditional IT implementation mechanism, there are research objectives required to be fulfilled.

1- Identify the reasons for the inability of a project management approach to realise ERP benefits
2- Identify how authorities/responsibilities and accountabilities are allocated in such a way as to manage the interaction between actors and increase the probability of success

3- Develop and test a Project Benefits Framework for improving the probability of ERP success

**RQ2:** *What is the road map for realising maximum level of ERP benefits?*

In order to achieve its research aim, the following research objectives are developed to:

4- Identify the required ERP resources as well as the organisational resources to achieve each class of ERP benefits.
5- Develop a theory to orchestrate ERP resources with ERP organisational complementary resources so as to improve the level of the ERP business benefits efficiently and effectiveness.
6- Develop and test a framework for enabling organisations to realize business innovations from their own ERP systems with the attached ERP resources
7- Develop and validate an ERP maturity model for identifying the weaknesses and strength in organisations' abilities to realise different categories of ERP benefits.

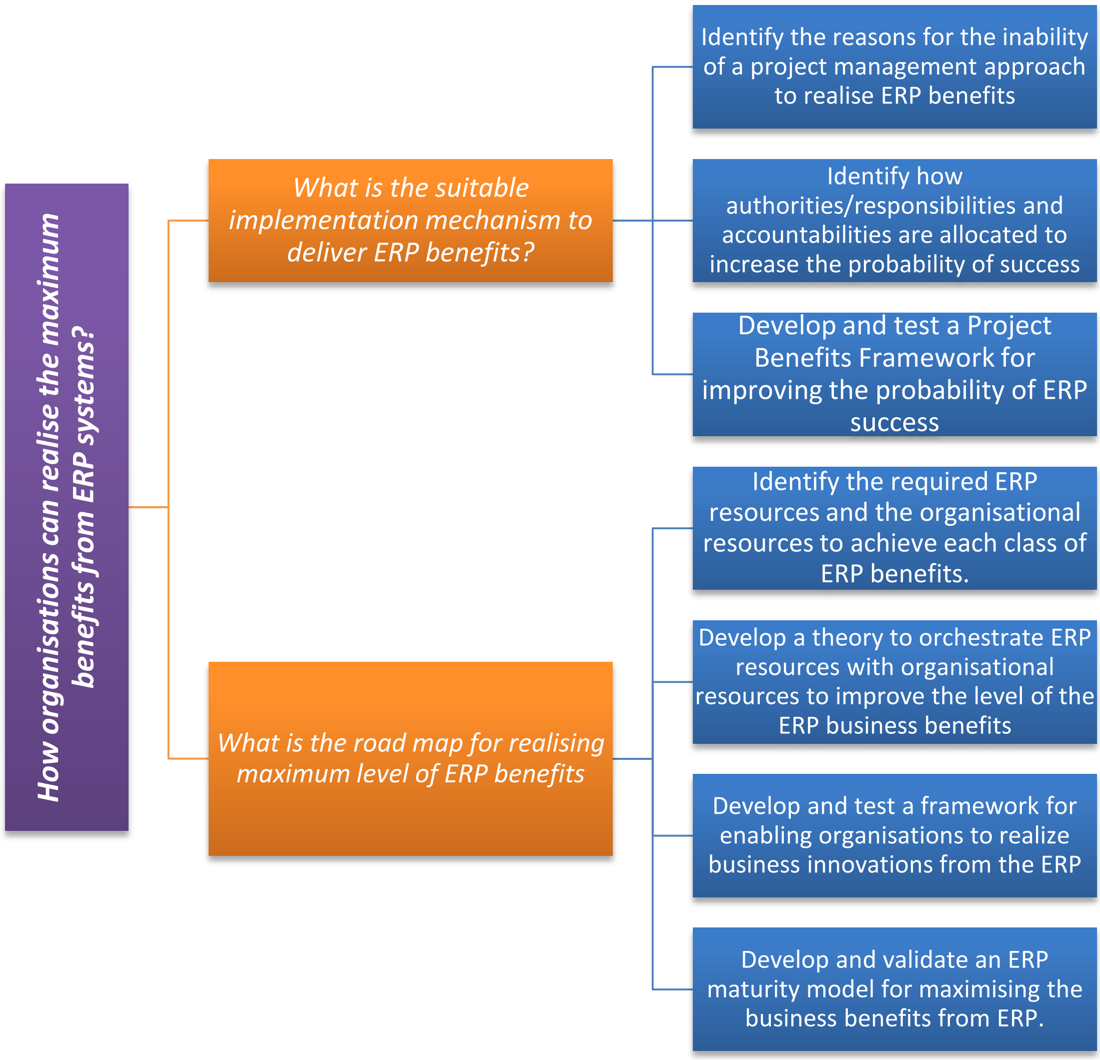



Figure 1-1: Relationship between research Question, sub research question, and research objectives

## 1.4 Thesis structure

This thesis has five main sections, as illustrated in Figure 1-2. The first section is for defining the questions, aim and objective of the research (Chapter 1), for setting the theoretical foundations of the present research (Chapter 2) and finally for clarifying the research epistemology, ontology, methodology and methods of data analysis (Chapter 3).

Since there are two research questions and one tool to be developed, the analysis is presented in three sections. Each section has a chapter in which is developed a framework and a chapter in which this framework is tested. Thus, Chapter 4 develops the Project Benefits Governance Framework which Chapter

5 tests. Likewise, Chapter 6 comes to present the development process of ERP orchestration framework, and Chapter 7 tests part of framework, the innovation framework. Finally, Chapter 8 is devoted to developing the tool but Chapter 9 validates all the research findings on a pair of case studies. The last section is to discuss research results in the light of theories to show out the contribution to knowledge and research academic and professional implications.

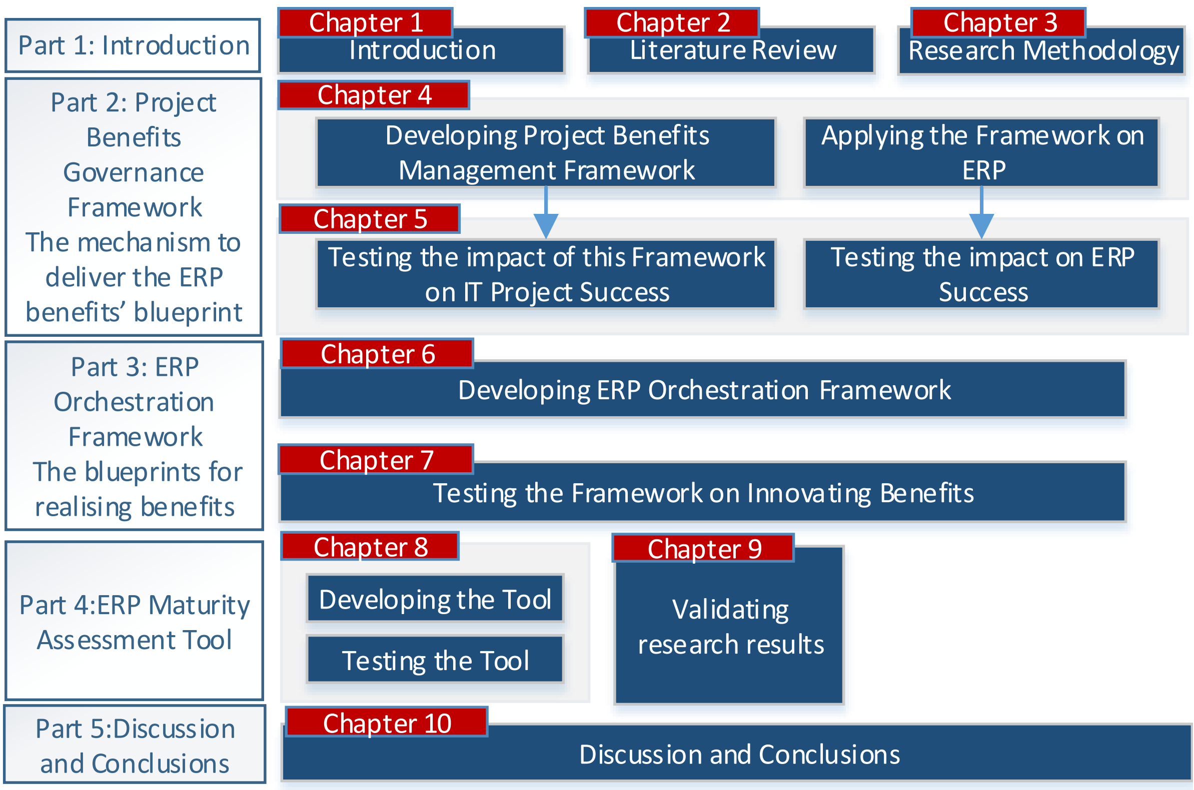



Figure 1-2: Thesis Structure

# 2 Chapter Two: Literature Review

## 2.1 Introduction

A literature review is conducted to understand the research problem and find whether any research has answered the research questions; the achievement of the present one is to construct four theoretical and conceptual frameworks for developing the research methodology and data analysis. Here, the main aim of the research question is to spotlight the variation in organisational performance due to the existence and implementation of the ERP system. To understand this variation, as illustrated in Figure 2-1, four theories/sets of theories are proposed: neo-institutionalisation theory, Business Value theories, Resource Orchestration theory and Innovation theories.

The first theoretical lens through which to understand this phenomenon is by means of use Project and Benefits management frameworks. The literature suggests that the impact of project management (PM) and benefits management (BM) on ERP benefits has mixed results. Thus, a novel theoretical lens is developed on the basis of neo-institutional theory to understand from the PM and BM angle why this variation occurs. This section (ERP Project benefits management), after defining project management, benefits management and the relationship between them, develops a framework for the institutionalisation of ERP project benefits. It is extended and elaborated in Chapter Four and tested in Chapter Five.

The second theoretical angle covers the business value frameworks. Business value frameworks were devised to explain the variation in the returns from IT investments. The Melville et al (2004) framework, and that of its succeeding scholars, is adopted as a theoretical aid because it argues that the variation in performance is due to the (technological and human) resources used. Since the connection between PM and BM is the blueprint design (what the organisation should look like from the technological and human resources perspectives if it is to realise benefits), the Melville et al (2004) framework is adopted to define the

ERP resources (in the IT department and its technologies) and the complementary organisational resources required for obtaining ERP benefits.

Because ERP benefits are heterogeneous, the Zuboff framework (1985) is used for classifying IT benefits; it has been adopted by many scholars in ERP. It classifies benefits into automating, planning and innovating. Because of this heterogeneity in the nature of benefits, three blueprints are required for recouping them. The problem is to decide when an organisation should deploy or invest in more resources for realising ERP benefits. In other words, when do capabilities become mature enough to move to another capability so that the organisation can secure the various ERP benefits? To this end, the third framework is the orchestration framework, taking into consideration capability theories and perceiving things from the dynamic capabilities perspective. The ERP Business Value framework and ERP orchestration framework are integrated in Chapter Six. The tool which is produced by this integration is developed in Chapter Eight and validated in Chapter Nine.

Finally, it is argued widely in the literature that ERP is an automating system which restricts the organisation so that it is flexible enough for innovating. The IT innovation frameworks are used to understand and to propose the factors that could enable an organisation to innovate using ERP resources. After refinement, they are tested in Chapter Seven because of the results in Chapter Six.

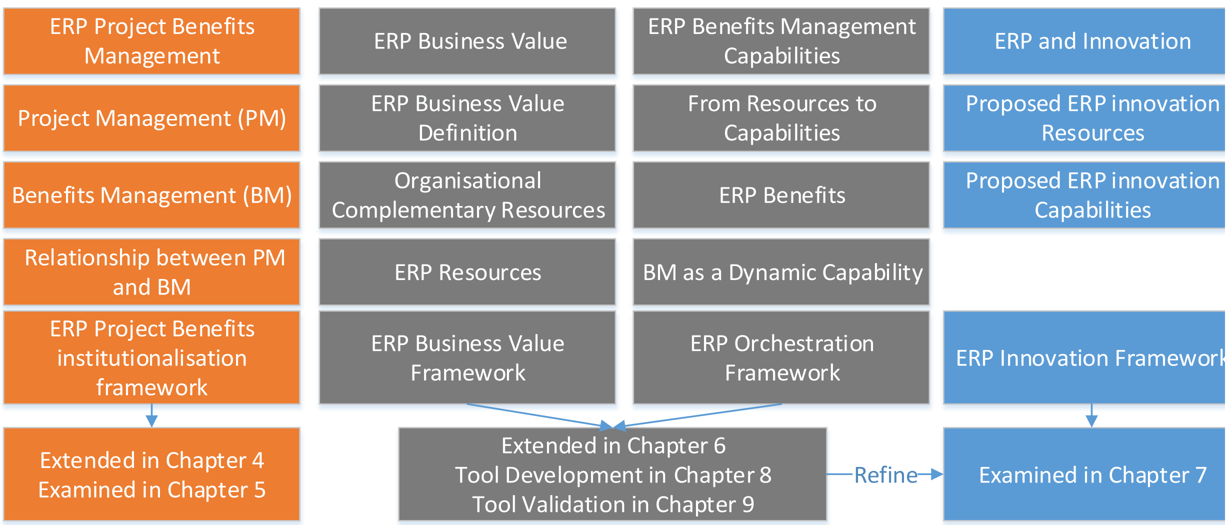



Figure 2-1: Theoretical research frameworks and relationships of them with other chapters

## 2.2 Enterprise Resource Planning (ERP)

Before presenting the theories used to explain the success of ERP, ERP and the nature of its success are defined to build a mutual understanding of these concepts. An enterprise resource planning system is "a business management system that comprises integrated sets of comprehensive software, which can be used, when successfully implemented, to manage and integrate all the business functions within an organisation" Shehab et al (2004). ERP systems were developed in the 1990s and combine many functions, such as logistics and distribution, human resources, manufacturing engineering, maintenance management, manufacturing execution systems and advanced planning and scheduling systems (APS) (Langenwalter, 1999). The first publications dealing with ERP and its implementation date back to the 1990s (Botta-Genoulaz and Millet, 2005); they emanated mainly from consulting groups. Since then, numerous academic researchers have gradually increased the interest in this phenomenon (e.g. Poston and Grabski, 2001; Rajagopal, 2002). Indeed, from 2000 to 2013, about five hundreds papers were published with "Enterprise Resource Planning" among their keywords (Fadlalla and Amani, 2014).

ERP has different definitions in different disciplines. It is defined by the eleventh edition of APICS (Association for Operations Management) as a ''framework for organising, defining, and standardizing the business processes necessary to effectively ***plan*** and ***control*** an organisation so the organisation can use its internal knowledge to seek ***external advantage***" (Blackstone and Cox, 2005). In the same year, MIS Quarterly defined the ERP as "commercial software systems that ***automate*** and ***integrate*** many or most of a firm's business processes" (Gattiker and Goodhue, 2005).

This difference in definitions reflects a difference in understanding the ERP System. Most of the literature from the Information Systems discipline deals with ERP as a way of automating business processes. Therefore, the main objectives of ERP should be only to improve efficiency, lower costs, and increase productivity (Marchand and Peppard, 2013). Although ERP could decrease costs, ERP is not a source of competitive advantage (Seddon, 2005) since it is a commercial package that can be bought in the market (Carr, 2003). Actually, however, this argument is challenged by many researchers (Romero et al., 2010; Stratman, 2007). Since ERP is a socio-technical system, the capacity to derive benefits from it is based on people (Doherty et al., 2011; Ashurst et al., 2008). For instance, Stratman (2007) contrasts ERP adopters who seek from it improvements in operational performance with those who seek from it external market and supply chain performance. He finds that organisations can improve their external market and supply chain through using the ERP system only if it is planned for them.

The above discussion suggests that ERP benefits may be classified into automating benefits, planning benefits, and controlling benefits. Automating benefits seek to achieve three main goals: lowering costs, improving productivity and increasing efficiency. The remaining two classes of benefit seek to achieve external advantage. ERP can be used as a source of competitive advantage only if it is used for planning and controlling organisational resources.

Nowadays, an ERP system is connected and synchronized with other information systems for enhancing the capture of the data process from its earliest forms, such as RFID and Bar Code technologies (Chuang and Wade, 2008; Thiesse et al., 2011). Additionally, other technological resources, such as Decision Support Systems (Holsapple and Sena, 2005) and Big Data (Elragal, 2014), have become available for processing these data in order to derive meaningful and insightful information. Integrating different technologies with ERP infrastructure and supporting them with organisational resources (e.g. skilled users, supporting culture and management practices) are believed to give the organisation a sustainable competitive advantage (Nevo and Wade, 2011a). Thus, an ERP system is redefined in the present research as “an integrated system that synchronizes different business information technologies and systems so that the organisation can automate its value-engineered business processes and can assimilate its internal and external knowledge to create and sustain its competitive advantage”

## 2.3 ERP Project Success versus Business Success

Successful implementation of an ERP system has two dimensions: success in delivering the ERP technology on time and within budget (this can be called 'ERP project management success' (Serrador and Turner, 2015)) and success in enhancing the organisation's capabilities by its use (this can be called 'ERP project investment success' (De Toni et al., 2015)). Nevertheless, it has been argued that delivering ERP on time and within budget does not necessarily mean that the organisation's capabilities are affected (Lech, 2013).

ERP project investment success, the ability to realise its intended benefits so as to reach a satisfactory level of Return on Investment (ROI), has been studied from different perspectives. Nevertheless, business success by means of an Information System is a broader concept than project success. While project success focuses only on short term goals, i.e. its scope is limited to the some project's lifecycle (Davis, 2014), information systems business success is more concerned with the strategic and effective use of the system in such a way as to deliver different benefits (Badewi, 2014; Burton-Jones and Grange, 2012). Project success concepts share the arena of stakeholder satisfaction. Although the traditional aim of project management is to deliver the "iron triangle" of cost, time, and quality, the success models for project management nowadays consider stakeholders' satisfaction (Atkinson, 1999).

Nevertheless, the concept of "stakeholders' satisfaction" may be misleading. Even though stakeholder acceptance in project management perspective focuses on the acceptance of the scope, time, and cost of a project, the stakeholders' acceptance in terms of information system business success depends on realising the targeted benefits of the new information system. For instance, delivering a piece of software in time, on cost, and free of bugs is a criterion for project management success. However, if this piece of software is unable to realize the expected benefits for other reasons such as improper training to users, business success cannot be claimed on its behalf. Hence, the present research defines information system business success as the successful implementation of projects in time and on budget with the desired quality and the obtaining of the targeted benefits from these projects.

To sum up, as summarised and delineated in Figure 2-2, on the one hand, project management success is about delivering technological artefacts to organisations on time and within budget, according to predefined criteria. On the other, Information System success is mainly about using a system that focuses on the individual use and/or the organisation's use of the system. The connecting point between them is project investment success, which entails customer satisfaction, benefits realisation and a satisfactory return on investments.

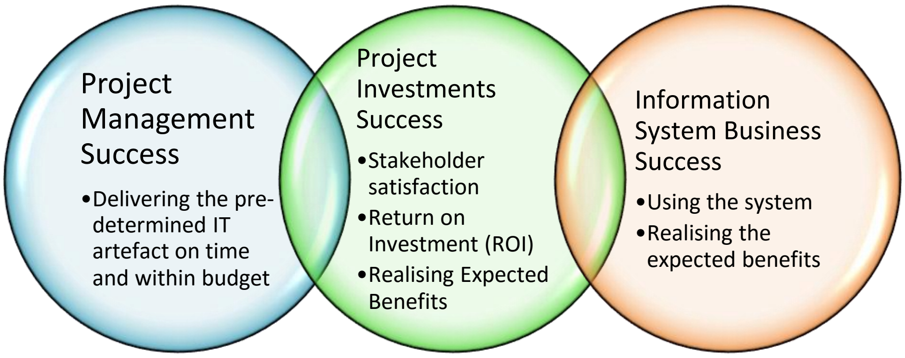



Figure 2-2: Conceptual demarcation between Project Management Success, Project Investment Success, and Information System Business Success

### 2.3.1 ERP Project Success

The main purpose of using a project management framework is to increase organisational value (Dalcher, 2012). The organisation can benefit from using a project management framework by increasing the effectiveness of the human effort in the organisation while increasing its efficiency. Therefore, project success is measured by its efficiency in the short term and by its effectiveness in achieving the expected results in the medium and long term (Jugdev et al., 2001; Müller and Jugdev, 2012). This means that the value of a project can be understood in so far as it satisfies customer needs, aligns the project output with the organisation's strategy and gives a return on investment (Thomas and Mullaly, 2008).

Nevertheless, from the traditional PM point of view, scope creep in projects and over-budgeting or over-scheduling are not acceptable, (Atkinson, 1999).

Achieving the targets of a project is called project management success (Zwikael and Smyrk, 2012) or internal project performance (Golini et al., 2015). However, from the business perspective the ability of the project's output to deliver the expected return on investment is the key to declaring project success (Camilleri, 2011). The term 'project investment success' is used to describe the ability to generate a project's return on investment (Zwikael and Smyrk, 2012).

Project investment success is in fact more challenging than project management success. Project investment success needs a systems thinking mind-set to understand and to manage the internal and external environment (Fortune and White, 2006). For instance, Cserháti and Szabó (2014) have found that relational-oriented success factors such as communication, co-operation, and leadership are more critical than are task-oriented success factors. Consequently, Golini et al (2015) find that the PM tools (e.g. critical path method and Gantt charts) used to achieve project management success are different from those needed for project investment success because they are more closely related to stakeholder management, such as the stakeholder matrix and responsibility assignment matrix.

Project success can be understood as product, process and organisational success (McLeod et al., 2012). Likewise, there are three perspectives on success for ERP projects. First, ERP project management success is defined in terms of delivering ERP on time and within budget with the required functionality (Lech, 2013). Second, ERP project investment success is the realisation of ERP's non-financial and financial benefits so that users perceive the usefulness of it and sponsors find the return from it to be satisfactory (Al-Mashari et al., 2003). Third, ERP project success is defined as deploying the ERP artefacts on time and within budget while delivering organisational change so that the users are satisfied, benefits are realised and the sponsor is satisfied.

### 2.3.2 ERP Business Success

In the data between 1995 and 2008, organisations that have the same organisation "productivity-enhancing business practices" regarding technology have the same rate of return on IT investments (Brynjolfsson and Saunders, 2010). Thus, based on Cybernetic Control theory (Green and Welsh, 1988), ERP investment success can come once the organisation is able to use it to capture, process, disseminate and analyze directive and predictor indicators on a timely basis (Wier et al., 2007). These arguments imply that, since any project entails changing working practices (Cicmil, 1999), an ERP project is designed to realise a significant increase in return on investment, which will be accompanied by organisational change in the ways of doing and perceiving work practices. Thus, it should be supported by psychological change toward the ERP operating model (Boersma and Kingma, 2005; Jasperson et al., 2005). Thus, without considering ERP Business success (i.e. the factors affecting the organisational use of the system), the process of achieving ERP Project investment success will be imperfect.

IT projects are different from any other product delivering projects since the integration of a new information system into existing business processes is not easy and has had many difficulties, due to widespread resistance to change (Davenport, 1998; Peppard and Rowland, 1995). Consequently, the literature rarely bridges the space between the soft and the hard schools of thought in this area. The soft school interprets IS business success by the "use" (Venkatesh et al., 2003), or "effective use" (Burton-Jones and Grange, 2012), or "perceived net benefits" (Petter et al., 2008b; DeLone and McLean, 2003). In contrast, the hard or action school, which focuses on benefits management, focuses on their active management (Remenyi and Sherwood-Smith, 1998) and focuses on benefits planning, auditing, and exploitation (Ward and Daniel, 2006).

The soft school, in which the "use" of benefits is the major driver of success (Venkatesh and Bala, 2008), takes "use" as the cornerstone in its theories; the greater the use, the more benefits will be realised and, therefore, the more the "success". Therefore, all these researchers consider the "use" variable as a mediating factor between what can be done and the success of the system (Hsu et al., 2015; Bossen et al., 2013; Urbach and Müller, 2012). This school is involved in perception, attitude, behavior, motivation, and intention. It is criticized because its theories do not help a responsible person to derive benefits from new ERP projects (Badewi et al., 2013).

The action school, for its part, focuses on developing models and approaches for managing benefits in order to produce a business case, as a desired benefit. The roadmap and the planning for setting and creating the business case form the cornerstone of the research by this school (Ward et al., 1996; Thorp, 1998). Its research may be concerned with developing a model for managing benefits (Bradley, 2010; Ward and Daniel, 2006; Reiss, 2006) developing capabilities for managing benefits (Ashurst and Doherty, 2003), or determining the factors that affect the process of realising them (Doherty et al., 2011).

Although the soft school can be examined by means of objective techniques, the benefits realisation management school has not been able to verify the effectiveness of its hard approach (Serra and Kunc, 2015). Roughly, all the literature that deals with benefits management from the hard perspective consists of interpretive research. Therefore, the present research proposes to remedy this knowledge gap by formulating and testing propositions about the validity of the hard school in realising the benefits of IS projects in general and ERP projects in particular.The gap between the two schools is seldom narrowed. Badewi et al (2013) developed a framework (see Figure 2-3), based on system dynamics (Sterman, 2000; Forrester, 1975; Forrester, 1994). Its purpose was to understand the virtuous cycles and death spirals of the impacts of ERP on the organisation. Its method was to propose intervention from external body such as a “Benefits Management team”, or any other team assigned to intervene, to align ERP with organisational strategy and with operations for a given period (e.g. such as an ERP task group to customize ERP or a Relationship manager to help and accommodate users to ERP (Chou and Chang, 2008a)). This team, according to Badewi et al, should regulate, control and manage the psychological cycles and spirals of individuals’ and groups’ attitudes toward the ERP system for the sake of achieving the predefined ERP benefits and a satisfactory level of ROI, which affects the top management decision to stop implementing ERP or assimilate it further.

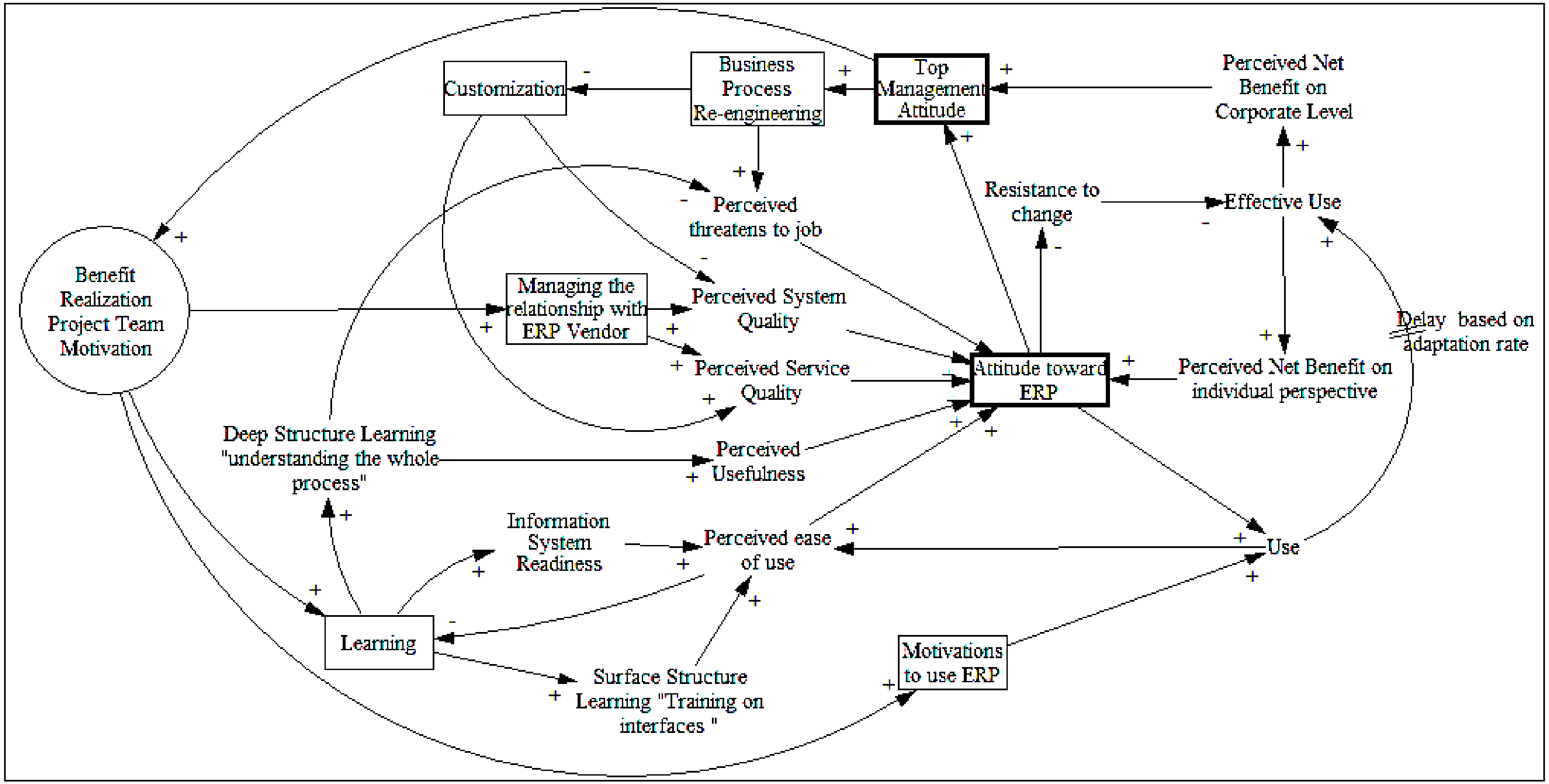



Figure 2-3: System Dynamics model for managing ERP benefits (Source: Badewi et al (2013)

## 2.4 ERP Governance: Project and Benefits Management

One of the main determinants of project success is the effectiveness of the project governance structure (Lechler and Dvir, 2010). The definition of project governance is not generally agreed in the literature (Bekker, 2014), perhaps because three concepts, at present used interchangeably, are in fact different. Project governance, the governance of projects and governmentality are three interwoven concepts for understanding and realising the value of project management (Müller et al., 2014). While project governance deals with the internal control of individual projects, such as the level of flexibility in applying PM tools, techniques, and roles (Müller, 2009), the governance of projects is a way of selecting, coordinating and controlling projects such as programme/portfolio management (Williams et al., 2010). This governance of projects varies according to the country, project size and project type (Müller and Lecoeuvre, 2014). Meanwhile, governmentality means managing the perceptions, attitudes, values, and culture to govern/control and direct projects in order to deliver project value (Foucault et al., 1991; Müller et al., 2014).

This research uses the concept of the "governance of projects", because the aim is not to manage the project in itself to deliver the expected performance; rather, the aim is to manage different IT projects activities and incline them toward achieving the greatest benefits (Williams et al., 2010). Thus, the governance of projects can be defined as "a process oriented system by which projects are strategically directed, integratively managed and holistically controlled, in an entrepreneurial and ethical reflected way" (Renz, 2007). Renz's definition suggests that the success of an ERP project is based on collaboration between implementing a reliable technological artefact with an acceptable level of service level agreement and an effective use of the system (Burton-Jones and Grange, 2012; Badewi et al., 2013). Thus, quality in allocating resources between these projects and supporting processes and quality in the cooperation between them are vital for this success (Jonas et al., 2013). ERP Governance, in the present research, is defined as the determination of roles, responsibilities, and accountabilities among stakeholders in order to achieve an ethical, cohesive, and transparent decision-making process for the sake of achieving the mission of the organisation.

Either the readiness for change (Stratman and Roth, 2002) or ERP readiness before its implementation has a significant impact on project success (Ram et al., 2015). Indeed, readiness is better managed through governmentality (Govern Mentality) (Foucault et al., 1991) than through managing behaviour. For instance, using expectation theory (Wabba and House, 1974), when the beneficiaries from the project output (the ERP system) expect to gain from it, they participate actively (Purvis et al.,) which enhances the probability of its success (Beringer et al., 2013; Missonier and Loufrani-Fedida, 2014). Thus, Business Change Management is critical for managing and monitoring the readiness and the current institutional logics of the department(s) that will implement the ERP module because ERP implementation is expected to change many things in the organisation's institutional logic. This position is also important for managing the change process hand in hand with the ERP project manager who will develop the capability of the ERP project (OGC, 2011).

### 2.4.1 Project Management

#### 2.4.1.1 Project Management Definition

A project is "a temporary endeavor undertaken to create a unique product, service, or result" (Project Management Institute, 2013a). It can be also defined as a series of activities and tasks to deliver a certain "thing" with certain specifications within a specific period using resources with a certain limit (Kerzner, 2013). Thus, Project Management (PM) is defined as "the application of knowledge, skills, tools, and techniques to project activities to meet project requirements" (Project Management Institute, 2013a).

The concept of Project Management (PM) was first identified in 1953 by the US Defence aerospace industry (Johnson, 2002). The first published article on it was written by Gaddis in the Harvard Business Review (1959). He documented the role of the project managers as integrators and as middle level managers. At this time, organisations were heavily subject to routine and bureaucracy as a way of management for achieving efficiency with least corruption (Weber, 1978; Weber, 1946). Because of the spread of matrix organisations after World War II, engineers in the Department of Defence (DoD) in US found themselves using project management tools and practices. From this time, conferences and seminars on project management tools (e.g. PERT, CPM, costing methods) began to proliferate (Morris, 2012).

Current PM practices are, however, criticized widely in their delivery of organisational change. One of the criticisms they face is the “front end” problem, since PM rarely connects itself with its users and does not listen carefully to their needs (Samset and Volden, 2015; Pinto and Winch, 2015). Furthermore, it does not consider change management practices as part of the PM mentality in terms of involving, engaging with and managing project stakeholders’ expectations and requirements (Jugdev et al., 2001; Winter et al., 2006; Crawford et al., 2006). It is argued that the change management mentality is different from the project management one because the background of each (i.e. technical versus business backgrounds) differentiates one from the other (Hornstein, 2015). Indeed, these may be materialised in the case of ERP implementation, since it demands a radical organisational change.

#### 2.4.1.2 The impact of project management on ERP success

The successful implementation of project management practices leads to the successful delivery of projects in terms of time, cost and quality (i.e. project management success (Zwikael and Smyrk, 2012; Zwikael and Globerson, 2006)). Furthermore, there is a significant relationship between project management success and project investment success (Serrador and Turner, 2015). In other words, the organisations that can deliver their projects on time and within budget are the ones able to enjoy project investment success from doing so (Badewi, 2015a). Nevertheless, applying the same argument to an ERP system may produce different results.

### 2.4.2 Benefits Management

#### 2.4.2.1 Benefit Management in Information System Discipline

Benefits Management (BM) is another framework used with the aim of increasing the success of IT projects (Ashurst and Doherty, 2003; Breese, 2012; Serra and Kunc, 2015; Melton et al., 2008b). The Benefit Realisation Management (BRM) concept was developed in the 1980s and 1990s in response to the need to rationalize investments in IT projects (Bradley, 2006). This concept evolved over time and it is interpreted, to some extent, differently across industries and countries (Breese et al., 2015). Bradley (2010) defines Benefit Realisation Management (BRM) as “a process of organising and managing, so that potential benefits, arising from investment in change, are actually achieved”. Furthermore, Ward & Daniel (2006) define Benefit Management (BM) as “The process of organising and managing such that the potential benefits arising from the use of IS/IT are actually realised”.

Actually, BM and BRM may be synonymous. Based on these definitions of BM, a change should happen before any benefits are realised. According to the Cranfield benefits management model, benefits management goes through six processes: identification, planning, implementation, execution, reviewing and exploitation of benefits (Ward et al., 1996). In order to allow bridge-building between Project Management and Benefits Management, Badewi (2015a), conceptualised Project Benefits Management as “the initiating, planning, organising, executing, controlling, transitioning and supporting of change in the organisation and its consequences as incurred by project management mechanism to realise predefined project benefits”

Academically, the table below (Table 2-1) shows the main Benefits Management frameworks in the literature. However, the ubiquitous framework among practitioners and academics is the Cranfield model (Breese et al., 2015).

From the professional and accreditation perspective, Association for Project Management (APM) integrated BM as part of its Programme Management Accreditation (Managing Successful Programmes (MSP)) since early in the 2000s and followed it by PMI accreditation in Programme Management (PgMP)

(Breese et al., 2015). From 2010, Benefits Management became more professionalised when the Association for Project Management (APM) launched its certificate in Benefits Management ™ in 2012 (Jenner and APMG, 2014) and the Project Management Institute (PMI) promised that it would become part of the Project Management Professional certificate in January 2016, according to the PMI's official website.

Table 2-1: Summary of major Benefits Mangement Frameworks in Literature

| Research | Contribution |
|---|---|
| **Active Benefits Management (ABM) (Leyton, 1995)** | Developed ABM, which focuses on a continuous flow between benefits and organisational and business change. |
| **Cranfield Process Model of Benefit Management (Ward et al., 1996)** | Focuses on a continuous process that flows as defining potential benefits, structuring them, planning for achievement, executing this plan, evaluating results, and identifying potential benefits. |
| **Benefit Realisation Approach (Thorp, 1998)** | A business-oriented framework, which focuses on delivering business results in a consistent and predictable way. |
| **Active Benefit Realisation (ABR) Approach (Remenyi and Sherwood-Smith, 1998)** | Developed Active Benefit Realisation (ABR), a continuous process for managing and evaluating information system development. |
| **(OGC, 2003)** | Developed Benefits Management Framework – Gateway Process which focuses on identifying potential benefits, planning, modelling, and tracking the results. |
| **Benefit Management Approach PMI (2006)** | Benefit Management starts by benefits identification, benefits analysis, benefits planning, benefits realisation, and benefit transition. |
| **(APM, 2009a)** | Benefits Management Lifecycle is a loop consisting of modelling benefits, benefits profiling, benefits strategy, benefits management plan, base lining, targeting, and benefits realisation review. |
| **Multi-Objective Realisation Method (MORE) Framework (Barclay and Osei-Bryson, 2009)** | Aims at providing a measurement framework to assess the strategic contribution of the programme to its stakeholders. This framework is based on 4 processes: identification, definition, analysis, and realisation. |
| **Change Management Process for realising benefits (Bradley, 2010)** | Continuous process consisting of setting vision and objectives, identifying the benefits and changes required to achieve the objectives, defining the required initiatives to make the changes, optimizing these initiatives together, managing these initiatives, and finally managing the performance for achieving these benefits. |

#### 2.4.2.2 Benefit Management for ERP Systems

Since any Information Technology investments should be managed in order to realise the benefits expected from it (Thorp, 1998; Thorp and Consulting, 2003; Peppard et al., 2007; Leyton, 1995; Peppard, 2007), ERP benefits should be managed through managing the change process of the organisation until the potential benefits of ERP system are realised. Logically, ERP software package as a technology will not be able to realise its benefits by itself. Indeed, benefits management is a management philosophy that puts the benefits at the central point for all the actors' activities in organisational change (Badewi, 2015b; Badewi, 2015a).

According to the college's work at Cranfield in Benefit Management over 15 years (Ward et al., 1996; Ward and Daniel, 2006; Ward and Peppard, 2002; Ashurst et al., 2008; Ashurst and Doherty, 2003), Benefit Realisation Management consists of five main stages: (Ward and Daniel, 2006). It starts by benefit Identification where potential benefits are determined and aligned with organisational strategy. Next, the planning benefits stage allows planners to work out how to realise these benefits through integrating, as illustrated in Figure 2-4, IT within organisational change. Executing the benefit plan is the stage when the IT is put into action through an organisational change process. To assure the quality of the implementation, a Benefit Review is periodically conducted. Last, the Benefit Exploitation stage allows organisations to obtain more benefits from IT applications.

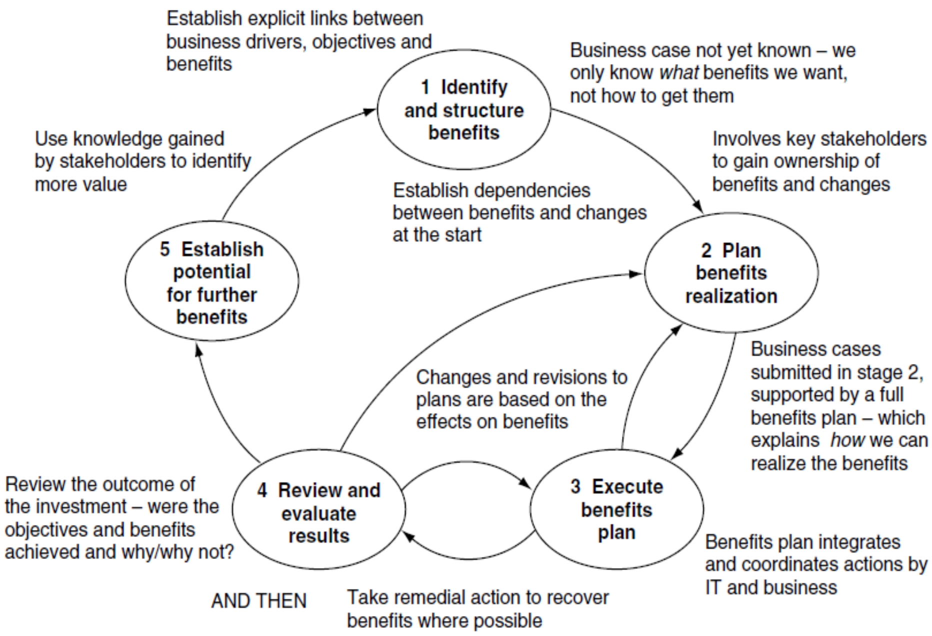



Figure 2-4: Stages and main activities of the benefits management process (Source: Ward & Daniel, 2006)

Unfortunately, this methodology has not been applied to ERP systems in the academic world. Therefore, synthesising the literature review, as summarised in Table 2-2, could help in applying these phases to ERP Benefits Management. Research in ERP focuses on each phase of the benefit realisation process. Nevertheless, although the literature touches each stage of benefits management, it does not help directly in developing the stages required for managing benefits.

Davenport et al (2004) were among the first to consider the principles of ERP BM vital for successful benefits realisation in the post-implementation phase. They addressed ERP benefits management by defending the view that benefits should be defined and prioritised and that action plans should be made to gain these benefits. Other researchers came to define (Shang and Seddon, 2000), quantify (Shang and Seddon, 2002) and develop the relationships between ERP benefits (May et al., 2013). Furthermore, they argued for the usefulness of auditing and reviewing the realisation of benefits. Empirically proven, ERP benefits were reviewed on the basis of quality (Nicolaou, 2004a), nature (Nicolaou, 2004b), timing (Nicolaou and Bhattacharya, 2008) and decisions taken after the review (Nicolaou and Bhattacharya, 2006) and were all found to be critical because there is strong evidence that all these factors in the long run affect the related financial performance of the ERP.

Finally, Davenport et al (2004) claimed that ERP implementation was an ongoing process until the “critical mass” of implementation was achieved, because it integrated the main function of departments so that the real value of ERP could be realised. Therefore, benefits review was recognized as a mechanism by which to follow up implementation and the action taken so that the organisational fit with current and new ERP implementation was perceived to be associated with the organisational sustainable financial performance from ERP (Nicolaou and Bhattacharya, 2008). Thus, the role of project management was not to stop after the implementation phase. Exploiting and sustaining the ERP benefits had to be a continuous process, since most of its benefits come after it has been implemented (Davenport et al 2004).

Table 2-2: Defining ERP Benefits Management Practices based on a synthesised Literature Review

| | Author's Definition of ERP BMP | Authors | Contribution |
|---|---|---|---|
| **ERP Benefit Identification** | The process of identifying and classifying benefits of ERP, finding relationships between benefits, evaluating non-monetary ERP Benefits and developing a business case for ERP | (Lai et al., 2010) | Besides the expected ERP benefits of complexity and compatibility, the imitation of other organisations that implement ERP to recognize legitimacy in the eyes of the stakeholders who are supporting the business case developed by the ERP steering committee |
| | | (Eckartz et al., 2012) | Determining the factors that influence the stakeholders' willingness to share information on the Business Case development for inter-organisational enterprise systems. |
| | | (Shang and Seddon, 2000; Shang and Seddon, 2002) | They develop a comprehensive framework for classifying ERP benefits. They also determine how to assess and manage them. |
| | | (Murphy and Simon, 2002) | Evaluation of intangible benefits for ERP systems |
| | | (Kanellou and Spathis, 2013; Spathis, 2006; Spathis and Ananiadis, 2005) | Determining accounting benefits of ERP without considering the relationship between them. They also classify the benefits of ERP. |
| | | (May et al., 2013) | Developing a network of ERP objectives (Benefits Network Diagram) |
| | | (Chand et al., 2005) | Develop an ERP scorecard for enhancing the relationship between ERP benefits |
| | | (Stratman, 2007) | ERP benefits should be defined on two levels: operational level and strategic level. The strategic level will not be achieved unless it is clearly expected and planned for before adopting the system. |
| **ERP Benefit Planning** | The process of planning for the ERP selection and implementation phase, changing management and usage so that ERP benefits can be realised. | (Mabert et al., 2001) | ERP preparation and planning efforts associated positively with ERP value |
| | | (Silveira et al., 2013) | Compensation system partially intermediates ERP usage and ERP performance in terms of level of achieving benefits |
| | | (Staehr, 2010) | Determining the role of the management agency in planning for ERP benefits |
| | | (Tsai et al., 2012) | ERP selection Process for ERP Vendor, ERP System and ERP Consultant affects the benefit realisation of ERP through affecting system quality and service quality. |
| | | (Sammon and Adam, 2010) | When an organisation prepares itself for implementing an ERP project (in terms of stakeholders' understanding the capabilities, urgency of and driven benefits from ERP as well as the ERP implementation planning), it affects project management success and project investment success. |

| | | | |
|---|---|---|---|
| **ERP Benefit Execution** | The process of purchasing and implementing ERP, managing the change process and increasing the use of system so that the benefits of ERP are realised successfully. | (Bhatti, 2005; Finney and Corbett, 2007; Holland and Light, 1999; Umble et al., 2003) | Critical Success Factors in ERP implementation in order to implement it successfully in terms of time and cost |
| | | (Liang et al., 2007) | Top Management rule intermediates the institutional pressure and ERP assimilation in the post-implementation stage (the use period) |
| | | (Staehr, 2010) | Understanding the role of management agency in ERP benefits realisation. |
| **ERP Benefit Review** | The process of formally reviewing the benefits of ERP periodically | (Nicolaou and Bhattacharya, 2008; Nicolaou, 2004b; Nicolaou and Bhattacharya, 2006; Nicolaou, 2004a) | ERP post-implementation reviews of its quality, timing and nature affects the organisation financial performance positively |
| | | (Esteves, 2009) | Each of the ERP Benefit realisation stages, which are prepare; realise; and achieve, should be reviewed and audited before moving the next one. |
| | | (Stefanou, 2001) | Providing a framework that considers a continuous review for the benefits realisation process of ERP; asserting that a continuous benefit review should be for strategic benefits in addition to operating benefits. |
| | | (Chou and Chang, 2008a) | Assigning an ERP steering group to conduct continuous periodical meetings with the users to find the progression in ERP benefits realisation has a significant impact on realising the ERP benefits in the post-implementation phase. |
| **ERP Benefit Exploitation** | The process of exploiting more benefits from ERP after implementation | Davenport (2004) | ERP implementation should not stop until "critical mass" is achieved. Benefits realisation is an on-going process. |
| | | (Chou and Chang, 2008b) | Organisational mechanisms (operational and strategic mechanisms) affect intermediate benefits (task efficiency and coordination) which in turn affect the overall benefits of ERP in the post-implementation period. |
| | | (Holsapple and Sena, 2005) | ERP benefits do not merely automate the processes, but also enhance the decision support systems in the organisation. Additionally, these writers find that decision support objectives are not currently such important objectives for ERP implementation as are traditional objectives such as automating processes. |
| | | (Olhager and Selldin, 2003) | These writers find that most Swedish companies plan to increase ERP benefits by integrating ERP with upstream and downstream activities and functions. |

### 2.4.3 The relationship between Project Management and Benefits Management

The relationship between delivering outputs (the project) and delivering outcomes (the benefits from the project) has been examined in many handbooks of professional guidance, such as Managing Successful Programmes (OGC) (OGC, 2011) and Programme Management (PMI) (Project Management Institute, 2013b). In addition, other authors, such as Ward and Daniel (2006) and Bradley (2006), have addressed the main steps required for obtaining benefits from IT investments.

Starting with the premise that the nature of a project is to deliver a certain well-defined output which may entail conflicts over changes in the environment, it follows that organisational governance is the key to obtaining the organisation's objectives by keeping a balance between the different tasks of delivering this output, delivering the expected benefits and attaining the organisational goals (Too and Weaver, 2014). Therefore, two or more different management themes (e.g. programme management, benefits management, portfolio management and project management) should be given prominence, to enable an organisation to impose its vision through the changes with and because of IT projects (Maylor et al., 2006; Bartlett, 2002; Zwikael and Smyrk, 2011; Blomquist and Müller, 2006).

A benefits management governance framework is built on the existence of a business case for contrasting benefits behaviour with cost behaviour (Ward et al., 2008; Eckartz, 2012), which is in the charge of the senior responsible owner of this change. Usually a benefits audit is conducted 6-12 months after delivering the project output (Thomas and Fernández, 2008). Therefore, according to Zwikael (2012), the responsibility of benefits realisation in the post-implementation stage is beyond the responsibility of project management. It may be the responsibility of the business change manager, whose responsibility is to manage the readiness to change before implementation, ensuring that the smoothing process of transitioning the project output is part of 'business as usual' and taking care to let the users of this output get the best out of it (OGC, 2011).

By reflecting that on an ERP project where there is a project management approach, governance and tools can be useful in its successful delivery on time and within budget, it is argued in this chapter that the Benefits Management (BM) approach will complement the successful recouping of ERP benefits. In other words, BM is introduced as an approach to managing the lifecycle of the ERP system. Norton et al (2013) have identified the critical success factors in each phase of ERP benefits management: planning benefits, delivering benefits (the project management phase), reviewing benefits (post-implementation phase 1) and exploiting the ERP benefits (post-implementation phase 2).

During the lifecycle of ERP, in the implementation stage, there are many different players with different impacts and importance (Somers and Nelson, 2004). These players are not only persons external to the organisation (e.g. ERP consultants and ERP vendors), but also internal ones (such as top management, users, the project champion) who are affected by the organisation's structure, power, culture and norms (Bintoro et al., 2015). For instance, in the organisations where ERP is initiated and promoted by a certain department or person (called the ERP activator), its ERP success can be affected negatively if this activator puts pressure on the ERP project to add weight to his/her department (Bernroider, 2013). Another example of structuring the power in organisations which affects the realisation of benefits is the agency role of managers (Staehr, 2010).

ERP project success is not only due to effort from the senior responsible owner, BCM and PM, but is the sum of actions by different actors (active stakeholders). Although the relative importance of each has been studied (Somers and Nelson, 2004), it is still not clear how the interaction between them may affect ERP project success (Bintoro et al., 2015). Logically, the interaction between actors in a system is determined by the distribution of power, authority and accountability between them which affects the success of investment in ERP project (Bernroider, 2013). Indeed, this distribution of power and authority over time becomes institutionalised in the organisation due to many pressures such as the departmentalisation process (Hatch and Cunliffe, 1997). For instance, while the functional organisations hold most of the power in the functional departments, in projectised and strong matrix organisations the power in the projects is more restrained (Ford and Randolph, 1992).

### 2.4.4 Institutional Theory

There are various theories explaining the differences in the structures that organisations design for coordinating and controlling their members and activities. Unlike contingency theory which suggests that the demands imposed by technical tasks in the organisation encourage the development of strategies to coordinate and control internal activities (Gresov, 1989), institutional theory proposes that the expectations concerning the fitting organisational forms and behavior that are conveyed in the wider social environment endorse the development of an organisation's structure (Meyer and Rowan, 1977). Institutional theory addresses the processes by which social structures, including both normative and behavior systems, are established, become stable and undergo changes over time (Scott, 2008).

Once the institution goes through the institutionalization process, organisational isomorphism is established, which means that organisations will have similarity or identity of form, shape and structure. This isomorphism is believed to be critical for organisational survival (Scott, 2008). It takes place because all organisations, according to institutional theory, face the same external pressures: regulative, normative and cultural-cognitive (Dimaggio and Powell, 1983). Regulative pressures incline them to coercive isomorphism by expedience, rules and sanctions. Normative inclines them to professional isomorphism, which is compliance by social obligation, certification and accreditations in the organisation's external and internal contexts. Cognitive or cultural inclines them to mimetic isomorphism – taking for granted ("All the others are doing this, so we are on the right path!"). By the time this institutionalization has proceeded across and within organisations, it has structurised the values and way of thinking which creates institutional logic, whether for professionals (Greenwood et al., 2002), scientific disciplines (Weerakkody et al., 2009), industry (Aldrich and Fiol, 1994) or even for a specific department in a specific organisation (Kraatz and Block, 2008; Dunn and Jones, 2010).

### 2.4.4.1 The Neo-institutional Theory

With the neo-institutional theory, Scott (2001) provides a new lens for institutional theory by formulating a comprehensive framework to show that the institutionalization process results from both external and internal pressures. This spotlights the role of actors in the institutionalization process. Internal factors can be the existence of a Project Management Office (PMO), as an internal actor, which puts its own regulative and normative pressures on all the projects conducted under its umbrella (Tsaturyan and Müller, 2015). Likewise, the pressures faced by the host country of  a firm's headquarters not only affect the practices for exploiting the potential of the IT investment of the company at its headquarters, but also, through its internal institutional factors, can affect the practices of its subsidiaries internationally (Heikkilä, 2013).

Likewise, the project management in large traditional bureaucratic organisations has a structured form of project management, whereas small organisations tend to have a more laissez-faire project management style using fewer PM tools (Turner et al., 2009; Turner et al., 2010). Industries and organisations can be heterogeneous because of their unique histories and what they face (Scott, 2008). Since homogeneity between organisations is accepted in practice, the isomorphism of project management practices across the same organisation should be underlined. Likewise, the institutionalization of the US government audit functions to be projectised in a homogeneous way was generated because most of the teams faced the same organisational problems (Gupta et al., 1994), which led to the audit performance being enhanced in the government.

Unlike the external environment pressures, which can be unintentional, organisations usually exploit the three pressures discussed above (coercive, mimetic and normative) as control mechanisms to constrain and direct the behavior of their actors (Haggerty and Golden, 2002). It can even be a governor's' way of controlling and directing the users' behaviors vis-à-vis the successful realisation of benefits.

From one perspective, when an organisation adopts, standardize, absorbs, and integrates a certain project management methodology (such as PMP or PRINCE 2 (Project Management Institute, 2013; OGC, 2009)), the project's success is enhanced (Joslin and Müller, 2015). In the same way, the corporate standardization of project management, integrating a project system with a general management system and making it part of the organisational culture, is vital for enhancing project management practices and gaining the expected results (Fernandes et al., 2015).

From another perspective, because the institutional logic matures and becomes consistent through standardizing the organisational practices (Hultin and Mähring, 2014), the more consistent these practices across projects, the higher the homogeneity of the organisational project's institutional logics. All of this can explain a significant portion of project success. Therefore, the present research proposes that when project management practices are institutionalized as routine practices for the organisation, the success of managing them increases and big projects such as ERP are able to succeed.

#### 2.4.4.2 Institutionalising ERP Project Benefits Framework

When an organisation believes in and adopts a benefits management mentality in its normal projects it becomes a part of the organisation's institutional logic in working with projects. Furthermore, the rise of distinctive actors and action routines comes from the institutional symbolic and behavioural systems, which contain representational, constitutional, normative rules and regulatory mechanisms (Scott, 2004). The existence of stable organisational structuring for tasks such as project management creates an institutional logic that defines the values, norms and beliefs that structure the mental models between actors (Barley and Tolbert, 1997). Although Benefits Management practices are found to have a weak, but significant, impact on project investment success (Serra and Kunc, 2015; Badewi, 2015a), it is proposed that when the organisation uses benefits management in its routine projects, it not only masters these practices but also confers a consistent and stable institutional benefits management logic on other active agents, for instance, project management logic. Consequently, as illustrated in Figure 2-5, it is expected that organisations that apply benefits management methodology in their routine projects will use it in ERP projects.

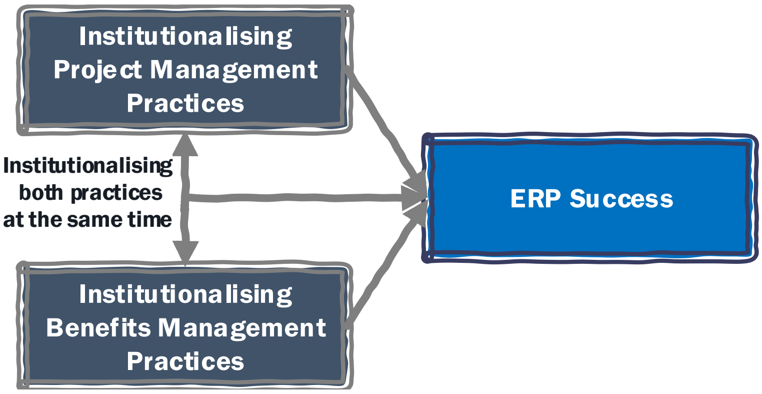



Figure 2-5: Institutionalisation of ERP Project Benefits Framework

## 2.5 ERP Business Value

### 2.5.1 ERP Business Value Definition

IT business value is the impact of IT investments on organisational performance (Melville et al., 2004) and organisational capabilities through different levels of the organisation (Schryen, 2013). Likewise, ERP is perceived to have positive impacts on organisational performance, including productivity improvement; profitability improvement (Nicolaou et al., 2003; Nicolaou, 2004a); competitive advantage (Stratman, 2007; Romero et al., 2010); inventory reduction; and other measures of performance (Shang and Seddon, 2000), and organisational capabilities such as renovation (Ma and Dissel, 2008) and lean capabilities (Powell et al., 2013).

Indeed, ERP is not only about benefits; rather, it entails huge costs in implementation (such as the costs of licenses, customization, etc.) (Rosa et al., 2013) and change management which is affected by many factors such as users' readiness for ERP implementation (Ahmadi et al., 2015). Moreover, ERP reduces organisational risks (i.e. the volatility of cash flow regarding market fluctuations); the more implementation of different ERP systems and the greater the integration between them, the more these risks are reduced (Tian and Sean, 2015).

Different factors of implementations affect one another (Fryling, 2010b; Fryling, 2010a; Badewi and Shehab, 2013). For instance, the training efforts before implementation affect the performance in post-implementation (Plaza, 2015). Likewise, managerial decisions to customise the system in the implementation phase affect the post-implementation maintenance costs (Fryling, 2010b; Fryling, 2010a).In the same way, the learning cost for the ERP system is considered when deciding on the timing of any upgrades to the system to maximize the value of the investment in the current system (Morgan and Ngwenyama, 2015). Therefore, based on the framework developed by Badewi & Shehab (2013), as visualized in Figure 2-6, the ERP business value could be defined as the impact of ERP on organisational capabilities and organisational performance in terms of financial and non-financial benefits, taking into consideration the direct and indirect ERP cost factors and the interactions between them. Nevertheless, to narrow down the scope of the research, the aim is only to focus on the benefits aspects only of the definition.

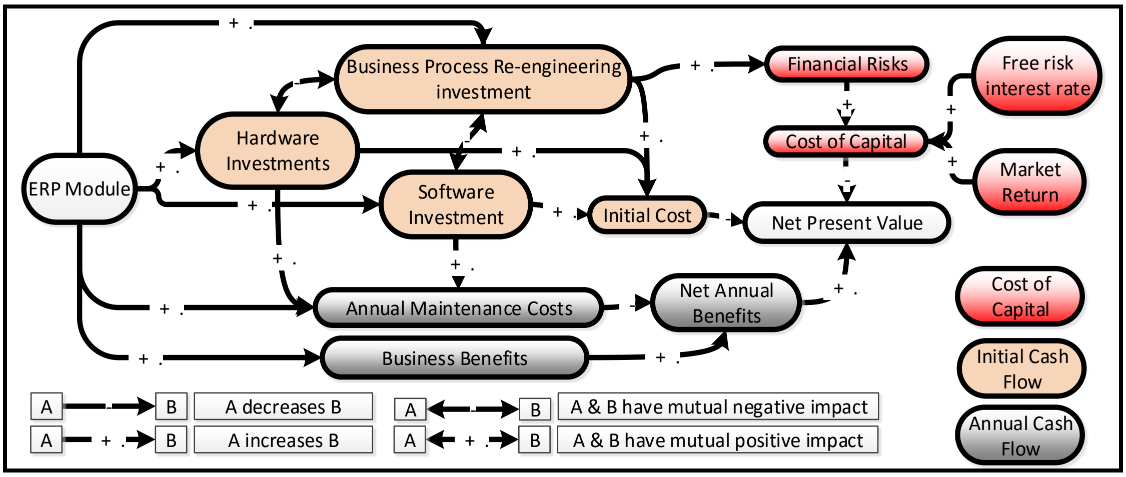



Figure 2-6: The CoBeFR Model (Badewi & Shehab, 2013)

### 2.5.2 ERP Business Value Framework

There are several different business value models and frameworks (Soh and Markus, 1995; Dedrick et al., 2003) for understanding how IT investments create value for organisations. The IT Business Value model of the Melville framework (2004) and subsequent research (Schryen, 2013; Nevo and Wade, 2011b) are used in this study because they consider both kinds of resource (organisational and IT). According to this framework, IT resources (Technological IT Resources (TIR) and Human IT Resources (HIR)) can achieve the expected benefits so long as organisational complementary resources (OCR) exist, such as a non-IT organisational structure and culture. The ERP System subjects it to a special and critical look because it requires (and leads to) a radical change in the organisational culture, structure and power (Morton and Hu, 2008; Ke and Wei, 2008), besides making it possible to integrate various information systems and technologies into a single harmonised system. Thus, as illustrated in Figure 2-7, the ERP Business value framework consists of two main sections: the ERP Blueprint and ERP Value. While the blueprint is to detail the Organisational Complementary Resources (OCRs) of ERP resources and ERP organisations, the Value section is about the emergent capabilities of such integration between these resources such that ERP Benefits are realised.

Indeed, a misfit between the ERP package (ERP resources) and the organisational functions (OCRs) affects both the success of implementing an ERP project (on time and within budget) and project investment success after its implementation (Gattiker and Goodhue, 2005). Therefore, ERP should be customised to a certain level and organisational processes should be changed to keep the fit between the two (Soh and Sia, 2004). Therefore, this conceptual demarcation of resources by Melville enables us to use orchestration theory to make a certain IT group of resources contingent on a set of organisational complementary resources

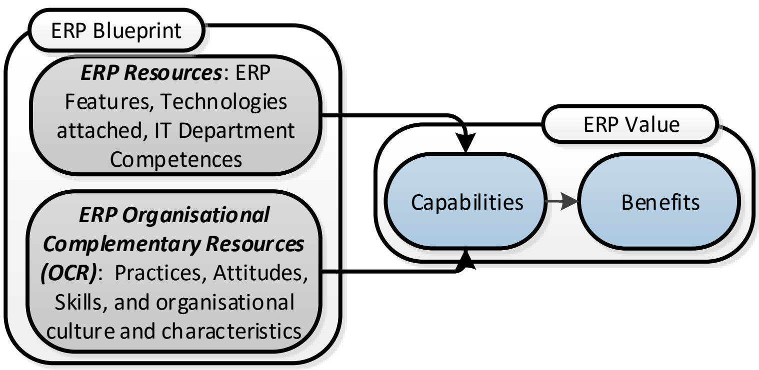



Figure 2-7: ERP Business Value Framework

#### 2.5.2.1 Blueprint Definition

The term “blueprint” has not been used academically but is used in professional life because one element of ERP implementation by SAP is to “prepare a Blueprint” (Dolmetsch et al., 1998; Gibson et al., 1999; Vernon, 1999). Indeed, in the present research, this concept is used because it is used in programme management guides (OGC, 2011) and benefits management guides (Jenner and APMG, 2014) to reflect the capability (i.e. the business operating model required for recouping the benefits). This research adopts the definition from the guide ‘Managing Successful Programmes’ (MSP) which highlights the future picture of an organisation (a business operating model) and consists of POTI (Process, Organisation, Technology and Information) (OGC, 2011; OGC, 2003). Thus, ‘blueprint’ is defined in the present research as the required operating business model for delivering benefits.

### 2.5.3 Organisational Complementary Resources (OCRs)

Since ERP is not implemented in a vacuum, the existence/lack of the various Organisational Complementary Resources (OCRs) is argued to be critical for the variation in the levels of success (Albu et al., 2015). OCRs that are found in the literature to be necessary are the organisation’s strategy, structure (Albu et al., 2015), control system (Kallunki et al., 2011), compensation system (Silveira et al., 2013), people (Sammon and Adam, 2010) including their demographics (age, cognitive style, education, gender and work experience) (Jasperson et al., 2005), peer advice ties (Sykes, 2015) and their psychological factors (e.g. readiness to change in attitude (Stratman and Roth, 2002)) and top management roles (Law and Ngai, 2007; Zhong Liu and Seddon, 2009; Dezdar and Ainin, 2011b) (e.g. their role in the continuous alignment between the organisation’s strategic objectives and the long term capabilities of the ERP (Chou and Chang, 2008a)).

#### 2.5.3.1 Organisational Factors

Organisational factors are organisation related factors such as characteristics of the compensation system, management, and people, and other organisational factors. Organisational factors such as compensation-based incentives found to have an impact on realising delivery performance benefits (Silveira et al., 2013). Techno-change Management and People Resources are considered enablers for achieving business benefits from ERP systems (Staehr et al., 2012). Not only these, but other factors, such as managerial decision making, through the agency role of managers, also affect the realising of benefits in the post-implementation phase of the ERP system (Staehr, 2010). Likewise, top management commitment is found to be one of the important factors of ERP success in terms of achieving the desired benefits (Law and Ngai, 2007). Actually, top management's role is found to be important in mediating institutional pressure and assimilating the ERP system (Liang et al., 2007). Likewise, transformational leadership affects the organisational culture in the activity of knowledge sharing which ultimately leads to ERP benefits in terms of operating costs, customer satisfaction and an efficient decision making process (Shao et al., 2012).

#### 2.5.3.2 Psychological Level

Since benefit realisation from investment in an ERP system, i.e., the maturing of the capability to yield sustained benefits, depends on the effective use of the system (Somers et al., 2003), the factors that affect the effective use of the system should be considered as OCRs in achieving such benefits. Not only is the negative impact of breaching the psychological contract with the users considered (Klaus and Blanton, 2010), but also psychological factors such as perceptions of the ease of use, usefulness, quality of vendor, quality of service and expected benefits in realising the desired benefits (Petter et al., 2008a; DeLone and McLean, 2003). Kamhawi (2008) finds that the perceived shared benefits affect the perceived ease of use and usefulness of an ERP system. Kamhawi's study found that ease of use of an ERP and perceptions of its usefulness affect the intention to use. The finding of Kamhawi comes in support of the findings of Amoako-Gyampah & Salam (2004). However, the two studies are different in determining the factors that affect the perceptions. On the one hand, Kamhawi (2008) shows that Individual differences and system characteristics are factors that affect the perceptions. On the other, Amoakoam-Gyampah & Salam (2004) focus on training and project commitment as major factors affecting the perceptions of ease of use and usefulness. As a Theory of Reasoned Action (TRA) (Montano and Kasprzyk, 2008), Bagchi et al (2003)'s theory uses TRA to claim that user involvement and attitude toward the ERP system affect the "Use" behaviour. Actually, punishment theory could explain some use behaviour in particular in a "mandatory to use" environment (Xue et al., 2011).

From synthesizing the literature, it is clear that the organisational factors and implementation factors affect the psychological factors. For instance, the quality of consultants affects the perceived ease of use and perception of usefulness (Wang et al., 2006) and therefore leads to organisational benefits being generated on four aspects of the balanced score card (Kaplan and Norton, 1993): finance, customer, internal business processes, and innovation learning (Tsai et al., 2012). Moreover, when ERP project implementation integrates adequate training and learning to the users, their satisfaction from the system is enhanced and therefore ERP benefits emerge (Dezdar and Ainin, 2011b). Therefore, the time and type of learning affect the behaviour and effectiveness of the use (Burton-Jones and Grange, 2012). The theories that explain the psychological behaviour toward IT (Delone and McLean, 2002; Montano and Kasprzyk, 2008; Ajzen and Fishbein, 1977; Ajzen, 1991) have been combined with controllable mechanisms (types and duration of learning, and tools for managing the attitudes) in an integrative framework (Badewi et al., 2013).

### 2.5.4 ERP Resources

#### 2.5.4.1 ERP Technological Resources

ERP technical resources is a concept developed to connect a traditional ERP system, such as payroll, accounts receivable, and accounts payable systems, and other synchronized and connected information systems and technologies to this web of systems. The main ERP resources illustrated in the literature are ERP modules, the level of integration and the ERP attributes.

The integration level is classified by Roh & Hong (2015) into the Laggards who implement one system, the Concentrators who implement and integrate two or three systems only, the Explorers who implements and integrates more than three systems and the Reinventors who implement and integrate all modules of ERP (based on SAP ERP model). Roh & Hong found that the level of integration and implementation affects ERP benefits positively in terms of sales, productivity and innovativeness.

Some attributes of an ERP infrastructure, e.g. database architecture and platform infrastructure such as cloud or an on premises system, and other technical attributes related to interface design are called in the present research ERP system features. Since the ERP infrastructure, such as cloud technology (Miranda, 2013; Arnesen, 2013) and perception of convenience interfaces (Amoako-Gyampah and Salam, 2004) , could have an impact on its business value, it is considered among the ERP technological resources.

#### 2.5.4.2 ERP Human Resources

The concept of ERP resources is extended to include the ERP department's competence to reflect the ability of the IT department to support the organisation with ERP service quality. Since the definition of quality is "meeting or exceeding customer expectations" (Reeves and Bednar, 1994). ERP service quality not only investigates the ability to respond effectively and efficiently to incidents (bugs or system fall- down) and to preserve the system's maintainability, connectivity, and security (Nwankpa, 2015), but also includes the ability to make the users feel their IT services are reliable, empathetic with high level of responsiveness (Hsu et al., 2015). The ERP service quality is found to be vital for users' use of the ERP system and a recouping of its costs (Hsu et al., 2015; Nwankpa, 2015). The role of ERP personnel should not be limited to technical responses; rather, their ability to scan the users' needs from time to time to find out new business needs from ERP, with an ability to respond quickly, is found to be important for enabling the organisation to assimilate the ERP and deliver more business benefits (Mu et al., 2015). Furthermore, IT department competences in project management affect the ERP success as explained and detailed before.

### 2.5.5 ERP Value

#### 2.5.5.1 From Resources to Capabilities

The Resource Based Theory (RBT) (Barney and Ray, 2015; Ray et al., 2013; Barney and Clark, 2007) has been found useful for understanding the relationship between the organisation's differential benefits (competitive advantage) and the emergent capability from the new blueprint that comes from integrating IT into organisational processes (Nevo and Wade, 2011a; Nevo and Wade, 2010). This emergent capability can be the source of competitive advantage when it is valuable, rare, inimitable and non-substitutable (VRIN) (Seddon, 2014). But investment either in technology or IT department competences, on its own, will never be rare or non-substitutable if it is merely expended; rather, it becomes irreplaceable through the complementary resources (OCRs) of the organisation (Melville et al., 2004; Schryen, 2013). For instance, IT department competences are not a source of competitive advantage regardless of their rareness or non-reproducibility, unless they are mediated with organisational agility (Chen et al., 2013). Consequently, synergizing both IT resources (e.g. Hardware, Software, IT department competences) and organisational complementary resources (e.g. organisational culture, structure) is believed to be an inevitable source of competitive advantage because it throws up unique organisational capabilities (Nevo and Wade, 2010).

#### 2.5.5.2 ERP Benefits

Bradley (2010) defines benefits as “an outcome of change which is perceived as positive by the stakeholder” Likewise, Ward and Daniel (2006) define Business Benefits as “an advantage on behalf of a particular stakeholder or stakeholder group. Bradley's definition is in fact more comprehensive because it considers ‘stakeholder perception’ and ‘outcome of change’ in the definition. Bradley's definition states implicitly that there is no positive outcome without the ‘perception of it’ and the need for ‘change to achieve it’. Another perspective is considered from a professional certification, Managing Successful programmes (MSP) which defines a Benefit as “the measurable improvement resulting from and outcome perceived as an advantage by one or more stakeholders, which contributes towards one or more organisational objectives" (OGC, 2011; P75). This definition considers the "measurable" aspects of the advantage perceived by stakeholders. Indeed, what we cannot measure, we cannot manage (Deming, 1982).

In order to perceive the positive outcomes, measures should be used to track and manage the progress in achieving them. These measures, called Key Performance Indicators (KPIs) (Kaplan and Norton, 1993), are financial and non-financial measures. Both kinds of measure should be adopted with caution. While financial measures are short run indicators of performance, non-financial measures are strategic and their impacts will be felt in the long run (Irani and Love, 2002). Therefore, a framework for benefits relationships should be developed for ERP systems. Although Chand et al (2005) developed the ERP scorecard to identify benefits relationships; ERP benefit relationships framework, benefit mapping, is still fairly immature in the ERP discipline. Their research did not cover different modules of ERP, and it did not consider the organisational capabilities required for achieving these benefits.

ERP benefits are listed in many papers. Writers tend to focus on different types of ERP benefit. Some of them focus on the financial rewards of it by focusing on either the impact of ERP announcements on a firm's market value (Ranganathan and Brown, 2006; Im et al., 2001) or the impact of ERP implementation on financial measures (Nicolaou et al., 2003; Poston and Grabski, 2001). However, a few papers have discussed the innovation benefits that may be realised from ERP.

#### 2.5.5.2.1 ERP benefits taxonomies

There are several different taxonomies of benefits, but only three dominant one that are used in research. First, Shang & Seddon (2000) classify ERP benefits into five groups, namely, operational, managerial, strategic, IT infrastructure, and organisational. Afterwards, they use four longitudinal case studies to examine the behaviour of these classes of benefit over time (Shang and Seddon, 2002).

However, the second taxonomy, that of Charalambos (2006), enhances this taxonomy by classifying organisational benefits, operational benefits based on time, operational benefits based on costs, and managerial benefits. In other words, Charalambos (2006) does not consider strategic benefits and expands the operational benefits to occupy two horizons, one based on time and the other based on cost. Charalambos (2006) conducted a survey of 73 companies that had recently implemented an ERP System. He classified the ERP benefits based on the “Cronbach’s alpha” between them into five groups: Organisational Benefits, Operational Benefits based on Time Reduction, Managerial Benefits, Operational Benefits based on Cost Reduction, and IT infrastructure benefits.

Unlike others taxonomies of ERP benefits, the third taxonomy, that of Uwizeyemungu & Raymond (2012) has an ERP capabilities perspective. These two writers focused on what ERP can do for organisations. As illustrated in Table 2-3, ERP benefits are classified into automational, informational, and transformational. Additionally, the capabilities of ERP are related to these benefits. Capabilities, such as Integration, Flexibility, and Transversality, provide evidence that they emanate the potential benefits of ERP.

Although this framework is useful in understanding how organisations can build the capacity to realise the potential of ERP, the benefits in this framework are not business benefits. But precision and accuracy of data, visualization of information at the workstations, for instance, are classified as information benefits and it is not clear how these benefits relate to business benefits, as explained in the previous frameworks (Shang and Seddon, 2000; Annamalai and Ramayah, 2011).

To sum up, ERP benefits are heterogeneous in the mechanism of their realisation and the organisational characteristics that they require: these benefits can be classified into operational, managerial, strategic, IT infrastructure and organisational benefits (Shang and Seddon, 2000; Shang and Seddon, 2002). However, the present research adopts Zuboff’s framework (Zuboff, 1985), classifying them into automation, planning and transformation benefits, as used for ERP systems (Uwizeyemungu and Raymond, 2009). The rationale for using this classification is that it classifies ERP benefits into three groups only, each group requiring its own capabilities (Uwizeyemungu and Raymond, 2012) and thus a special blueprint is needed (detailing ERP resources and OCRs).

Table 2-3: ERP benefits (Uwizeyemungu & Raymond, 2012)

| Category | Related ERP benefits |
|---|---|
| **Automational Benefits** | Productivity of organisational processes |
| | Better management of warehousing space |
| | Connectivity with customers |
| | Integration of resources |
| | Increase in the risks linked to integration |
| **Informational Benefits** | Improvement of production scheduling |
| | Richness of information extracted from the data |
| | Precision and accuracy of data |
| | Visualization of information at the workstations |
| | Simultaneous diffusion of information |
| | Standardization of information |
| | Improvement in decisions |
| **Transformational effects** | Development with customers |
| | Flexibility in pricing |

#### 2.5.5.2.2 Timing of harvesting ERP benefits

Esteve (2009) classifies the timing for realising benefits into three phases: stabilise (6-9 months), synthesis (6-18 months), and synergise (12-24 months). This classification comes from his belief that an ERP system takes time to become mature. Actually, most of the operational benefits of ERP are achieved within the synthesis & synergise periods. Managerial & organisational benefits are more generally realised in the synthesis phase than the first and third phases. Furthermore, Esteve (2009) notes that the strategic level benefits are achieved in the third phase, that of synergising. As a result, as illustrated in Figure 2-8, he develops a road map for realising ERP benefits. First, the focus of the preparing stage is on realising the stabilising benefits and also taking action to prepare to realise benefits in the next two phases. Second, the realising benefits stage focuses on realising most of the ERP benefits: namely, the operational, organisational, and managerial ones. Third, all the benefits should be realised in the “achieve” phase and the focus should be on the strategic objectives. Finally, there is a continuous process in which each phase is audited.

The different timings of harvesting the different ERP benefits may call for different blueprints for different capabilities at different times. In other words, benefits management should be conceptualized to be a part of the organisation's dynamic capabilities for assimilating the ERP system.

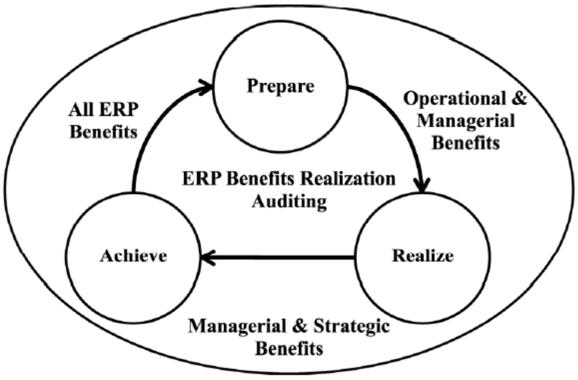



Figure 2-8: Benefit Realisation Road-Map (Source: Esteve, 2009)

## 2.6 Benefits Management as a dynamic capability

### 2.6.1 Operational Capabilities versus operational capabilities

Capabilities are of two types: operational and dynamic. While the operational capabilities are involved in the routine of performing individual tasks, the dynamic capabilities are involved in the routine of coordinating, integrating, expanding and retiring these tasks (Helfat and Peteraf, 2003). Amit and Schoemaker (1993) define operational capability as the ability of an organisation to deploy, integrate and make use of its assets in the interests of a specific goal. According to this definition, which the present research adopts, IT capability is the ability of an organisation to deploy, integrate and make use of its IT resources to enhance organisational performance (Wang et al., 2012). Furthermore, the capability does not count as a full organisational capability until it becomes routinely integrated in the organisation processes to the point where the "repeated, reliable performance of an activity" is acknowledged (Helfat and Peteraf, 2003).

Each operational capability has its lifecycle, starting from the time when it was established. It becomes mature and ends with what is called capability branching. When capability branching occurs, the factors external to a capability (which can be external or internal to the organisation) affect its lifecycle, such as a managerial decision to have a "selection event" point which transforms the performance by transforming the capability (Helfat and Peteraf, 2003). Indeed, a managerial decision can reverberate throughout the creation of strategic resources (Sirmon et al., 2011). Thus, Helfat in 2007, describing the complementary operational capabilities (at the branching stage) of dynamic capabilities (e.g. to renew or redeploy), underlines the function of top management of structuring, bundling and leveraging the organisation's resources/capabilities for the sake of achieving sustainable competitive advantage. To structure the resources means to acquire, accumulate and divest them. Once acquired, they must be bundled (tailored) into the organisation's system so that the leveraging process (coordinating and deploying) can take place to achieve the organisation's performance targets. Hence, it has been found that it is critical for top management to prioritize, synchronise and support (orchestrate) the resource management activities of managers at all levels of the firm in the interests of organisational performance (Chadwick et al., 2015) and sustainable competitive advantage (Sirmon et al., 2011).

### 2.6.2 Orchestration Theory

Asset Orchestration is the "capacity of managers to create purposefully, extend or modify the resource base of an organisation" (Helfat et al., 2007) so that corresponding capabilities can be created (Helfat et al., 2007). Resource orchestration takes one-step further toward mixing resources and capabilities, and managerial interventions deploying more resources (Sirmon et al., 2011). Thus, resource orchestration is the integration between asset orchestration and resource management (Chadwick et al., 2015). The lifecycle of each capability starts at the foundation stage but ends differently. It can end by any of the 6 Rs (Renewal, retirements, redeployment, recombination, replication, or retrenchment) (Helfat and Peteraf, 2003). Thus, by orchestration mechanisms, organisational performance can be transformed from level to level by intentionally "branching" the lifecycles of the organisation's capabilities. Each resource orchestrated into organisational IT portfolio creates a new capacity that builds a new organisational environment state; this itself may require a new resource (Cui and Pan, 2015). In other words, resource orchestration theory implies that deploying an extra resource will lead to something (a capability) which leads to incremental performance (benefits) (Davis, 2014).

Orchestration involves not only between IT resources; rather, it can involve IT resources alone or organisational complementary resources alone, or the two combined. Wang et al (2012) show that investing in technological IT resources (TIR) is more effective for the business in stable times, whereas investing in Human IT Resources (HIR) is more viable in a dynamic environment. Indeed, Srimon and Hitt (2007) found that the fit between the resource investment decisions (in which resource to invest) and deployment decisions (where to deploy the resource) are more critical to the organisational performance than simply seeking to maximize any of the decisions by itself. Therefore, synergizing and fitting IT resources and organisational complementary resources (which resources should be deployed where and when) is proposed to be more critical than rationalising the purchase of each IT resource alone or developing intangible organisational assets (human resources capabilities) at a distance from the IT resource management strategy. By applying the same argument to ERP benefits, synergizing ERP resources planning with developing organisational human resources planning is expected to have a higher impact than merely focusing on any of these areas in isolation.

### 2.6.3 Benefits Management Dynamic Capability framework

Benefits management frameworks and models are implicitly inherent in the concept of dynamic capabilities. For instance, for those who want to realise more benefits from their current IT portfolio, researchers spotlight the value of the power to exploit benefits (Ashurst and Hodges, 2010; Ashurst et al., 2008) and the ERP system (Norton et al., 2013) by investing in organisational resources (e.g. training) rather than technological ones. Likewise, the active benefits management framework shows that benefits management is a continuous process (Remenyi and Sherwood-Smith, 1998). Davenport et al (2004) underlines that ERP implementation is an ongoing process until the “critical mass” of implementation is achieved, able to integrate the main function of departments so that the full value of ERP can be realised. Therefore, it is practical to use a benefits review as a mechanism to follow up implementation and take action so that the organisation's fit with current and new ERP implementation is perceived to be associated with the organisational sustainable financial performance from ERP (Nicolaou and Bhattacharya, 2008).

The factors required to realise ERP benefits are immense. Without a significant capability in the organisation to change as it implements the new technology, the benefits will not be realised and thus the value of investing in this technology will not be felt. The activities required for delivering ERP benefits are project management factors (for IT resources) and management factors for business change (for OCRs) (Badewi, 2015a). Both should work together in a unified and consistent framework for managing the value curve which supports the organisation's capabilities (OGC, 2011; Jenner and APMG, 2014; Serra and Kunc, 2015). Figure 2-9, adopting the value curve, helps to visualise the idea of the different blueprints required for achieving different benefits

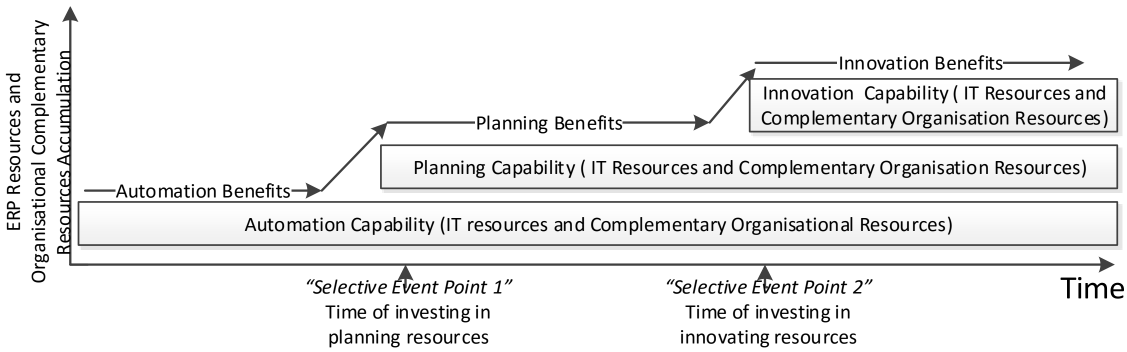



Figure 2-9: Framework showing the Capability for Realising ERP Benefits

## 2.7 ERP Business Innovation Framework

### 2.7.1 IT Business Innovation

Business Innovation is defined as doing unusual things that are ultimately appreciated and valued by customers – not only developing new products (Luo et al., 2012), services, and communication channels (Song and Song, 2010) but also developing new business processes (Tarafdar and Gordon, 2007) and new business models (Cash et al., 2008; Sawhney et al., 2011). In addition to organisational changes that are required to achieve sustainable business innovation (Cash et al., 2008), it has been found that IT has a critical role in realising business innovation (Tambe et al., 2012).

From one side, IT investment has a significant impact on product innovation when R&D competence, in terms of the skills and knowledge of R&D employees, is present (Kleis et al., 2012). From the other side, business innovation is not only product innovation; rather, it is also business process and business model innovation, Thus, although the picture is somehow clear about product innovation (Song and Song, 2010)  and process innovation (Tarafdar and Gordon, 2007) through using IT resources and competences, it is still vague in the case of business model innovation. Additionally, although it is known that IT investment has an impact on business innovation (Luo et al., 2012), it is not clearly known what organisational capabilities are required to leverage this relationship.

What differentiates the leading edge organisations in innovations using IT from others is that these organisations use IT in measurement, experimentation, sharing, and replication (Hopkins, 2010). The sequence of innovation through IT is measuring everything in an organisational environment, either external or internal, using these measures to do experiments to understand the conditions for this organisation, sharing the results and insights across it, and finally replicating the innovations within it.

Information technology as a business innovation enabler is not a new research discipline (Swanson, 1994; Jansen et al., 2006; Kodama, 2009; Lee and Berente, 2012). Swanson (1994) classifies IT innovation into three types. Type I, IS process innovation, is IT innovation that enables an organisation indirectly to increase its efficiency through IT efficiency; efficiency in either IS administrative tasks such as the way of managing the IT department, technical aspects such as using application prototyping, or both. Type II innovation is innovation in IT products and services delivered to the business such as introduction of automated systems; IT innovation comes to automate business processes only. Unlike the previous 2 types that focus on innovation in IT and its processes, Type III innovation “integrates IS products and services with core business technology, and typically impacts upon general business administration as well”. Therefore, IT that enables organisations to do business innovation is called IT business innovation, or Type III innovation, in the present research.

Types I & II IS innovation have been researched extensively. Type III, IS business innovation, is still relatively immature since the emergence of new information technologies such as Big Data & Gaming technologies enables organisations to do and innovate more than before. Additionally, it is believed that business could innovate for decades with its present ICT (Brynjolfsson and Saunders, 2010).

In order to understand how information technology enables organisations to achieve business innovation, Tambe et al (2012) provides a framework for finding the impact of IT, as a means of decentralization in authority and of achieving a high degree of external focus on the external environment, i.e. product innovation. This is based on the belief that business innovation comes from decentralization and external focus abilities, the ability of an organisation to detect and respond to changes in its external environment. However, IT investment is not only the way to achieve business innovation: intangible resources such as the skills and knowledge of R&D employees have a significant impact on product innovation (Kleis et al., 2012). Last but not least, IT in addition to its critical role in realising business innovation, must be accompanied by organisational changes to achieve sustainable business innovation (Tambe et al., 2012). Thus, IT complemented with the organisational capabilities required to absorb this technology is proposed if an impact on business innovation is required.

### 2.7.2 ERP Innovation Framework

A theoretical framework for ERP innovation is developed to assess the possibility of recouping the benefits of innovation from ERP under certain conditions. As illustrated in Figure 2-10, ERP capability, which emerged from the designed blueprint for the sake of recouping certain benefits, is an equation to represent how ERP resources are supported by complementary resources. Thus, the ERP innovation resources and ERP innovation organisational complementary resources (OCRs) are proposed to have ERP capabilities for realising the benefits of innovation.

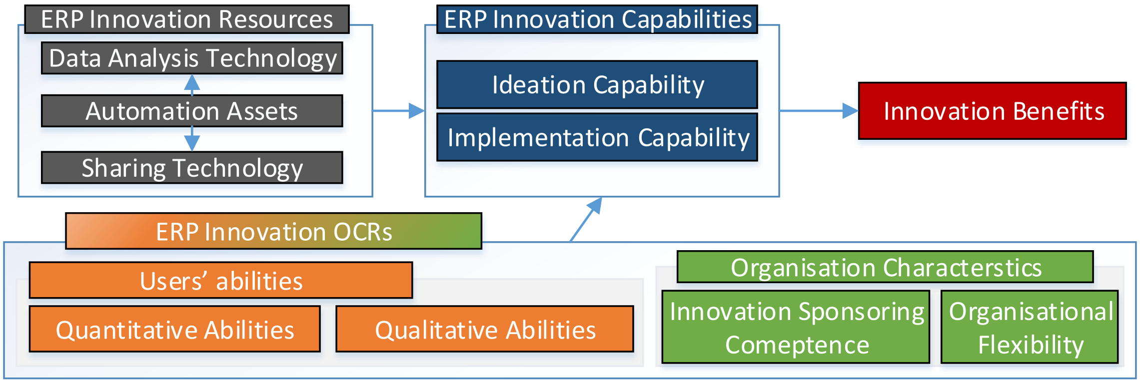



Figure 2-10: ERP business innovation framework

### 2.7.2.1 ERP Innovation resources to ERP innovation capabilities

An ERP innovation Resource, like any class of IT resources, delivers above average performance only when the organisation is able to exploit its strategic purpose (Aral and Weill, 2007). The ability of an organisation to deploy, integrate and use its assets to further a specific goal is called its 'capability' (Amit and Schoemaker, 1993). Since IT capability is the ability of an organisation to deploy, integrate and use its IT assets to enhance organisational performance (Wang et al., 2012), ERP Business Innovation capability is the ability of an organisation to deploy, integrate and use its ERP innovation resources to achieve business innovation. In other words, capability is the sum results of the existence of enabling technology accompanied by relevant organisational complementary resources.

Although business innovation cannot be realised without thoughtful ideas from different search efforts; demand-side, supply-side and spatial search (Sidhu et al., 2007), following-up and implementing these ideas are the real challenge for most organisations (Birkinshaw et al., 2011). Therefore, business innovation is an equation of idea generation as well as idea implementation (Govindarajan and Trimble, 2010). Consequently, innovation capability, as illustrated in Table 2-4, is rooted in a pair of main sub capabilities: idea generation capability and idea implementation capability. While idea generation capability is the ability of an organisation to generate new valid ideas, idea implementation capability is the ability of an organisation to implement this idea successfully.

Table 2-4: IT Business Innovation Organisational Competences

| Capabilities | Competences | Description | Literature Review |
|---|---|---|---|
| **Idea Generation** | Positivist Competences | The ability level of organisations to test new ideas through experiments using data available in databases | (Hopkins, 2010; Marchand and Peppard, 2013) |
| | Interpretive Competence | The ability level of organisations to understand and comprehend evidence through the data in the system | (Shneiderman, 2007; Sidhu et al., 2007; Sabherwal and Becerra-Fernandez, 2011) |
| **Idea Implementation** | Innovation sponsoring | A dedicated unit for scouting and implementing new ideas | (Cash et al., 2008; Govindarajan and Trimble, 2010) |
| | Organisation Agility | The level of an organisation's ability to be flexible enough to accept innovative ideas in its processes and business model | (Chen et al., 2013; Bock et al., 2012) |

#### 2.7.2.1.1 Idea Generation Capability

Idea generation capability is one side of knowledge creation capability. However, whereas idea generation has a direct impact on enhancing or redesigning the current product, service, process, or business model, knowledge creation has a direct impact on understanding the current processes to make innovations possible (Leonard-Barton, 1995; Nonaka and Von Krogh, 2009)

Knowledge creation, gaining the "truth", usually comes into three epistemologies: interpretive, positive, and critical epistemology (Kanellis and Papadopoulos, 2009). While interpretive epistemology focuses on understanding the evidence (Walsham, 2006), positive epistemology focuses on gaining knowledge through formulating hypotheses and testing them (Singleton and Straits, 2005). Indeed, combining these methodologies for gaining knowledge has many functions such as validating the new knowledge through positive research (Venkatesh et al., 2012a; Teddlie and Tashakkori, 2008).Therefore, in order to generate new validated ideas, organisations go through three sequential activities: understanding the evidence, proposing new ideas based on understanding the evidence, and testing the proposition in an objective way. In other words, organisations should be competent in understanding their realities, proposing new ideas, and testing these new ideas before implementing them.

Harrah's, a Las Vegas casino, has used its business analytics technologies to develop a testing-hypotheses culture which has propelled it to be one of the top casinos in the industry (Hopkins, 2010). Although this is evidence that testing-hypotheses culture is a robust variable in leveraging IT innovation assets, as represented by the use of business analytics, this evidence is based on a single case study. Other examples are represented in many books (Leonard, 1995). In other words, this view needs itself to be tested across different organisations to know whether the testing-hypotheses culture is a significant factor in realising business innovation through IT innovation assets.

The ability to test hypotheses using a systematic approach requires statistical skills. These statistical skills are required to increase the ability of the organisation to absorb the huge numbers constituting its databases. Although analytical applications enable organisations to do more than before in analysing historical data, not all organisations have the same ability to analyse the data since they are different in their skill competences. Therefore, it is hypothesized that statistical competence has a robust impact on the relationship between IT innovation assets and business innovations.

#### 2.7.2.1.2 Idea Implementation Capability

Idea implementation capability focuses on the ability to implement successfully. Innovation always contradicts organisation routine (Obstfeld, 2012), since innovation requires "slack" (Birkinshaw et al., 2011), such as time, to develop and test new ideas. Indeed, it is believed that devoting a special entity could solve the problem of an organisation routine (Cash et al., 2008; Govindarajan and Trimble, 2010; Obstfeld, 2012). However, others believe that organisation agility, i.e. flexibility, could be another solution (Bock et al., 2012), or structuring an organisation based on projects to overcome the problem of routine and the functional structure of organisations (Davies and Hobday, 2005). Actually, it is not easy for organisations to be project-based structures due to the limitations of standardized production systems (Project Management Institute, 2013a). Indeed, project-based organisations, such as construction organisations, lack the routine capabilities that are necessary, in terms of cost efficiency and organisation stability (Cyert and March, 1963), but are not sufficient (Obstfeld, 2012). Therefore, the present research considers the first two options: devoting a special entity, such as a sponsor, to finding and nurturing new ideas, for the sake of innovation and organisational flexibility.

#### 2.7.2.2 ERP Innovation Resources

ERP innovation resources are those technological artefacts that are expected to have an impact on product/service innovation, business model innovation, and process innovation. Luo et al (Luo et al., 2012) found empirically, through a longitudinal study of the apparel industry, that the level of IT technical resources represented in IT infrastructure and enterprise systems has an impact on an organisation's ability to innovate in its products. IT-enabled knowledge capabilities have an impact on innovation (2010) (Sabherwal & Sabherwal, 2005). IT affects the ability of organisations to acquire, assimilate, transform, and exploit knowledge. (Joshi et al., 2010). Therefore, ERP innovation resources are defined in the current research as the IT assets that enable organisations to integrate operational data, analyse these data, and share ideas and knowledge. Thus, the three ERP technological resources are automating technologies and data analytic (reporting) technologies supported by knowledge sharing technologies.

##### 2.7.2.2.1 The impact of automation on Business Innovation

The reliability, and therefore the usability, of organisational data are based on the quality of the data in terms of accuracy and timeliness. Therefore, the higher the accuracy and timeliness of the data, the more use is made of the data and the greater the dependence on them (Sabherwal and Becerra-Fernandez, 2011). According to Elliot (2009), many intelligent efforts made in organisations are not successful because the information available in their depositories is not clean, consistent, timely, and relevant. One of the best ways to enforce the reliability of the data is stopping human interventions in data entry. Therefore, the greater the integration between the systems, the higher the accuracy and timeliness of the data. Since the higher the use of the system, the higher the benefits that are realised from it (DeLone and McLean, 2003; Petter et al., 2008a), it is hypothesized that the level of integration between different information technologies enables organisations to use intelligent systems to produce business innovation.

#### 2.7.2.2.1 The impact of Data Analytics assets on Business Innovation

It is very difficult to explore new patterns in data or to test the validity of new ideas without using business intelligence applications (Sabherwal and Becerra-Fernandez, 2011). Business intelligence applications, for instance, enable organisations to either explore new patterns in customer perceptions, supplier trends, and processes efficiency or test new ideas using historical data (Marchand and Peppard, 2013). Additionally, visualization and simulation applications, as creativity tools, enable engineers and product designers to enhance knowledge creation in the organisations that use them (Shneiderman, 2007). Furthermore, the “bisociation” capability of intelligent information systems, the ability to build bridges between two disciplines of thought, enables an organisation to transform and exploit its knowledge in a way that may lead a firm to innovate (Joshi et al., 2010). Therefore, the use of data analysis applications is hypothesized to have an impact on business innovation.

#### 2.7.2.2.2 The impact of Knowledge Share on Business Innovation

Sharing technologies, such as Web 2.0 Technologies, are perceived by executives as enablers to share, and therefore to accumulate, knowledge among employees, customers, and suppliers (Bughin et al., 2008). But in fact Web 2.0 technologies are perceived to have mixed results (Birkinshaw et al., 2011). For instance, in a global survey McKensey (2008) reveals that only 21% of the respondents were extremely or very satisfied with Web 2.0 technologies, in contrast to 22% dissatisfied and 7% who stopped using one or more of the tools in question. According to this study, while more than a quarter of the satisfied respondents saw that Web 2.0 tools had altered the interaction with customers and suppliers, other satisfied respondents saw that Web 2.0 had helped in creating improved roles, functions, products, and culture. However, the reason for these disappointing results may have been that organisations in general need time to absorb the new technology (Kohli and Grover, 2008) or that they lack the organisational capabilities to support the use of the sharing technologies (Cash et al., 2008; Birkinshaw et al., 2011)

From another perspective, sharing technology enables peers to share texts, videos and graphics either internally or externally to the organisation. Sharing texts and ideas enables organisations to overcome the problem of physical separation between departments, and the problem of cultural differences, problems which both have an impact on the ability to develop new products (Song and Song, 2010). Furthermore, this sharing technology enables an organisation to accumulate and absorb knowledge among the interactions between the organisation's members. Suffice it to say, the ability to accumulate and absorb organisational knowledge is a source of continuous innovation (Leonard-Barton, 1995). Consequently, sharing the technologies which support ERP is hypothesized to have an impact on business innovation

#### 2.7.2.3 ERP Innovation OCRs

Although innovations in IT have an impact on business innovations (Swanson, 1994), it is believed that business could innovate for decades within the existing information technologies (Brynjolfsson and Saunders, 2010). Moreover, many non-IT related factors are said to affect the organisation's capability to innovate. Examples of such factors include the type of leadership (Lu and Ramamurthy, 2010), its individual characteristics (Sharma & Rai, 2014), shared understanding of the organisational future (Birkinshaw et al., 2011), the ability to acquire knowledge (Ritala and Hurmelinna-Laukkanen, 2013) and the ability to combine this knowledge by means of managerial ties (Rost, 2011; Shu et al., 2012).

However, IT has an impact on knowledge acquisition and absorption (Joshi et al., 2010). Additionally, IT communication assets enable understanding to be shared between different departments (Song and Song, 2010). Furthermore, managerial business ties are believed to be expanded and enhanced by using IT in the form of social media. Even regarding the level of decentralization as an enabler for business innovation, IT is perceived to have an impact on the decentralization of authority, thus enabling business innovation (Tambe et al., 2012).

Further factors that leverage the impact of IT on product innovation are, for example, organisational financial resources (Luo et al., 2012), diversifying the stakeholders who input idea generation and development through online forums (Birkinshaw et al., 2011), business-IS linkages, and IT/innovation governance (Tarafdar and Gordon, 2007). With this this in mind, we propose that complementary resources for organisational business innovation in terms of generating new ideas and implementing them has a robust impact on the relationship between IT business innovation assets and business innovation

## 2.8 Knowledge Gap Analysis

### 2.8.1 Knowledge Gaps in Project Management and ERP literature

Traditionally, projects aim to deliver outputs such as delivering a required and well-specified piece of software on time and on budget (OGC, 2009). Therefore, these projects use “output-focused” project management, which focuses on managing inputs and outputs through the iron triangle (cost, time and scope) performance measures (Chih and Zwikael, 2015). As the literature suggests, complying with the iron triangle is not sufficient for declaring the project a success (Samset, 2009). Similarly, failing does not involve only the delivery of an IT project on time and within cost; it also pertains to the expected benefits from the project. Therefore, the literature revealed that this “output focused” PM mind-set could mislead the project manager as to orientation and therefore it could leave the project customers/sponsors unsatisfied (Shenhar and Dvir, 2007). For this reason a new “project benefits management” mentality is spotlighted by academics and practitioners (Bennington and Baccarini, 2004; Breese, 2012; Chih and Zwikael, 2015)

Benefits Management (BM) is another framework used with the aim to increase the success of IT project (Ashurst and Doherty, 2003; Breese, 2012; Serra and Kunc, 2015; Melton et al., 2008b). Despite an early call to implement BM (Ward et al., 1996; Thorp, 1998), little empirical evidence has been brought up to show how much light benefits management sheds on the prevalent tendency of IT projects to fail. Most of the research conducted on benefits management either explores it at the level of implementation (Bennington and Baccarini, 2004; Lin and Pervan, 2003; Coombs, 2014) or implements and develops the benefits management approach in case studies (Baccarini and Bateup, 2008; Fukami and McCubbrey, 2011; Doherty et al., 2011; Pina et al., 2013). Nevertheless, a few papers have used generalizable evidence to test the success or level of effectiveness of benefits management (Serra and Kunc, 2015).

Paradoxically, from one perspective, these papers have found a mixed weak relationship between the implementation of benefits management practices and project success (Badewi, 2014; Serra and Kunc, 2015). Indeed, current benefits management practices are not in themselves a panacea (Breese, 2012) and sometimes they don't even matter (Haddara and Paivarinta, 2011). From another perspective, project management practices alone are perceived to have only a moderately significant relationship with project success (Besner and Hobbs, 2013).

Moreover, project management maturity is found to have an impact on project management success but not on project investment success in terms of customer satisfaction (Berssaneti and Carvalho, 2014). Additionally, project management performance is significantly correlated with success in both project investment and project management (Mir and Pinnington, 2014). However, when project management practices are used in transformational change, such as the deployment of a new IT system to change work practices, the results may be frustrating (Ram et al., 2013).

Regardless of this proliferation of the discipline, a few researchers have used generalizable evidence to test the success or level of the effectiveness of benefits management (Serra and Kunc, 2015; Badewi, 2015b). Furthermore, a survey conducted by the APM Benefits Management SIG, in the UK, revealed that 60% of the respondents described their organisations' approach to benefits management as casual or informal (APM, 2009b). Furthermore, according to a global study conducted by the Project Management Institute (PMI), only 20% of organisations believe that they are mature enough in using benefits management in their practices (PMI, 2015). The reason for this may be that the BRM discipline is still new and immature. It needs more research before it becomes a well-established discipline.

In fact, the Project Management (PM) framework is different from that of Benefits Management (BM). Whereas traditional PM focuses on the iron triangle (Atkinson, 1999), BM focuses on delivering the value of IT projects (Ward and Daniel, 2006). Although they each have different aims, methodologies and techniques (Project Management Institute, 2013a; APM, 2009), combining them into a single governance framework is proposed to enhance the probability of success for the IT initiatives, i.e. project success.

To bridge this knowledge gap, this research understands the relationship between success in different areas (i.e. project investment success and project management success) to find out whether successful project management leads to project investment success. It goes on to investigate, criticise and then propose that project management practices (Project Management Institute, 2013a) alone and benefits management practices alone (Ward and Daniel, 2006) affect the success of project management. Finally it is aim to investigate how PM and BM come together, the probability of success is enhanced.

### 2.8.2 The impact of project management of ERP success

ERP, unlike limited scale IT projects, involve a radical change in the organisational processes and culture that entails risks to the project and to IT, together with organisational transformation, significantly affects a project's success. Therefore, there are two schools of thought about the impact on ERP project success of using project management. One school believes that project management enables the organisation to deliver an ERP artefact on time and within budget (ERP project management success) but it cannot affect the success of ERP project investment (Ram et al., 2013; Ram et al., 2014). This belief comes from the idea that it is misleading to focus on the iron triangle of delivering an ERP project (Lech, 2013). Not only this, but also the reliance on traditional PM methodologies has been attacked as the reason for the rigidity of the ERP system

(Leonard and Higson, 2014), which may harm the fit between ERP and the organisation’s functions (Soh and Sia, 2004).

Although the explicit role of project management declines in the later stages of the ERP lifecycle (Acceptance, Routinization and Infusion) (Somers and Nelson, 2004), recent research has found that the impact of this role in its early stages (adoption and adaptation) has a significant impact on later stages (Peslak, 2006; Velcu, 2010; Tsai et al., 2011; Dezdar and Ainin, 2011a). The risk of poor ERP project management is leveraged as the highest level of vulnerability to risks in the implementation phase (Dey et al., 2010). It suffices to say that poor project management in an ERP project leads to failure without even being fully introduced to stakeholders (Yusuf et al., 2004). Indeed, poor ERP project management results, in terms of scope creep, poor risk management and inadequate allocation of resources, in frustrated users pushing the organisation to fail in its ERP project investment (Chen et al., 2009). Therefore, Dezdar et al (2011a) found that the extent to which project management tools are used in ERP implementation affects the realisation of ERP benefits and users’ satisfaction with it. Because of this, project management is found to be a predictor for the quality of ERP implementation and eventually of project success (Zhu et al., 2010). Likewise, successful ERP project management is found to be a necessary requirement for organisations to realise ERP benefits through the organisation’s functional fit with the ERP and its ability to overcome organisational inertia (Zhong Liu and Seddon, 2009).

Indeed, the relationship between ERP project management and ERP project investment success has been examined in many other studies. Peslak (2006) reveals that the successful implementation of an ERP project (in terms of time and cost) leads to the stakeholders’ perception of its success. Furthermore, Tsai et al (2011) found that the use of high quality consultants in ERP affects ERP project management success and this in turn leads to ERP project investment success.

Knowledge of project management, without the ability to manage stakeholders and IT preparedness for implementing the ERP, is perceived to be insufficient for building its capacity to earn the ERP benefits (Karimi et al., 2007). ERP has different sub-systems in different departments across different levels of the organisational hierarchy; unsurprisingly, then, stakeholders as a rule have different and sometimes conflicting interests, which may be aligned with or misaligned, by implementing it (Boonstra, 2006). Therefore, without a proper integration of change management practices and project management practices, ERP may fail (Yusuf et al., 2004). Thus, De Toni et al (2015) found that the successful implementation of ERP projects by using a competent ERP project team that can integrate key users in implementation leads to ERP success in the post-implementation phase.

The divide in the findings can be traced back to many factors. Since Dezdar et al (2011a) focused on the “extent” to which tools are used, the difference between the two schools can be understood in terms of the level of maturity (professionality) with which the project management tools and practices are deployed. Furthermore, only a proportion, albeit a significant one, of the organisations that claim to implement “project management practices” in ERP implementation was indeed doing so. Tasevska et al (2014) found that most of the organisations surveyed did not use project management planning tools such as Gantt Charts or WBS. However, most organisations used general project management principles such as having a time baseline and defining the project scope. The difference may have arisen due to the use of change management tools and procedures. Change management in such projects is perceived to be critical to integration with the project management methodology used (Cicmil, 1999; Hornstein, 2015) or to dedicating a Business Change Manager (BCM) or Benefits Management (BM) to the work of managing the organisational change (Badewi, 2015a). Therefore, it is proposed to consider institutionalisation theory to address these problems. It is unknown any researcher propose that before (Badewi & Shehab, 2016).

This conceptualization of institutional theory is not new in IT research (Mignerat and Rivard, 2009). For example, Drazin and Van Di ven (1985) underlined that internal coordination and control practices may become so institutionalized over time as to be difficult to change. Indeed, the routinization of certain controlling and coordination practices can serve as instrumental tools in achieving control and improving performance (Gresov, 1989). This is reflected in the fact that hybrid dynamic organizational structures can have different and perhaps conflicting, institutional logics which leave the actors in some confusion (Pache and Santos, 2012). This was clear in the American aerospace institute, NASA, after one year of implementing its Enterprise System, since its organizational institutional logics were in conflicting between different organizational actors, which led to loose coupling (Berente and Yoo, 2012). Following these arguments, if an organization uses the same governance framework in managing its projects, can it achieve higher success than those who do are not have a consistent institutional logic? In other words, the research addresses this question: by making them part of organizational institutional logic, does the institutionalization of project management and benefits management practices affect the success of ERP projects?

### 2.8.3 Knowledge Gaps in ERP Business Value Literature

The Resource Based Theory (RBT) lens has been found useful for understanding the relationship between the organization's differential benefits (competitive advantage) and the emergent capability from the new blueprint which comes from integrating IT into organizational processes. This emergent capability can be the source of competitive advantage when it is valuable, rare, inimitable and non-substitutable (VRIN) (Seddon, 2014). But investment either in technology or IT department competences, on its own, will never be rare nor non-substitutable if it is merely expended; rather, it becomes irreplaceable through the complementary resources (OCRs) of the organization (Melville et al., 2004; Schryen, 2013). For instance, IT department competences are not a source of competitive advantage regardless of their rareness or non-reproducibility unless they are mediated with organizational agility (Chen et al., 2013). Consequently, synergizing both IT resources (e.g. Hardware, Software, IT department competences) and organizational complementary resources (e.g. organizational culture, structure) is believed to be an inevitable source of competitive advantage because it creates unique capabilities (Nevo and Wade, 2010). In order to realise the benefits from Information Technology (IT) projects, Melville (2004) developed a business value model for doing so. According to this model, IT resources (Technological IT Resources (TIR) and Human IT Resources (HIR)) can achieve the expected benefits so long as organizational complementary resources (OCR) exist, such as non-IT organizational structure and culture. The ERP System subjects it to a special and critical look because it requires (and leads to) a radical change in the organizational culture, structure and power (Morton and Hu, 2008; Ke and Wei, 2008), besides making it possible to integrate various information systems and technologies into a single harmonised system. It is still vague to academics how can Melville et al (2004) can be used to derive and to develop a road map composed from different blueprints to maximize the benefits from ERP.

### 2.8.4 ERP and the Innovation Paradox

An ERP system is always reported as a restrictive system that prevents innovation (Davenport, 2000; Trott and Hoecht, 2004a; Trott and Hoecht, 2004b); therefore, it could not be a source of business innovation and correspondingly not a source of sustainable competitive advantage. This idea is, however, challenged by many researchers (Srivardhana and Pawlowski, 2007; Luo et al., 2012). Srivardhana & Pawlowski (2007), for instance, use absorptive capacity theory to propose that ERP could be a source of business innovation; Joshi et al (2010) use the same theory to explain how organisations can continuously innovate in their products. Nevertheless, there are no empirical evidences used to understand and to examine the use of business value framework developed by Melville et al (2004) to illustrate how ERP can be a source of innovation with taking into consideration the rigidity impact of implementing ERP on organisations.

## 2.9 Summary

The aim of the above literature review was to uncover the knowledge gaps in understanding the benefits realisation process for ERP systems and to develop theoretical frameworks for designing methodology and analysing and understanding the data and results. A summary of the gaps may be found in the next section.

This chapter synthesised and criticised the relevant literature in ERP and its success, project management, benefits management, business value and innovation. The output of this chapter is four frameworks for understanding the reasons behind the variation in ERP performance among organisations. These frameworks are extended, enhanced, tested, and validated in the remaining chapters of the thesis. They are the Institutionalisation of the ERP project benefits framework, the ERP Business value framework, the ERP Orchestration framework and the ERP innovation frameworks. The first one is extended in Chapter 4 and tested in Chapter 5. The ERP business value framework and orchestration frameworks are integrated and extended in Chapter 6. Based on the results of Chapter 6, the ERP innovation framework is improved and tested in Chapter 7.

# 3 Chapter Three: Research Methodology

## 3.1 Introduction

To understand the variation among organisations in the recouping of ERP benefits, a novel and unique research methodology is required to uncover the root causes of this research problem. This chapter starts by spotlighting how the researcher understands the nature of knowledge (ontology), the ways to gain this knowledge (epistemology), identifies his values in judging this knowledge (axiology), and develops the research frameworks (research logic). All of these elements constitute the research's philosophical paradigm in approaching and dealing with the problem. In response, this chapter is structured as follows. The first section (3.2) ends by developing the researcher's critical realist paradigm for revealing the evidence on an untraditional way. The paradigm is translated into activities in section 3.3, to show what has been done to acquire this knowledge. It goes through five phases, containing three milestones (the mechanism to realise the benefits, the blueprint for realising the benefits, and the development and validation of a tool). In section 3.4, the research approaches used in these phases are explained. Afterwards, in section 3.5, the data analysis models used in this research are discussed, with their advantages, limitations and fitness for use (model and data specifications). Before the final chapter summary, it reflects on the values and measures taken in this research to confirm its quality.

## 3.2 Developing Research Paradigm

"Any research activity seeks valid knowledge" (Kanellis & Papadopoulos (2009)). Valid knowledge is sought through different approaches based on different philosophies (i.e. ways of understanding reality). Thus, a paradigm is a set of basic beliefs that constitute how one understands and explains the surrounding reality (Guba and Lincoln, 1994). Reality may be subjective, according to Kaplan and Duchon (1988), based on such different contextual factors as time and place. Others believe that it should be approached as objective and outside the researcher (Singleton and Straits, 2005). These differences in understanding reality, and understanding what is valid knowledge, has led to the founding of two classical research schools: Positivists and Interpretivists (Creswell and Clark, 2007). Recently, the critical realist school has emerged to form a bridge between them (Wynn and Williams, 2012). A summary of the differences between the main paradigms is shown in Table 3-1. This table is drawn from an analysis of the stream of research into research methodology and books (Guba and Lincoln, 1994; Tashakkori and Teddlie, 2008; Venkatesh et al., 2012; Creswell and Clark, 2007). According to this table, each paradigm may be defined as follows.

***Positivism*** is the research paradigm that believes in a single reality shared across the world. It is unknown by anyone. Therefore, reality is proposed and deduced from the literature. The literature review is used to develop a theoretical framework (i.e. deductive logic) for *explaining* the research problem. Once this framework is tested in an objective way (e.g. survey, experiment), it is called a model. Science is a set of verified relationships (called models). However, ***Interpretivism,*** another the research paradigm, believes in multiple realities. Each reality should be constructed in its context; that is why it is called social construction of reality. Reality is known not only by experts and consultants but every society. Indeed, it is known partly by the researcher who seeks to complete and understand what the expert knows. What the experts know collectively on one diagram is called a framework. Therefore, frameworks are used to *understand* what people call reality (i.e. inductive logic). A framework consists of a set of models devised to understand the research phenomena from different perspectives. Science consists of a set of models, which are abstractions of reality in a meaningful diagram to describe, investigate, and analyse the case under investigation.

***Pragmatic (Critical Realist)*** adopts a multiple “worldview” (Tashakkori and Teddlie, 2002) in which the positivist view and interpretive view of the world are combined in a single study either simultaneously or consequently (Venkatesh et al., 2012a). For instance, reality can be seen as single (positivist ontology) but knowledge is gained through in-depth analysis of certain cases (interpretivist epistemology) to be tested and verified in an objective way (positivist axiology) (Wynn and Williams, 2012).

Table 3-1: Comparison of four important paradigms used in the social and behavioural sciences; developed by the researcher

| Paradigm | Positivism | Post-positivism | Pragmatism (Critical Realist) | Constructivism |
|---|---|---|---|---|
| **Ontology** | Naïve realism (Single Reality) | Critical or transcendental realism Reality is different from country to country | Accept external reality. Choose explanations that best produce desired outcomes. | Relativism (Reality is different according to its context and the case under investigation) |
| **Knowledge Accumulation** | Accretion –" building blocks" adding to the "edifice of knowledge" – generalisations and cause-effect linkages | | Mixed | More informed sophisticated reconstructions ; vicarious experience |
| **Research Aim** | Explanation: prediction and control | | Critique and transformation; restitution and emancipation | Understanding |
| **Nature of knowledge** | Verified hypotheses established as facts or laws | | Structures/historical insights | Individual reconstructions coalescing around consensus |
| **Framework Definition** | A set of propositions between concepts to be tested objectively | | Mixed | Elements under investigation which are believed to describe, to abstract, and to set the boundary of the research problem and its constituting factors |
| **Model Definition** | A tested framework (the impact of parameters on the framework | | Mixed | Abstraction of reality; a subunit of the framework. |
| **Epistemology** | Objective point of view. Knower and known form a dualism testing the hypothesis | Modified dualism. Findings probably objectively "True." Testing Hypothesis | Both objective and subjective points of view<br><br>Mixed | Subjective point of view. Knower and known are inseparable .<br>Social construction of reality |
| **Logic** | Deductive From general to particular | Primarily Deductive | Deductive + Inductive Both | Inductive From particular to general |
| **Methods** | Quantitative | Primarily quantitative | Quantitative + Qualitative | Qualitative |
| **Goodness or quality of criteria** | Conventional benchmarks of "rigor": internal and external validity and objectivity | | Mixed | Trustworthiness and authenticity and misapprehensions |
| **Voice** | "Disinterested scientist" (third voice) | | "transformative intellectual" as advocate and activist | "Passionate participant" as facilitator of multi-voice construction |
| **Axiology** | Enquiry is value free | Enquiry involves values, but they may be controlled | Values play a large role in interpreting results | Enquiry is value bound. |

### 3.2.1 The ontological stance in research

Ontology asks how the research defines reality. In other words, it explains the nature of reality from the standpoint of the researcher (Kanellis and Papadopoulos, 2009). On the one hand, the positivist school believes that there is a single reality and it is external to the researcher. Therefore, the researcher should be objective in collecting and analysing these data. Objectivity is represented by using a questionnaire as a way of collecting data and analysing these data using statistics. Positivists are always interested in developing theories based on the verification of hypotheses (Bhattacherjee, 2012). A hypothesis is a relationship between two concepts. Therefore, positivists define theory as a validated relationship between concepts to explain phenomena (Singleton and Straits, 2005).

The Interpretivist school, for its part, believes that there is no single reality and that the researcher should be a part of a process of interpreting and understanding. Reality is different from context to context and from organisation to organisation. This ontology matters in understanding and studying cultures and organisation-based problems (Walsham, 2014; Walsham, 1995). However, in studying professions ruled by a set of international guidelines that govern how professionals should act and work (Scott, 2008), decisions may change. Believing that reality is pluralistic sometimes enables insightful and in-depth understanding to be attained. Nevertheless, it does not enable researchers to have a broader view and its ability to generalise and to conclude valid, bias-free conclusions is questionable (Stahl, 2014). The ontology of the present research accepts a single reality, but in interviewing experts it seeks to understand their context. Contrasts between them are taken into account so as to reach a unified model of understanding. This is typically aligned with the ontological stance of grounded theory authors (Birks and Mills, 2011; Glaser, 1978; Charmaz, 2006).

### 3.2.2 Epistemological stances in research

There are two main ways of gaining knowledge (i.e. two epistemological stances). The first way constructs reality in its context and accepts the social construction of reality because the researcher sets out to understand what is going on and "interpret" it on the basis of his experience, knowledge and background (Lee and Hubona, 2009; Walsham, 2006). This leads to the belief that subjectivity is inevitable (Stahl, 2014). The second way is called the positivist approach and is based on testing reality. Testing reality with no direct contact between the researcher and the knowledge is meant to ensure objectivity in the research (Singleton and Straits, 2005). Different epistemologies have different axiological implications (i.e. subjectivity versus objectivity).

### 3.2.3 Axiological stances in research

"Objectivity versus Subjectivity" has long been debated since interpretivists believe that there is no such thing as "objectivity" (Walsham, 2006; Stake, 1995). Human beings understand data and facts on the basis of their education and background. Nevertheless, positivists believe that the researcher must be objective and must not intervene in presenting the data. Presenting the data as numbers is the best way to be objective. Nevertheless, verbal and numerical data have their own pros and cons. From one side, human actors will never be able to interpret evidence without consciously or unconsciously using their background and knowledge. In the present case, the researcher works as a consultant and trainer and has a long history in project and benefits management and ERP systems.

On the other side, too much subjectivity may lead to the inability to differentiate between facts and opinions. Objectivity should be sought for the sake of differentiating between what the researcher knows from his experience, what he gains from interviewing experts and organisations, and what the "real" root causes of the problem are . Demarcation between facts and opinions is necessary for spotlighting the real causes of the research problem, which in the present enquiry is the variation in recouping ERP benefits between organisations. Thus, combining the two axiologies would be interesting for the sake of capturing and understanding the problem.

### 3.2.4 Research Logic

There are two traditional ways of developing theories. First, the deductive approach seeks to develop a theory from general evidence to particular applications. In other words, the theory is developed from the literature and then tested on a particular community or population. Second, the inductive approach seeks to develop the theory from empirical evidence (Bryman and Bell, 2015; Collis et al., 2003). The main flaw of the inductive approach is its attempt to develop a theory based on scanty evidence, which cannot be generalised since it has come from only a limited number of cases. However, the inductive approach works well with the interpretive paradigm (i.e. subjectivity, different realities and the social construction of reality) However, through the applicability and replicability of this research in other contexts and with regard to other cases, the results can be generalised.

Thus, unlike the deductive approach, which starts by forming a theoretical framework from the literature, the inductive approach starts with an open-minded approach and ends with a framework. The purpose of the framework, in interpretive research, is to diagram the mental models of the experts and consultants (Wieringa, 2009; Forrester, 1994). In other words, to map the factors and their interactions for understanding reality, researchers operationalise the experts' views in the form of diagrams (Checkland and Holwell, 1997). According to interpretive researchers, a framework consists of different models abstracted from reality in meaningful ways and the spotlighting of particular relevant aspects (Sterman, 2000; Peterson and Eberlein, 1994; Chunpir et al., 2014).

A new approach is currently used among modern researchers, called the abductive approach (Haig, 2005). This approach uses the literature to develop a theoretical framework from which a research and analysis methodology can be developed (Dubois and Gadde, 2002). In other words, the definition of a framework is similar to the hypothetico-deductive approach if it can be stated as a set of propositions developed from the literature (Haig, 2005). Nevertheless, the data enquiry is simply for testing the framework but also for enriching and expanding it (Dubois and Gadde, 2002). This is what happens in the present research; the literature is used to develop theoretical frameworks, helps to conceptualise new concepts, and is borrowed from to test the developed frameworks, the required operationalised concepts. The subsequent interviews and focus groups enrich and expand the framework. At the same time, the literature is also used to criticise the findings from the interviews. Finally, the hypotheses are tested in quantitative ways.

Although the abductive theory development approach cannot claim to generalise its framework because it usually makes its data enquiries from a few cases to enrich and to enhance the framework (Stahl, 2014), this research claims generalisability through of its way of testing the framework, because it uses the critical realist paradigm in such a way as to spotlight the use of a single reality mind-set with a positivist paradigm (using surveys to test hypotheses).

### 3.2.5 Formulating the Research Paradigm: the Critical Realist Paradigm

It is not necessary for a researcher to adopt a single paradigm in his research; the current trend of mixing paradigms seeks to improve the theory development process, increase the value and significance of the research and achieve a deeper verified understanding of reality (Rotaru et al., 2014). When the research paradigm is customised, the research is called pragmatic (Creswell and Clark, 2007). Others call it 'critical realist research' because it enables the researcher to criticise the fundamental realities that are held by a society (Modell, 2009; Tsang, 2013).

For instance, benefits management is perceived to be a panacea for IT projects. Many authors produce books on benefits management, and professional bodies are at present putting these principles into the industry standards (Jenner and APMG, 2014; Bradley, 2006; Axelos, 2011). Nonetheless, because researchers on benefits management are working as benefits management consultants and adopting subjective interpretive paradigms to study their specialism, it becomes hard for them to see the problem from a novel perspective (Ashurst et al., 2012; Ward and Daniel, 2006; Fukami and McCubbrey, 2011). Thus, the failure rate is still high. Indeed, the power of adopting these professional standards makes certain ideologies seem like absolute truth (Scott, 2008b; Scott, 2008a). Therefore, it seemed valid in the present research to criticise the reality in the minds of interviewees and criticise what was assumed by the contributors to the literature, in order to present a different and challenging point of view. Based on these premises, the findings from the interviews and criticisms in the literature review are used to develop hypotheses to be tested in a positivist way.

Figure 3-1 summarises the previous arguments and shows that the present research uses the critical realist paradigm in all its meanings. Critical realism is used as a way to use the interpretivist paradigm to construct reality as it is conceived in various cases and then to use the positivist paradigm to test and generalise the results (Venkatesh et al., 2012). Indeed, the researcher takes a sceptical attitude in gaining, validating, verifying and testing knowledge.

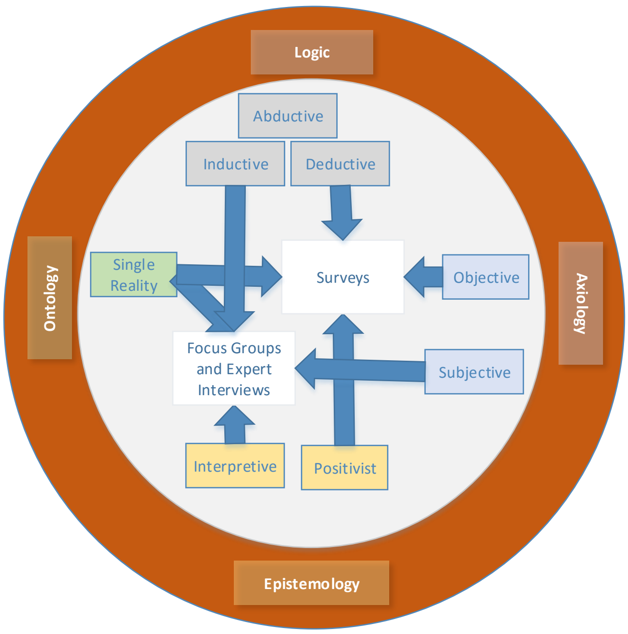



Figure 3-1: Research Paradigm

## 3.3 Research Design

As illustrated in Figure 3-2, this research has developed five frameworks (the pink boxes) using the literature, interviews and focus group. After testing these frameworks through a series of surveys, four models are produced (i.e. tested frameworks, the three blue boxes). This research went through five phases:

developing and testing mechanisms to deliver ERP projects in such a way that benefits were recouped; designing the blueprints required for recouping benefits (ERP orchestration framework); developing and testing a framework for realising the innovation benefits from ERP systems; developing and verifying an assessment tool to combine the latest frameworks; and validating all the research results.

### 3.3.1 Phase 1: the mechanism to Deliver ERP systems

The first phase in this research was to identify and define the ERP implementation mechanisms for recouping the ERP benefits. The literature review, including professional handbooks, was used to determine the mechanisms. A focus group with consultants from the UK, Denmark, and Australia was involved in the debate to address the reasons for the inability of IT projects to realise the expected benefits. Based on the results of these, as illustrated in Figure 3-2, face-to-face interviews were conducted to improve the framework.

The literature review was used to show that governance theories could help to remedy the weakness in current practices. Consequently, a new framework was developed to consider all the problems in studying the governance theories. This was called the Project Benefits Governance Framework. It was tested and then verified using a sample of 200 organisations with IT projects in general. However, when the framework was applied to ERP, it had to be customised to reflect the maturity of the implementation mechanisms in use (the project benefits governance framework). Therefore, after criticising the potential problems in using the current PBGF on ERP discussed in the literature (institutional theory), an institutionalised project benefits governance framework was developed. It was tested on a sample of 130 organisations.

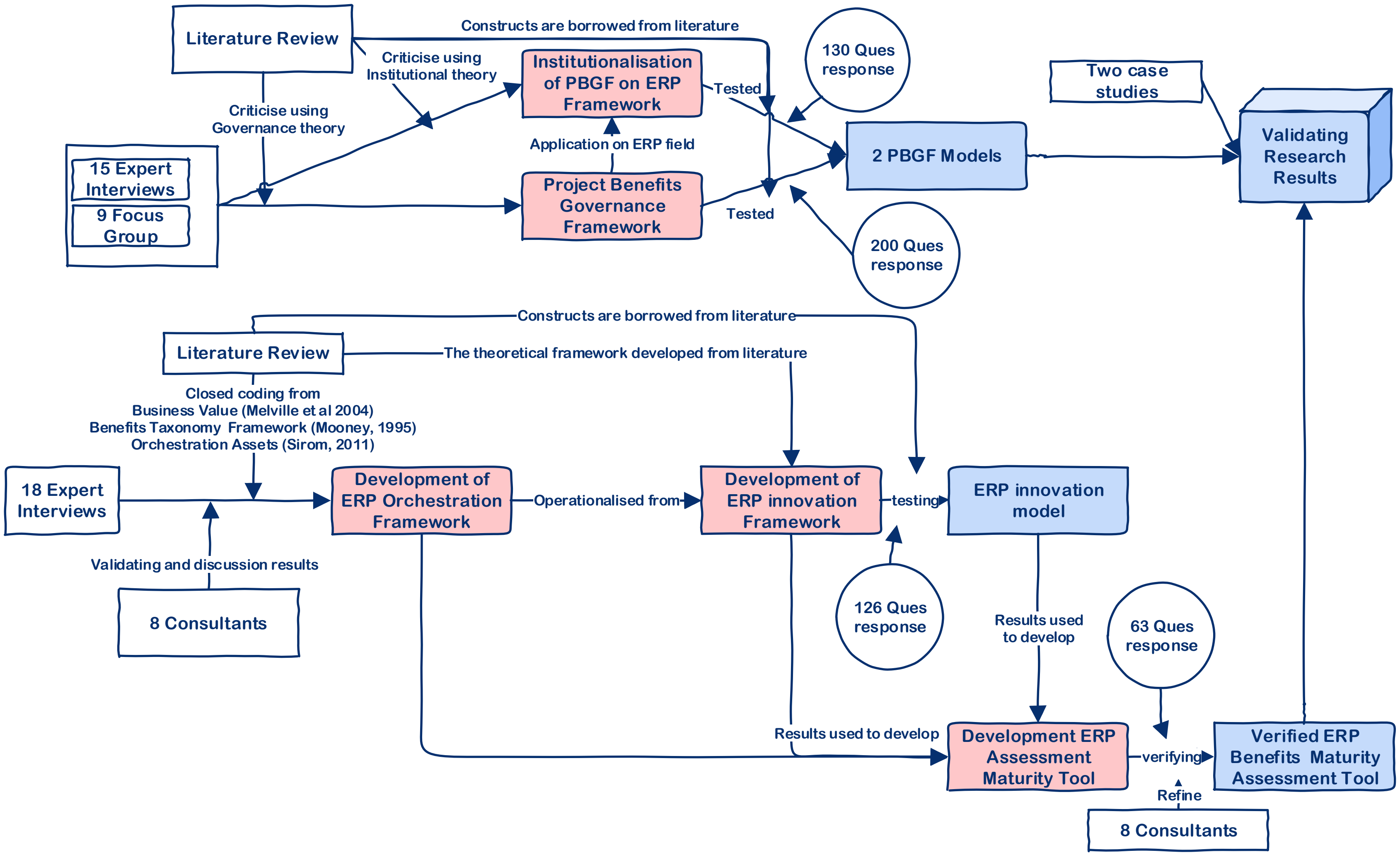



Figure 3-2: Research Design

### 3.3.2 Phase 2: ERP orchestration theory

Using snowball sampling and based on sampling saturation method, eighteen experts form thirteen organisations were interviewed before the blueprints required for ERP benefits were designed. The sampling saturation method is based on increasing the number of respondents until the theory development process is saturated (i.e. no additional knowledge gain from interviewing more cases) (Charmaz, 2006).The benefits are classified within Zuboff's (1985) framework, as improved by Mooney et al (1996) and applied to ERP by Uwizeyemungu and Raymond (2012); they are automating, planning, and innovating benefits. The framework by Melville et al (2004) is used to classify the factors leading to each group of benefits. Finally, for orchestrating the ERP resources to realise the ERP benefits efficiently and effectively, an asset orchestration framework is used (Sirmon et al, 2011). These frameworks were used to design the interview guide, to criticise what the participants said and believed in, and to analyse what they were saying. Finally, the results were presented and discussed with eight consultants to validate and improve the framework.

### 3.3.3 Phase 3: ERP innovation Framework

With the results of the previous phase in mind, the literature review is used to appropriate the relevant concepts to be used for measuring and testing whether ERP can lead to innovation benefits. This framework was tested in the 126 organisations.

### 3.3.4 Phase 4: ERP Maturity Assessment tool

This tool was developed within the ERP orchestration and ERP innovation frameworks. However, because there were more items than could be used in measuring the organisation's ability to realise ERP benefits, interviews with consultants were used to narrow down the number of items and enhance the wording used. Next, the tool was distributed to a sample of organisations around the world using LinkedIn and a purchased database of organisations deploying the ERP system. 63 organisations acknowledged having the tool and were assessed by it. The results allowed the tool to be verified.

### 3.3.5 Phase 5: Validating Research Results

The research result was validated by means of two case studies, in which the organisations were assessed. Prescriptions based on the institutionalised Project Benefits Governance Framework (PBGF) were given. Some of them have been implemented and the results reported, while the implementation of others was agreed upon.

## 3.4 Research Approach

Research approaches can be classified into case studies and field studies, based on their ontological stance; do they assume a single reality or plural realities? On the one hand, case studies mainly study single cases in context so as to understand what seems real to the people living in the case. Case study research does not take organisations only as the unit of analysis; cases can be individuals or countries (Yin, 2008; Stake, 1995). On the other hand, field studies are those which aim to generalise from a representative and relatively large number of participants.

Field studies come mainly in the form of survey research. However, they can also draw on interviews. They may do so only if the aim is to generalise and it is believed that the differences between the respondents are owed not to their context but to the various actions and behaviours followed. In other words, ERP is the same all over the world. The same brands may be found in Egypt, the UK, the US and Saudi Arabia. Furthermore, the certificates governing professional behaviours, such as PMP, PRINCE 2, SAP certificates and Oracle Certificates, are global. This is not to claim that no differences exist between companies in different parts of the world.

Nevertheless, this research is not interested in studying particular cultural or social perspectives. It focuses on certain professional practices governed by certain professional institutes. Therefore, a single reality in the interviewees is assumed. Three approaches are used in sequence. Narrative enquiry, the analysis of stories from experts' experience, is used for enriching and expanding the research frameworks. Surveys are used to test these frameworks. Case studies are used for validating the research results.

### 3.4.1 Narrative Enquiry - to enrich, modify and refine

Narrative enquiry is the analysis of stories from experts (Clandinin and Connelly, 2000). Indeed, narrative enquiry is used more in studying personal life histories and is used more in psychological studies (Clandinin, 2006). However, it is used in this research to analyse the experience of experts in the form of stories. Narrative enquiry is different from normal or traditional interviews. Whereas traditional interviews aim to understand the experience of the interviewee at a particular juncture, expert interviews are mainly held to air stories from the interviewees and learn how they dealt with experiences in different contexts (Kvale and Brinkmann, 2009; Seidman, 2013). The problem of seeking reliable evidence from interviews by asking a question such as "What are the benefits of ERP?" is that there is a difference between what is perceived and what is conceived. According to the Oxford definition, "perceive" is "to become aware of, see, or notice" but "conceive" is "to form (an idea, etc.) in the mind, think". Although perception is a sensory experience of something that is formed on the basis of the current "interpretation" of reality, conception is what remains in the mind regardless of the other dimensions or other definitions of reality (Kanellis and Papadopoulos, 2009). Therefore, interviews alone are not sufficient to capture valid knowledge from expert respondents.

In such interviewees, the researcher distinguished what they believed in "without having real evidence and stories they believed in" from the experience that they lived and felt. For instance, the use of a benefits audit was addressed by only one interviewee. However, others ranged between 'do not know it' and knowing and valuing the idea but not having adopted it before. Differentiating between what is real in terms of personal experience and what is real according to external sources such as courses, books or advertisements is important if one wants to get the “truth” from a validated experience.

Grounded theory approach, as identified in **Error! Reference source not found.**, is embedded in this study by continuously contrasting respondents with one another. Furthermore, the interviews were iterative. In other words, the interview took place on more than one occasion. The reason for doing this was to discover what is done by other experts and contrast it with the practice of the expert being interviewed at the time. Expert interviewees were used in developing a project benefits governance framework, developing an orchestration framework, and refining the tool. On average, an interview took between 2 and 6 hours occupying several sessions. Expert interviews are interviews with knowledgeable people who have relevant experience of the subject under investigation.

The sampling of experts and professionals in the whole thesis is based on their experience in the subject (i.e. ERP, project management and benefits management). Furthermore, due to the difficulty to get the access to them, the snowball sampling is used by asking experts to refer me to other experts. Finally, grounded theory sampling technique is used. The grounded theory sampling technique is based on theoretical sampling (Charmaz, 2006). In other words, once the new expert gives no more value than what is already available to the researcher, the recruiting process for new interviewees stop.

Furthermore, the selection process has another criterion to avoid the problem of nationalities, countries specific contexts and the differences between developing and developed countries. All experts have international and work experience at least for three years outside their home country. It is intended to do so to have global views from international experts, who used to work in multi-ethnic cultures. This is because the research ontology is mainly “single reality” as illustrated in section 3.2.1.

### 3.4.2 Survey Research – to test

Positivist research approaches are those strategies that enable the researcher to be objective and to generalise results (De Vaus, 2013; Field, 2013). Furthermore, they help the researcher to test a well-defined theoretical framework developed from the literature (Singleton and Straits, 2005). The most common approach meeting these criteria is survey research (Bhattacherjee, 2012). It is designed from a reading of the literature and operationalised to reflect different concepts.

It avoids subjectivity because, first, it is remotely administered. In other words, the researcher does not influence the results. Second, the ontological stance towards external reality is reflected in the belief that respondents do not know it; so that the questions are used to measure simple practices. In other words, the question is not phrased as "Do you believe that organisations are able to innovate because of ERP?". However, two questions probed in order to find a relationship: "Does your organisation innovate using ERP" and "do you have sponsors for innovations?" The second question is about practices. By such operationalisation (converting concepts into measurable items), reality may be grasped.

Because positivists believe in a single reality, the same questionnaire was distributed globally. However, the sample was consistent in terms of selecting people who filled specific roles to answer the questionnaires.

#### 3.4.2.1 Questionnaire Design

All the questionnaires used in this research, including the tool design, were built to the same design. Concepts were operationalised into a set of items ranging from three to five questions (Bhattacherjee, 2012). As far as possible, the concepts were derived from the literature to ensure their theoretical validity. All the questions had measurable answers using a five-point scale. Standardising scales were set to avoid any adjustments that might lead to distorted results (Field, 2013). To tell the truth, a seven-point scale would have been more helpful in studying interactions. Nevertheless, the respondents found even a five-point calibration difficult and time-consuming, in particular because the questionnaires were long in any case. Thus, this research used a five-point scale as standard.

#### 3.4.2.2 Sampling techniques

Sampling is the process of selecting representative cases from the population (Collis et al., 2003; Saunders et al., 2011). The sample can be random, stratified, convenience, or snowball in character. Indeed, because of the difficulty of recruiting respondents, snowball, and convenience sampling were selected, using electronic groups such as LinkedIn, Facebook, and databases purchased from marketing research companies.

#### 3.4.2.3 Sample size

The sample size was based on the aim of the analysis. For a descriptive analysis such as mean, mode, and median, more than thirty cases would be sufficient for a normal distribution curve (Field, 2013) . However, for regression analysis, when the need is to test relationships between different parameters in a single model, the sample size is determined by the number of parameters. In this variable sampling technique, each parameter needs thirty cases to enable the validity and reliability of the construct to be assessed (Velicer and Fava, 1998).

However, “more than 100” is considered a reasonable size. From 100 to 200 is considered acceptable, and more than 200 is considered a large sample (Kline, 2005). In the case of SEM, the sample size is reflected in the Comparative Fitness Index (CFI). As long as the CFI is accepted, the sample size is accepted, but a sample of fewer than 100 is never accepted (Kline, 2005). Indeed, SEM usually needs a larger sample than traditional multivariate models do (e.g. regression, ANOVA, multiple regression) because SEM uses algorithms that are more advanced (Hair et al., 2006).

### 3.4.3 Case Study Research – To validate

Case study research comes in three forms: positivist (testing theoretical framework) (Yin, 2008), interpretivist (understanding phenomena) (Stake, 1995; Walsham, 1995) and pragmatic (Tsang, 2013; Wynn and Williams, 2012; Kaplan and Duchon, 1988). Since the aim of the case studies conducted in this research was to validate the research findings, the studies came close to being pragmatic case studies whose aim was to intervene in something and see the results. The technique could not have been put forward as action research because action research is based on understanding a situation ‘‘as-is, designing the tool, intervening, analysing the results, and comparing them with what was expected (Bradbury and Reason, 2001; Brydon-Miller et al., 2003).

The tool, in fact, was designed by other organisations and developed from theirs and the solution was designed by another organisation. The aim in the present research was to only intervene and see what would happen. The validation was based on the results, and the way in which those involved in the cases perceived the results or the proposed solution. Two cases were selected, one in Ireland and the other in Egypt. Both similarly produce and sell Fast Manufacturing Consumer Goods (FMCG). The assessment was made by means of a questionnaire to middle level managers, results were reported, and recovery strategies were suggested from within the Project Benefits Governance Framework (PBGF), as set out in Figure 3-3. Some of these strategies succeeded on application, while others were agreed on but not followed up because they were implemented beyond the timeframe of the present thesis.

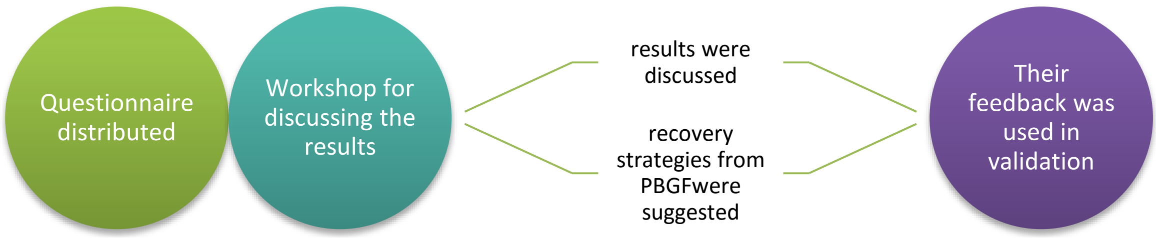



Figure 3-3: Case study design

## 3.5 Data Analysis Tools

### 3.5.1 Qualitative Data Analysis

Qualitative data were used in this research for developing the Project Benefits Governance Framework (Chapter 4), in adapting it to ERP systems (Chapter 4) and for developing the ERP orchestration framework (Chapter 6). Because this research adopts the abductive approach, the codes are mainly identified from the literature (Alhojailan, 2012). The three coding approaches worked together (Glaser, 1992; Glaser and Strauss, 1967). Pre-defined (sometimes called closed) coding searches for something already known, using theory developed from literature as a sensitising tool. In this research, the framework of Melville et al (2004) was used as the theoretical framework for coding the interviews so as to identify how ERP can create value for an organisation. Furthermore, an assets orchestration framework (Sirmon et al., 2011) was used to code the process of moving from one group of benefits to another by investing in different technologies. Finally, an IT impacts framework developed by Zuboff (1985) and applied to ERP (Uwizeyemungu and Raymond, 2012) was used for coding the ERP benefits.

Unlike closed coding, which is applied to the literature, open coding seeks to understand new themes. For instance, in Chapter 4, asking why IT projects fail, themes emerge composed of what experts claim and believe in.  In the online focus group, “likes” are used in weighing the importance of opinions. Furthermore, new debates are introduced that turn the conversation in new and useful directions, such as the merits of “Rolling wave programmes” and whether “benefits management should be in a process or in a project” Finally, axial coding connects the data between codes (Charmaz, 2006). Open and axial coding is used to discover new patterns and develop the theory.

However, the refinement of the tool described in Chapter 8 did not need advanced qualitative analysis as its developing frameworks, because the experts’ advice was taken into consideration to improve the wording and narrow down the number of sentences based on their collective view, i.e. the items that most of them perceived to be less important were removed. In the same vein, the validation process of the research results in Chapter 9 was straightforward. In other words, the assessment was done, the reports were handed out, and the suggested solution was discussed in the workshops. Positive and negative feedback was reported as described in the validation chapter.

### 3.5.2 Quantitative Data Analysis

Quantitative analysis ranges from descriptive analysis in the tool, unstructured multivariate analysis in verifying the tool and testing the interactions between factors to structured equation modelling for the testing frameworks.

#### 3.5.2.1 Unstructured Multivariate Analysis

Correlational analysis and regression were used to find and test the relationships between concepts in sequence (Field, 2013). Correlational analysis was used in all the quantitative analysis chapters (5, 7, 8, and 9) to discover the relationships between concepts. Regression analysis was used in Chapter 8 to test the impact of each factor (as proposed in Chapter 6) on ERP benefits. Indeed, for multiple regression analysis, five assumptions are held as valid (Field, 2013; Hair et al., 2006; Aiken et al., 1991).

First, the relationship between the dependent and independent should be linear. Second, multivariate normality should be implicit. Third, there should be little or no multicollinearity between the dependent variables. Fourth, there should be no auto-correlation between the dependent and independent variables. Finally, homoscedasticity is assured (the error level is constant for independent variables).

All these assumptions were found to be valid except that of multi-collinearity. Multi-collinearity is a statistical inferential problem when the independent variables have mutual impacts that exaggerate the impact on the dependent variable (Hair et al., 1998). Therefore, Structure Equation Modelling was used to overcome the problems of multicollinearity (Howell, 2007) (in which inflated results occur due to the correlation between the dependent variables) and of the correlation between dependent variables (Hu and Bentler, 1999). It must be admitted that multi-collinearity was found in all models. Therefore, Structure Equation Modelling (SEM) was used. However, SEM, as discussed below, needs at least 100 samples. Therefore, simple regression was used in verifying the relationships between the tool's independent factors (the proposed items) and the benefits.

#### 3.5.2.2 Structured Analysis (Structured Equation Modelling)

Structure Equation Modelling (SEM), sometimes called Covariance Structure Analysis and latent variable analysis, is a statistical methodology that uses a confirmatory approach to data analysis using a structural theory (Byrne, 2013). SEM is preferred to other statistical models such as regression, multiple regression, and ANOVA. First, it overcomes the problem of multi-collinearity between concepts. Second, SEM has the ability to symbolise both the measured (observed) and latent (unobserved) variables in the relationships. Third, it corrects for measurement error in the estimation process (Hooper et al., 2008). Fourth, it enables researchers to measure and isolate the direct and indirect impacts between variables (Hoyle and Smith, 1994).

## 3.6 Research Quality

Because positivist objective quantitative research implies other research values than interpretivist subject qualitative research does, the quality criteria for each are different.

### 3.6.1 Positivist Research Quality Criteria

There are three types of quality: the quality of the research design (design validity), quality of the tool(s) used (measurement validity) and the quality of results from the data analysis model (inferential validity) (Venkatesh et al, 2013).

#### 3.6.1.1 Quality of designing the research

The quality of the research design stemmed from the positivist paradigm and underpinned two different values, namely, objectivity and generalisability (also called external validity) (Bhattacherjee, 2012). Objectivity and generalisability were assured by using a self-administered questionnaire in different organisations in different countries. Furthermore, to add to the objectivity, a random sample of the practitioners who are familiar with the research objectives was chosen. The following sections spotlight the quality of the tool used, based on the reliability and validity of the tool, and the quality of the analytical models (i.e. their fitness).

#### 3.6.1.2 Quality of tool used

A data collection tool should be known as reliable and valid before being used. The following tests are used for all questionnaires. Furthermore, they are used in testing the reliability and validity of ERP benefits maturity tool, as aspects of its quality. As summarised in Table 3-2, the tests used in the present research were Cronbach's alpha for the construct's reliability and factor analysis for its validity.

Table 3-2: summary of the quality testing tools of the construct

| Criteria | Testing model | Cut off points |
|---|---|---|
| **Construct's reliability** | Cronbach's Alpha | More than 0.7 |
| **Construct's Validity (Exploratory Factor Analysis)** | Factor Analysis | Factor Loads more than 0.7 |

The next subsections detail and explain these tests and other qualitative measures for ensuring the validity of the quantitative data collection tool (questionnaires in the testing frameworks and the ERP assessment tool).

##### 3.6.1.2.1 Tool Validity

Validity in positivist research means that the instrument (i.e. the questionnaire and its contents) measures what is intended to measure (Peter, 1979). Construct validity refers to ensuring that items used to measure a certain construct are different and that none of these items is more associated with another group of items for a different scale (construct). Thus, there are two main types of validity test: of content validity (of the questionnaire) and of construct validity (i.e. of the items constituting the constructs). This research claims two types of validity: face and convergent validity.

Face validity, also called content validity, is tested to ensure that the dimensions of a concept have been described (Sekaran & Bougie, 2010). In other words, project investment success is best measured by three questions only. Likewise, in developing and validating the tool, the questions used are the best ones, from the experts' point of view, to describe the constructs,. This validity is not assessed quantitatively; at the end of the day, it is the opinions of the experts and the researcher that matter (Zhang, 2000). However, the literature review is used, as far as it can be, to ensure that the words used in the questionnaires have been used before in similar ways. For instance, the measures of product innovation, organisation flexibility, and investment success are borrowed from the literature.

Nevertheless, other measures which are created and conceptualised by this research have been validated from the content perspective by involving experts in the wording and use of the questions, as shown in Chapter 9 on the developing and filtering of the items used in the tool. Quantitatively, convergent validity is the extent to which the multiple measures of a construct are associated with each other (Bhattacherjee, 2012). The validity of constructs is tested through dimension reduction analysis. Exploratory Factor Analysis (EFA) proceeds by reduction analysis with Factor Analysis Varimax rotation methods with an Eigen value of one using SPSS V.12 (Field, 2013). This analysis was used in this research not only to validate constructs but also to refine and reduce the number of items used in the ERP Benefits maturity tool assessment.

##### 3.6.1.2.2 Tool Reliability

Because constructs are measured using a list of items, these items need to be associated with each other to reflect reliability. The work on defining, identifying, and measuring the construct reliability goes back to the 1900s and the work of Spearman (Peter, 1979). Construct reliability is understood as follows: "Measurements are reliable to the extent that they are repeatable and that any random influence which tends to make measurements different from occasion to occasion is a source of measurement error" Nunnally (1967). In other words, construct reliability is recognized as the consistency between its items, stability in the measurement of them and dependability among them with which an instrument measures a set of dimensions (Field, 2013).

In order to measure the reliability of the constructs used, two approaches can be taken: the test-retest method and the internal consistency method (Bhattacherjee, 2012). The first is based on the measuring the degree of similarity between the responses for an individual at two different points in time. However, this reliability would have been too difficult to conduct in the present research because it is not easy to send the same questionnaire twice to an expert whose time is scarce and valuable.

The second method is more practical and useful. In the internal consistency method, the measurements scale is applied to the cases at some point in time and the items constituting the scale are intensively correlated (Peter, 1979). To measure the internal association between the items constituting the scale for measuring the construct, Cronbach’s alpha is used (Cronbach, 1951; Cronbach and Meehl, 1955). Indeed, Cronbach alpha was used to assure the quality of one of most cited tools in marketing, the SERVQUAL (Parasuraman et al., 1991; Parasuraman et al., 1988; Fukey et al., 2014).

#### 3.6.1.3 Quality of the inferential model

This research used SEM four times: twice in Chapter 5 and twice in Chapter 7, as illustrated in Table 3-3. The model fitness for these models was ensured and they had been found valid and reliable. In order to ensure that the results of the model were valid and reliable, Goodness-of Fit criteria had to be deployed. There were several perspectives from which to assess the fit of the model (Hair et al., 1998).

First, overall fit (absolute fit) measures were used to assess the degree to which the overall model and the structural and measurement models fitted the sample data. Chi-Square per Degree of Freedom ($x^2/df$ ) Goodness-of-fit index (GFI) and Root Mean Square Effort of Approximation (RMSEA) were used to measure the absolute overall fit of the model in the present research. All The Chi-Square per Degree of Freedom ($x^2/df$ ) were lower than the cut-off points of 2.0 (Byrne, 1989) and 5.0 (Marsh and Hocevar, 1985), as accepted in the literature. All the GFI were higher than the 0.9 that indicates a good fit of the sample data (Hair et al., 1998). In addition, the RAMSEA were lower than 0.05. This was a good indicator, since it is accepted in the literature that below 0.1 is acceptable, from .08 to 0.05 is to be recommended and less than 0.05 is the best (Browne et al., 1993).

Second, incremental fit measures were used to compare the proposed model with the baseline model. The Adjusted Group Fitness Index (AGFI), the Tucker-Lewis Index (TLI), Normed Fit Index (NFI) and Comparative Fit Index (CFI) were the indicators used for measuring the incremental impact of the model which assumed zero population covariance between the observed values (the baseline model). Indeed, all the measures indicated that this model was significant in relation to the baseline model, because the AGFI, TLI, NFI and CFI were more than 0.9 (Hu and Bentler, 1999).

Third, parsimony measures (model parsimony) were used to assess whether the model fit had been achieved by over-fitting the data with too many coefficients. Indicators were adjusted from previous indicators, such as NFI, GFI and CFI, to consider the parsimony (P) of the model. All the adjusted indicators, PGFI, PCFI, PNFI were higher than 0.5, which indicated a parsimonious fit (James et al., 1982; Hu and Bentler, 1999).

**Table 3-3: Assuring the quality of the SEM results**

| Quality Dimension | Criteria | Measure | Tested Frameworks using SEM | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | Cut-off-point |
| **Absolute Fit** | The general fitness model relative to degree of freedom | Model Chi-square/df | 1.32 | .952 | .985 | 1.10 | Less than 5.0 is accepted |
| | Overall degree of fitness: the good fit of the sample data | Goodness-of-fit index (GFI) | .961 | .912 | .929 | .918 | More than 0.9 indicated |
| | Measures the error of approximation (population based index) | Steiger-Lind root means the square of approximation (RMSEA) | .40 | .00 | .00 | .029 | Less than 0.1 is accepted |
| | Measures the mean absolute value of the covariance residuals | Standardized root means a square residual (SRMR) | .053 | .069 | .069 | .068 | Less than 0.1 is accepted |
| **Incremental fit** | Adjusts the GFI | AGFI | .928 | .87 | .90 | .90 | Greater than 0.8 indicates a good fit |
| | Incremental fit indices over the null model – assuming zero population covariance among the observed values | Tucker-Lewis Index (TLI) | .978 | 1.01 | 1.00 | | |
| | | Normed Fit Index (NFI) | .945 | 0.9 | .949 | .925 | |
| | | Bentler Comparative fit Index (CFI) | .986 | 1 | 1.00 | .993 | |
| **Parsimony** | Diagnosing whether model fit has been achieved by over-fitting the data with too many coefficients | PGFI | .524 | .772 | .573 | .612 | Range from 0 to 1.0. Higher is better |
| | | PNFI | .618 | .69 | .67 | .71 | |
| | | PGI | .645 | .63 | .655 | .762 | |

1 testing Project Benefits Governance Framework on IT success (Figure 5-4)
2 testing Project benefits governance framework on ERP success after considering institutional perspectives (Figure 5-7)
3 testing the impact of ERP on innovation mediated by knowledge share and use of data analytics (Figure 7-3)
4 testing the impact of ERP on innovation mediated by organisational flexibility and knowledge share (Figure 7-7)

### 3.6.2 Interpretive Research Quality Criteria

Interpretive research quality criteria are widely different from those in positivist quantitative research. The main criteria for assessing the interpretive research quality are credibility, transferability, and confirmability (Merriam, 2014; Anderson, 2010).

Interpretive researchers believe in subjectivity and they do not claim to be as objective as positivists are. Indeed, their self-reflexivity about subjective values, biases, and inclination of the researchers are much valued and seen as part of the “sincerity” which is seen to be a criterion of good qualitative research (Tracy, 2010). This research spotlighted several quotations from experts, which are perceived by the researcher to mark turning points, and could affect the of theory development. The researcher used his experience as a consultant and as a trainer to interpret and understand the critical issues faced by the experts and consultants who were his interviewees. However, too much subjectivity could affect the process of theory development. Thus, “confirmability” requires tracking all or most of the interpretations of the evidence gathered (i.e. quotations).

Interpretive research seeks to be credible by contrasting the findings with those in the literature (Halldorsson and Aastrup, 2003). The research credibility is ensured by the researcher’s repeatedly contrasting the findings with those in the literature in the analysis chapters and in the discussion chapter. Furthermore, the internal validity, the match between what researchers interpret from the views of the participants and what they really see (Venkatesh et al, 2013), is ensured by sending parts of the analysis chapters to them in order to listen to their feedback. Furthermore, all the material that emerged from this research was sent to the participants before it was published them. Finally, part of the validation chapter was devoted to validating the research findings by applying them to be encapsulated in the assessment tool and discovering tactics to cure points of weakness.

Triangulating the research findings with subsequent research using different methods, methodologies and paradigms is believed to have improved the research value and significance (Creswell and Clark, 2007). This is one of best characteristics of pragmatic mixed research.

## 3.7 Chapter Summary

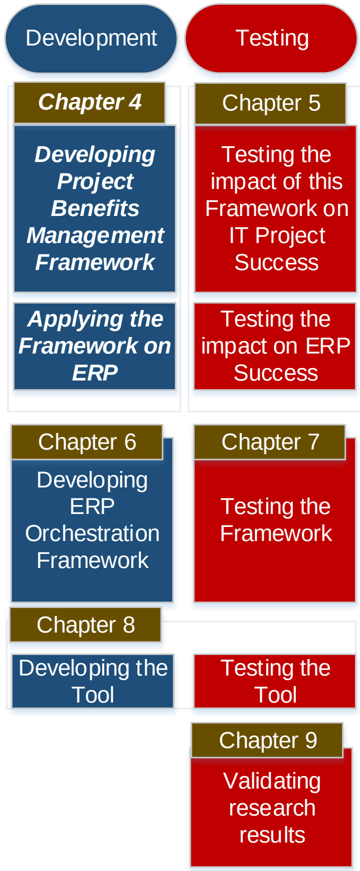
The chapter is summarised in Table 3-4. The research as a whole adopts the critical realist paradigm. A mixed research approach was selected from narrative enquiry, case studies, and survey research. Different quality criteria were used in testing the quality of this research. After developing each framework using the abductive approach, survey research was used to test and generalise the results.

In line with this methodology, the following chapters are classified into development chapters (Chapter 4 and Chapter 6), chapters of testing (Chapters 5 and 7) and one chapter for developing the ERP assessment tool and verifying it (Chapter 8). Finally, Chapter 9 sets out to validate all the research results by conducting a pair of pragmatic case studies.

Table 3-4: Summary of research methodology chapter

<table>
<tr><th></th><th>What</th><th>Method</th><th>How</th><th>Analysis</th><th>Quality Criteria</th><th>Quality Assurance</th></tr>
<tr><td>1</td><td>Developing Project Benefits Governance Framework</td><td>Focus Group<br>Expert interviews</td><td>8 experts<br>15 Experts</td><td>Mixed Coding</td><td>Verification, Credibility<br>Trustworthiness,<br>Applicability</td><td>Project Management Framework (PMI, 2013)<br>Managing Successful Programmes (Axelos, 2011)<br>Managing Benefits (Jenner & Axelos, 2014)</td></tr>
<tr><td rowspan="7">2</td><td rowspan="7">Testing the Framework</td><td rowspan="7">Survey</td><td rowspan="7">Sample of 200 (on IT projects)<br><br>Sample of 130 (using Institutional theory for adopting the framework on ERP)</td><td rowspan="2">Building Constructs</td><td>Reliability</td><td>Cronbach’s Alpha</td></tr>
<tr><td>Validity</td><td>Factor Analysis</td></tr>
<tr><td rowspan="5">Structure Equation Modelling (SEM)</td><td>Fitness</td><td>Model Chi-square/df<br>Goodness of fit index (GFI)<br>Steiger-Lind root mean square of approximation (RMSEA)<br>Standardized Root Mean Square Residual (SRMR)</td></tr>
<tr><td>Incremental Fit</td><td>Adjusts GFI<br>Tucker-Lewis Index (TLI)<br>Normed Fit Index (NFI)<br>Bentler Comparative Fit Index (CFI)</td></tr>
<tr><td>Parsimony</td><td>Parsimony Group Fitness Index (PGFI)<br>Parsimony Comparative Fitness Index (PCFI)<br>Parsimony Normed Fit Index (PNFI)</td></tr>
<tr><td>Significance of relations</td><td>Critical Ratio and P value</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>3</td><td>Developing ERP Orchestration Framework</td><td>Expert Interviews</td><td>18 experts, validate by 8 ERP consultants</td><td>Mixed Coding</td><td>Validation<br>Verification</td><td>Asset Orchestration Framework (Sirmon, 2011)<br>Business Value Model (Melville et al, 2004)<br>ERP benefits taxonomy (Uwizeyemungu et al 2011, 12, 13)</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Testing ERP Innovation Framework</td><td rowspan="2">Survey</td><td rowspan="2">Sample of 126</td><td>SEM</td><td colspan="2">The same quality criteria used in raw 2</td></tr>
<tr><td>Interaction Analysis</td><td>Model accuracy to test relationships</td><td>Model Significance (t and P value)</td></tr>
<tr><td>5</td><td>Refining the ERP Assessment Tool</td><td>Expert interviews</td><td>8 experts</td><td>Prioritizing</td><td>Validation</td><td>Experts review and accept on statements used in measurement and their words.</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Testing the Tool</td><td rowspan="2">Survey</td><td rowspan="2">Sample of 63</td><td>Building Constructs</td><td>Validity and Reliability tests</td><td>Cronbach’s’ alpha and Factor Analysis</td></tr>
<tr><td>Regression Analysis</td><td>Model accuracy to test relationships</td><td>Model Significance (t and P value)</td></tr>
<tr><td>7</td><td>Validating the tool</td><td>Case Study</td><td>2 Case Studies</td><td colspan="3">Assessment, followed by proposing strategies and feedback is received and documented</td></tr>
</table>

# 4 Chapter Four: Developing Project Benefits Governance Framework




## 4.1 Introduction

An Information Systems project needs two complementary actions: deployment of the technology and organisational change to absorb this technology. On the one hand, project management aims to carry out deliverables as outputs (i.e. the technology deployment) (OGC, 2009). But delivering a "specification-led" output such as an IT artefact of acceptable service level quality presents different challenges from those of the "business transformation" required to absorb this output (OGC, 2011). In carrying out "specification-led" outputs, the challenges mainly relate to delivering action of the required scope on time and within budget while taking account of the risks of implementation. In contrast, the main challenges of "business transformation" outcomes are the people who should be changed and the governance themes required to deliver this change.

Since coherent governance is one of the factors in realizing the benefits from IT investment (Doherty et al., 2011), the responsibility for managing change and/or recouping the benefits should be addressed because the project manager has only a certain scope for delivering the output (OGC, 2011; Zwikael and Smyrk, 2011; Too and Weaver, 2014). It is not clearly known from the literature how authorities' responsibilities and accountabilities are allocated in such a way as to manage interactions between them to increase the probability of IT success.

Thus, the first aim of the present research is to understand the project management (PM) and benefits management (BM) adopted by experts with a view to bridging the distance between PM and BM in a single governance framework. To this end, first, BM and PM practices and logics (values) are presented; and second, the project benefits governance framework is developed on the basis of the distinction between them, once this is understood.

ERP demands special attention in implementing such a framework for the sake of improving the probability of success. As examined in the literature review chapter, project management alone is found to have mixed results; some studies have evidence to support the impact of PM on ERP success while others have found no relationship. The same applies to the impact of BM. However, it is not known what would happen if project management (PM) and benefits management (BM) were both used at the same time, What would happen if an organisation used PM and BM in a professional way; not confining itself to the basic principles of these approaches?

The chapter structure is as follows. After introducing the chapter and detailing its methodology, the findings are presented in three main sections: understanding current project management practices, criticizing these practices to develop a project benefits governance framework, and applying this framework to ERP. The idea of this chapter is built on understanding who the various actors are and how they work together in the same implementation vehicle. Next, the ability and inability of each actor is discussed. Once these are understood, the development process starts by analysing how these actors can be integrated to compensate for one another's weaknesses. Consequently, governance documents are presented by which to control their behaviours so that benefits can be guaranteed. The focus then changes, moving to the ERP and its challenges to apply the framework as it emerges. Thus, the components of the framework are discussed and developed until the end of the chapter, by which time the institutionalization of the project benefits governance framework has been developed.

## 4.2 Research Methods

This research chapter uses a qualitative approach for understanding and criticizing the PM and BM practices in depth. Two concurrent data collection methods were used: an online focus group and interviews.

### 4.2.1 Online Focus Group Design

This aim of this focus group was to investigate and understand the practices used in benefit management. A virtual focus group is used instead of a traditional focus group because benefit management experts are distributed geographically (Bloor et al., 2001), as illustrated in Table 4-1. This indicates the impossibility of bringing them physically together. The investigation considers factors that may be relevant to benefits realization, such as Benefit Governance, Benefit Management, Accountability, and Responsibilities.

The online focus group was based on a LinkedIn professional group (the official group of Managing Benefits Certificate holders that is administered by the APMG Benefits Management Author). All the participants had long experience (more than 20 years) in managing IT transformational projects and programmes. The questions were addressed and the respondents answered them in debating mode. The role of the researcher was to follow the debate carefully and to put the questions that directed the conversation towards meaningful results.

Table 4-1: Expert Focus Group Participants

| Code[1] | Expert Position | Experience | Country |
|---|---|---|---|
| **F1** | Managing Director of Business Consulting Group (Transformation Programmes) | 30 years | UK |
| **F2** | Founder of Value Management Consulting Group | 40 years | Australia |
| **F3** | Principal Consultant and Visiting Lecturer at Business School (Project Management and Agile) | 20 years | UK |
| **F4** | CEO of a consulting organisation in Benefits Management and the value management of transformational projects | 40 years | UK |
| **F5** | Director of the Project Management Consulting Group | 20 years | UK |
| **F6** | Associate Consultant at a Global Consulting organisation | 25 Years | Denmark |
| **F7** | Director of a Consulting organisation specialized in transformation projects and programmes | 27 Years | UK |
| **F8** | Senior Project Manager and Business Analyst at a Governmental Organisation | 20 Years | Australia |

[1] Expert name code

### 4.2.2 Interviews

The interviews, as illustrated in Table 4-2, were with fifteen IT senior managers and consultants in several countries: Egypt, Saudi Arabia, Kuwait, and the UK. The aim of these interviews was mainly to help criticize the current state and develop a new governance for project benefits, with the support of the professional handbooks published by the Project Management Institute (PMI) and the UK Office of Government and Commerce (OGC).

Table 4-2: List of Interviewees

| Code | Expert Position | Experience | Country |
|---|---|---|---|
| **EE1** | Founder of ERP Local company | >20 years | Egypt |
| **EE2** | ERP Implementation Consultant | 8 years | Egypt |
| **EE3** | ERP MM Food Industry | 7 years | Egypt |
| **EE4** | ERP MM Pharmaceutical Industry | 8 years | Egypt |
| **EE5** | ERP Business Analyst consultant | 9 years | Egypt |
| **ES1** | IT Manager of a Bank | 15 years | Saudi Arabia |
| **ES2** | IT Manager in a Ministry | 20 years | Saudi Arabia |
| **EK1** | Head of Systems Development in a News Agency | 20 years | Kuwait |
| **EK2** | Head of IT in an International Exhibitions organisation | 10 years | Kuwait |
| **EK3** | Senior IT specialist in a Ministry | 7 years | Kuwait |
| **EU1** | Portfolio Manager of a transportation organisation (Head of the Benefits Management Committee at APM) | 15 years | UK |
| **EU2** | ERP Benefits Management consultant | 15 years | UK |
| **EU3** | ERP Oracle Consultant | 10 years | UK |
| **EU4** | ERP SAP consultant | 13 years | UK |
| **EU5** | ERP HR SAP Consultant | 17 years | UK |

## 4.3 Understanding Practices

The Understanding Practices section is split into two sub sections. The first is for investigating and understanding the differences and relationships between project management, benefits management and programme management as mechanisms for delivering benefits. The second aspect concentrates on understanding the agents of these mechanisms: what they can and cannot do. The project benefits governance framework is developed on this basis.

### 4.3.1 Benefits Management, Project Management and Programme Management

#### 4.3.1.1 Contrasting between PM and BM

Before understanding the different mechanisms of realizing the benefits, the differences between project management and benefits management logics are explored. It is believed that understanding the distinctions between different mentalities would build a foundation of understanding, in this case understanding the ways in which the frameworks differ. Although benefits management and project management are discussed in the literature chapter, this section extends the understanding of the differences between the two, taking into consideration the experts' points of view. The logic of project management and benefits management can be differentiated on the basis of four dimensions: principles, assumptions, identity, and domain (Thornton and Ocasio, 2008). All of these aspects are inseparable components of the institutional logic. However, separation between management logics does not necessarily mean that they are separately associated with two persons or two roles. This research, according to the views of experts, advocates a separation of the two logics when two positions are involved. Still, the consistency between logics is proposed as a factor in securing successful ERP project investment. Table 4-3 was developed on the lines of findings presented in (Badewi, 2015; Badewi and Shehab, 2016) and in Managing Successful Programmes, Project Management Professional, PRINCE2 and Managing Benefits Certificates.

Table 4-3: Distinction between Project Management Logics and Benefits Management Logics (Source: Badewi and Shehab, 2016)

| | Project Management Logic | Benefits Management Logic |
|---|---|---|
| **Organizing principle** | Outside the department<br>There is a contract with the change sponsor to delegate the authority to start the work (Project charter) | Inside the department to be changed<br>There is a benefits profile contract to assign accountabilities and to be the basis for a benefits review |
| **Assumptions** | Deliver what is required on time and within budget with a predefined quality level. | A benefit is the central point for all the actors' activities in the organisational change. This can be translated into return on investment, or the users' and organisation's satisfaction with the change. |
| **Domain** | An engineer or someone with a technical background | Management background, changing management and understanding business processes |
| **Identity** | Technical words to communicate with vendors | Business words to communicate with business people |
| **Tools** | PERT/CPM and Gantt Chart | Benefits Profiles, Benefits Modelling, Benefits simulation, Benefits Validity Test and Benefits Network Diagram |
| **The work lifecycle** | Output lifecycle | Outcome lifecycle |

| | | |
|---|---|---|
| | Initiation, Planning, Execution, Controlling and Closing | Benefits Identification, Benefits Planning, Benefits Implementation, Benefits Review and Benefits Exploitation |

#### 4.3.1.2 Rolling Wave Programme

The process of realizing IT, based on the views of the experts in the focus group, enabled the benefits of change to take three main forms: a continuous process, project/programme based process and a rolling wave programme. Those who believe in realizing benefits as a continuous process align their ideas with the Cranfield Benefits Management Model (Ward and Daniel, 2006). The rationale for recouping benefits in a continuous process is also aligned with the Cranfield Model. This group believes that the process of realizing benefits is bigger than the concept of project/programme management. It should be continuous to reflect the “exploitation” of the benefits after realizing all the expected ones. In other words, benefits should be integral, be part of the performance management department, and reflected in the organisation’s appraisal system. Furthermore, they should be consistent and aligned with the finance department. In short, benefits management should be part of the management philosophy rather than a haphazard process.

The second view, supported by the literature and an academic school of thought (Barclay and Osei-Bryson, 2009), believes that programme management should be used to achieve business success from newly IT- enabled change projects. Programme management helps organisations realize IS business success from different perspectives. First, it permits coordination between the workers on a set of projects, to realize a common goal. Second, it enables them to control the resources that are used to realize the benefits from the new capability. The scope of benefits realization should be well defined before initiating projects, and projects should aim to realize benefits. In other words, if the benefits realization process from IT is managed as a continuous cycle and not limited by clear boundaries, there is the potential for having no control of initiatives.

> *“For a change programme I normally only measure benefits at the programme level, not at the project level. It means projects can focus on delivery and it*

*reduces the overhead and...it's one of the things a programme is for." Narrated by F3*

Third, it provides an account of responsibilities for and ownership of the benefits. By doing so, it allows traceability and, therefore, accountability for the score, time, cost and benefits to be assigned.

Although there is a strong belief that programme management is quite useful in managing benefits, how to determine the end of a programme is still a critical issue. This is mainly because the programme is terminated once the projects (implementing and supporting projects) are completed, but not because the benefits are realized. Therefore, the answer may be to give the responsibility for benefits realization to a more permanent management level such as the portfolio manager or the business unit.

> *"However even programs do end, and in many real live cases* ***before the full benefits have been realized,*** *and then the* ***portfolio management will have to at least do some benefit tracking. Benefit realization / tracking should be anchored at a strategic level in the organisation****, whether you have a formal portfolio management function or not."* F6

Indeed, to ensure the sustainability of realizing the business benefits, the new business practices should become an integral part of Business-As-Usual (BAU). As the expert in the focus group remarked, *"Benefits that do not become embedded in the business are* ***not sustained****".* This is because, once the audit enforced by the Business Change Manager (BCM) stops, the benefits from the technology may not be realized again. Thus, without integrating the benefits into Key Performance Indicators (KPIs) to be part of the evaluation criteria for appraising managers and employees, the benefits will not be sustainable.

> *"The trick is that the* ***owners of the benefits*** *usually run a division of the business, and have an incentive to ensure the benefits are obtained (either through the value of the benefits themselves, and/or through criteria to be met as part of their employee performance)" reported by F8*

Because of the inability to determine the time to close the programme and the inability to absorb benefits management more as a management philosophy than a haphazard process, a rolling wave programme is believed by experts to be the optimal mechanism. An expert made this clear:

> *"I guess the **optimal solution is to have a rolling program of benefit creating projects.** That way, you will get continuous improvement through a series of controlled changes" narrated by expert F1*

Three issues should be borne in mind in rolling wave programmes. First, the timing of the programme spans many years, which make stakeholders frustrated and disappointed. Second, over time, the programme grows into a daily business, which leads, also, to disappointment for stakeholders. However, quick wins and continuous positive communications (communicating benefits) may outweigh this pair of issues. Furthermore, structuring the programme into tranches enables the stakeholder to see the programme as a sequence of different programmes. The third issue is ensuring that the benefits are self-sustaining after certain period. This can be recovered, as discussed earlier in this section, by integrating the new KPIs that emerge from the changes in the department and individual performance appraisals.

The comparison is summarised in Table 4-4 to spotlight the weaknesses and strengths of each mechanism in delivering benefits. It is notable that the best approach is the rolling wave in terms of its ability to combine a "continuous process" mentality with "controlled" projects. Interestingly, most of the focus group members agreed on this idea and some of them were already using it in their information system projects. This is totally aligned with the Managing Successful Programmes (MSP) guidelines

Table 4-4: Comparison between different mechanisms for realizing benefits

| | **Pros** | **Cons** |
|---|---|---|
| **Continuous Process** | Integrating the benefits management concept into a daily organisational process | Inability to control costs and time |
| **Project/ Programme Based** | Ability to control costs and time<br>Ability to assess and reassess the viability of the programme from time to time using a business case | Inability to determine the closure time easily<br>Benefits after closing may be stopped<br>Often the "exploration" of current change is omitted |
| **Rolling Wave** | Mixed | Over time, the programme can become a daily business. |

| | | |
|---|---|---|
| | Continuous improvements through a series of controlled projects | Frustrating and disappointing, due to the literally endless programme |

### 4.3.2 Agents of Benefit Realization

After discussing with experts and consultants in the interviews and the focus group, the key stakeholders involved in transformational change process were found to be four in number. The first role is that of the project manager, who is responsible for delivering the IT artefact. The second actor is the benefit owner (the business department) who is responsible for targeting and earning the benefits, whether monetary or non-monetary. The third actor is the Senior Responsible Owner, who is responsible for earning the strategic benefits from the investment (usually in monetary terms). Finally, there is the business change manager who acts as supervisor and assistant to the benefits owner helping him/her to achieve the desired benefits.

#### 4.3.2.1 Project Manager

As discussed in the literature, a project management mentality can be seen as a critical factor in realizing benefits or can be seen as an important factor in implementing only and not in realizing benefits. In both the focus group and the interviews, the first serious argument concerned whether or not the current project management mentality could lead to a successful IT project. The project management mentality in managing IT projects was found to have pros and cons. The positives lay in identifying a start date and end date, which raises the level of management and enables internal customers (benefits owners) to follow up the progression rate and thus to anticipate the future hand-over date and cost. Furthermore, a professional project management mechanism was perceived to have an impact on benefits from projects because of the reliability of the outputs in terms of getting software free of bugs and problems. Finally but still important, the ability to manage the vendor was found to significantly affect the service level of the software after implementation, in terms of its maintainability and serviceability.

However, the project management mentality, according to the interviewees, at least in organisations based in developing countries which have no proper project management governance (integrating projects in the organisational strategy), leads to many undesired results. For instance, projects are implemented according to their attractiveness from the technical perspective (e.g. “a fantastic CISCO server” or “Windows 10 has advanced security advantages”). This technical language does not make much sense to business users on the one side, and, from the other side, is indifferent towards the current organisation strategy. The current IT and project management mentality is dominated by technical people who have a passion for technology, maybe stronger than for their businesses. Furthermore, IT project managers measure their success by whether or not the software is usable and free from bugs. For them the definition of success is purely technical. There is no focus on realizing business value from this capability. This is not because they are “bad” workers but because the project management practices and scope are limited to seeing only one side of the coin, the technical side. The scope of project management stops at delivering the technological artefact. To tell the truth, project managers may not have sufficient authority or ability to determine, measure, and evaluate the benefits from the projects of this scope.

> “***The project/programme may not be allowable/able to do the measuring****. Why? Well, the project produces the outputs, but as others and myself have already said, it’s only when the output is exploited in the organisation that benefits may arise.” Stated by* F3

In a nutshell, as set out in Table 4-5, the project manager, due to his background of education and experience, can deliver only a usable and reliable technology on time and within budget. Furthermore, s/he can ensure a service level agreement for the outputs of the IT projects. All of these aspects increase the users’ perceptions that the system is reliable and useful. Nevertheless, this cannot ensure its “proper” use in realizing and recouping the benefits.

Table 4-5: what Project Manager can/cannot do

| What Project Managers can do | What Project Managers cannot do |
|---|---|
| Identify start date and end date which enables stakeholders to follow up the implementation and the expected date of transition | Understand business needs because of their technical language |
| Enable stakeholders to follow up cost and risks in implementation (controlling) | Manage stakeholders (i.e. users) in more than a limited way because of their involvement on the technical side. However, projects are the building blocks of the programmes. Projects deliver outputs but programmes deliver outcome. |
| Reduce the number of bugs | |
| Track changes in the technological aspects | |
| Ensure a proper vendor relationship to guarantee the service level after implementation | Track changes in the organisation and manage changes |

### 4.3.2.2 Business Change Manager (BCM)

Business change managers, unlike project managers who master technical aspects, are better trained and educated, with suitable experience for managing change. BCMs should be able to affect business users (i.e. benefits owners) who are more oriented to business functions and the standardization of the business processes (Efficiency).

> *"This is important, as **change management has a strong focus on communication as well as technical process** - and both are important if a change is to succeed. This means that **the Project Manager** can focus **more on the project delivery** - and, apart from benefits that are delivered during the **execution of the project** itself**, don't need to directly focus on benefits.**"*
> *Spoken by expert F8*

The business changes required for recouping the benefits are out of the hands of benefits owners (business users) in terms of authority, abilities, skills, and knowledge. Therefore, Business Change Managers (BCM) are required to act as liaison between the various benefits owners and the Senior Responsible Owner (SRO). The BCM may have a unified view of what the business should look like, in order to translate the change into benefits. This unified view can be communicated to the SRO. Furthermore, the BCMs are there to ensure the stability of the current business practices and in turn ensure the continuity of the business at times of transition (i.e. the handing over of technical IT outputs to business processes). Because users' resistance as a behaviour is led by the users' attitudes toward the technology (Badewi et al, 2013), the BCMs are responsible for managing (assessing, planning, directing and controlling) the users' attitudes toward the new IT initiative. It cannot be claimed that the BCMs themselves realize the benefits. They are not the users or beneficiaries of the system; rather they are advisors and consultants for helping benefits owners to identify, plan and implement the benefits.

> *"When Business Change Managers are managing business change, what are **the Managers and Directors of the business doing**? They must **just be Supervisors,** otherwise we wouldn't need Business Change Managers and we would be paying twice over for the management of business change. " comment from expert F4*

Furthermore, they can appoint or receive reports (i.e. from the HR department or performance management department) from the benefits auditors to ensure that the benefits are realizable and to ensure that these benefits are aligned with the forecast benefits trends. In summary, Table 4-6 contrasts what BCMs can do with what they cannot do. BCMs are in fact the change agents in the organisation.

> *"whereas **the change agents have the expertise in change management**, so they are usually the best people to ensure the change is carried out in a way that maximises the chance of success." Narrated by F8*

Table 4-6: What BCMs can/cannot do

| What BCMs can do | What BCMs cannot do |
|---|---|
| Help to identify benefits | Identify the benefits |
| Organise workshops for defining benefits | Own the benefits |
| Assess the attitudes toward the technology | Realize the benefits |
| Audit the benefits | |
| Act as a liaison between benefits owners and the Senior Responsible Owner to communicate a unified view of the required changes | |

### 4.3.2.3 Benefits Owner (BO)

The Benefits Owner is the ultimate beneficiary from the technology. The users of the system and the head of the department which receives the system are the benefits owners. Without integrating the new technology into their business processes and their decision-making, the value of their technology would be virtually zero. Therefore, as agreed and accepted by most experts and consultants in both interviews and focus groups, the existence of the ownership of benefits is necessary, and the owner is the benefiting department.

> *“Commonly, **finance takes control**, but it may be the **relevant business operations**, and they **fight to own** - or not to own, as **ownership brings responsibility***” F3

The drawback of making the finance department own the benefits is the consequent lack of buy-in from the ultimate business users. As long as the “victory” is backed to the finance department or the IT department, business users will not buy in the system. Making the users the owners is the key to making them “own” the system in a psychological and behavioural way.

The relationship between a Business Change Manager (BCM) and a benefits owner is crucial. Benefits owners should define and plan the benefits because if they are not involved and engaged in this process, the benefits will not be realized. Benefits need to be actively managed by their owners. If benefits owners are not interested and engaged in this process, it will be not be possible to draw the expected benefits. Benefits owners are not expected to know about benefits planning or developing benefits maps or to be able to quantify, measure and estimate benefits. All of these skills may be out of the scope of the business users. The role of the BCM is to help, educate, and supervise the benefits owners in owning the benefits. Furthermore, the benefits owners (business users) are unable to (and should not) audit the level of recouping the benefits from the investment in their departments

> “*Some seniors [benefits owners] do not go for benefits **audit because it might come to light [that] it was not successful at all**. Nobody wants to be guilty*” as stated by expert EU2

Table 4-7 summarises what the BO can do and what s/he cannot do. The BO is responsible for realizing the benefits from a change. However, the BCM should give him/her a hand to do this.

Table 4-7: What Benefits Owner can/cannot do

| What Benefits Owners can do | What Benefits Owners cannot do |
|---|---|
| Use the system and its features | Audit their benefits |
| Identify and plan benefits, if they receive help and suitable training for so doing | Attach benefits to their performance appraisal process |
| | Align benefits with the organisational strategy |
| | Define the technical needs of the expected technology for realizing benefits |
| | Make changes in the organisation's processes which are beyond their province |

### 4.3.2.4 Senior Responsible Owner (SRO)

Benefits Owners may be interested in drawing the benefits from the system but the current business processes may hinder this interest. Without top management commitment and without translating this commitment into a clear alignment between the IT project and the organisation's strategy, the benefits owners and the organisational benefits management mechanisms (e.g. performance management and financial department) will be confused and frustrated in evaluating, valuing, and in turn committing to the activities required to ensure benefits realization for an IT project. Indeed, one of the experts said, *"We believe in no orphan projects."* In other words, without having a sponsor in the organisation to defend the benefits, ensure resources, communicate with key stakeholders, and align this project with the organisation's strategy, the benefits will not be recouped.

Because alignment between the IT initiative benefits (i.e. ERP) and the organisational strategy in terms of mission and objective is critical for project success, the SRO role is to assure the alignment between them. If there is no such alignment, the benefits owners (BO) will not be interested in owning and managing the benefits. This case is exaggerated in organisations that connect their strategies with its Key Performance Indicators (KPIs) because the benefits owners are focused on them for the sake of being promoted or acknowledged.

The relationship between an SRO and a BO is vital for success. In fact, the SRO should motivate BO to realize the predefined and expected benefits according to the BO's plans for benefits. Motivating extrinsically is done by tying benefits to the compensation system through an effective appraisal system. Motivating intrinsically, the SRO can motivate the BOs by aligning the organisational characteristics (such as organisation structure, communications, power, the decision-making process) with the objectives and benefits of the IT project. The SRO needs to revise the design of the organisational blueprint required to deliver benefits to ensure that it fits in with the organisation's vision and that it will lead to the achievement of the organisation's mission.

> *"Absolutely agree lack of commitment from leaders and lack of vision or as you point out weak leadership is setting up a programme to fail.* ***If you are going to lead you need to know where you are going****."* EU2

Table 4-8 summarizes the areas under the SRO's control for which s/he should be responsible and also the areas that are out of his/her control and that s/he therefore should not be directly responsible for. The SRO is accountable for the entire IT project including its benefits. However, the SRO is responsible for using mechanisms to create a convenient environment for motivating the benefits owner, intrinsically and extrinsically, so as to recoup the benefits.

Table 4-8: What SROs can/cannot do

| What SROs can do | What SROs cannot do |
|---|---|
| Align the expected benefits with the organisational strategy | Use or get direct benefit from the system |
| Devote resources to the IT-enabled change | Track and manage benefits because of the time available and the skills required for performing these tasks |
| Revise the viability of the projects in terms of the alignment of the expected benefits with organisational strategy | |

### 4.3.3 Summary of current practices

There are three main actors in transformational projects, as illustrated in Table 4-9. The project manager can deliver the technological artefact on time and within budget with a high level of system reliability and usability but he cannot ensure that the users will use the features of the system nor realize their benefits. The benefits change manager is able to help benefits owners to discover and find benefits, create a sense of urgency in realizing the benefits from the system, assess the attitude toward the system, review, and audit benefits. Nonetheless, s/he cannot own the benefits in terms of realizing them nor be responsible for realizing them. The benefits owner is the focal point for realizing the benefits;

without a proper use of the system, the benefits will not be realized. Nevertheless, if the use of the system is not aligned with the organisational strategy nor aligned with its current business processes, s/he will be confused. Furthermore, without making her/him responsible and accountable for realizing the benefits, s/he will not be interested in doing new things. The senior responsible owner owns and believes in the technology and supports all the actors with the relevant and required resources for delivering success. At the end of the day, the SRO should be responsible for the return on investment from such investments.

Table 4-9: Summary of actors' abilities in realizing benefits

| | Can do | Cannot do |
|---|---|---|
| **Project Manager** | Deliver outputs | Change users' behaviour |
| | | Make users use the outputs' features |
| **BCM** | Help benefits owners to identify, own, plan, review and achieve benefits. | Use the system or its features |
| **BO** | Use the system and its features | Identify or plan benefits. |
| | | Change the organisation's processes |
| | | Align the use of the system with the organisation's strategy |
| **SRO** | Align the expected benefits with the organisation's strategy | Use or get direct benefits from the system |
| | Devote resources to the IT-enabled change | |

To sum up, the traditional project management practices, which are conducted by project manager, may not be able to enable organisations to recoup the ERP benefits. Therefore, the first proposition is

***Proposition 4-1:*** the traditional project management practices a lone do not have significant impacts on IT project success

Furthermore, the traditional benefits management practices, which are documented in literature (Ward and Daniel, 2006), could be flawed if they are implemented alone because the benefits management frameworks do not spotlight the importance of the existence of project managers. Therefore, the second proposition is

***Proposition 4-2:*** the traditional benefits management practices alone do not have significant impacts on IT project success

Indeed, if both frameworks (project management and benefits management) and their practices are combined into a single framework, this can overcome the weakness of the practices of each. Therefore, the third research proposition is

***Proposition 4-3:*** when traditional project management practices are combined with benefits management practices, the IT project success is improved significantly.

### 4.3.4 The relationship between project management and benefits management

In order to understand the relationship between project management and benefits management or between the process of project management and that of deriving benefits, a governance-based framework is developed in this chapter to distinguish between the two processes (see Figure 4-1). Governance can be defined, as detailed in literature, as the framing of policies, rules, and contracts that can guide and control different actors behaviour for aligning their behaviours to the organisation interest. The process of realizing benefits has a broader scope and longer life cycle than a project has. This is because projects deliver outputs that enable certain benefits to be obtained (OGC, 2009). Therefore, the benefits should first be identified before plans are made for obtaining them (Ward and Daniel, 2006). Afterwards, a business case can be developed in a formal document to consider these benefits, the costs of obtaining them and the plans for doing so (Ward et al., 2008).

Since the organisational capabilities which are inherent in the current state of the organisation (e.g. its processes, culture and attitudes) deliver a certain performance, that of transforming the current performance level, this current state has to be changed (Bradley, 2010; Serra and Kunc, 2015). The new state required to deliver the new benefits is called the blueprint (OGC, 2011). Thus, the process of delivering the benefits underlies the two different types of project (or sub-project): the soft and the hard. Soft projects, such as training and propaganda to change user attitudes, occupy the human side (Burton-Jones and Grange, 2012; Venkatesh and Bala, 2008), since negative attitudes toward the new IT projects, in particular, radical change projects such as ERP systems, lead to falling into a "death spiral" and to failure (Badewi et al., 2013) . Hard projects focus on non-human activities, such as purchasing the hardware and installing the system.

Each project should be managed and coordinated to deliver the blueprint that is expected to be coordinated using a single management framework such as programme management (Reiss, 2006; Ribbers and Schoo, 2002). The project dossier that is based on this blueprint is designed as a roadmap to deliver the blueprint so that the benefits can be realized. Finally, projects are initiated on the basis of a project dossier which delivers a cohesive blueprint by means of which an organisation can pursue benefits through the required changes (OGC, 2011).

> *"If the project is part of a programme, which it in most cases should be, then **the program will have a Blueprint for benefit realization**, and the programme will have **a Senior Responsible Owne**r, who will have the responsibility **for the delivery of the benefits**." stated by F6*

For this reason, a project charter has been drawn up on the basis of the blueprint requirements defined in the project dossier, the initial document for assigning responsibility in the project (the delivery of an output and its contents to a specific person) (OGC, 2009). From this point, the project to deliver the required blueprint is launched. Projects are initiated, planned, executed, controlled and monitored according to the project's lifecycle (Project Management Institute, 2013a). The hand-off point (sometimes called the "output closeout") should be left to the benefit owner. The benefit owner is perceived to be critical for buy-in behaviour and in this capacity has been found to affect project performance (Zwikael and Smyrk, 2015). Finally, a benefits audit should be conducted regularly in order to guarantee that the benefits are obtained after implementation (Ashurst et al., 2008). Once the benefits are delivered, or once they are self-sustaining, the process of obtaining them is finished; this juncture is also called the outcome closeout (Zwikael and Smyrk, 2011).

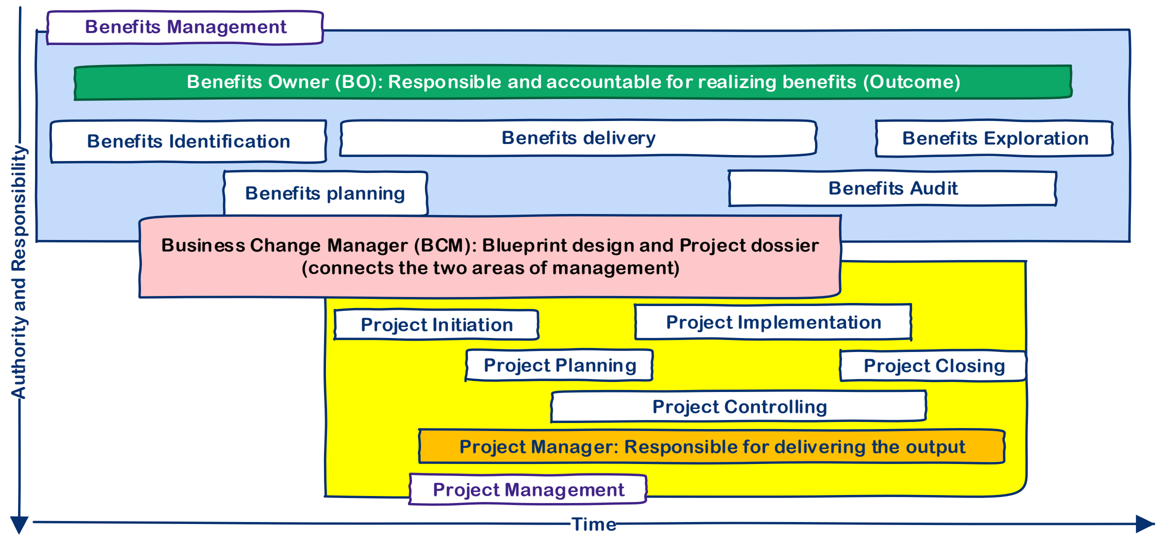



Figure 4-1: A governance based framework to integrate PM and BM (Badewi, 2015a)

### 4.3.5 Allocating and assigning tasks between actors

In order to achieve effective cooperation between all the elements of a system, the interdependence between them should managed by structuring and defining it (Forrester, 1994; Golden and Martin, 2004). Likewise, the interdependence between roles, responsibilities and accountabilities should be clarified before starting a project (Ahola et al., 2014; Too and Weaver, 2014) so that the cognitive conflicts over the responsibilities and accountabilities between these roles can be reduced (Forbes and Milliken, 1999) and therefore the project success be improved through the cohesiveness of the governance of the structure. To be rational in assigning responsibilities and accountabilities, the focus should be on the ability of each actor based on an ability analysis conducted as described in the understanding practices section (4.3).

#### 4.3.5.1 Relationship between BCM and BO

Because the benefits owner does not have sufficient knowledge and experience in change management and benefits management, the role of the BCM is to supervise and help BO in this job. Therefore, the BCM has the main responsibility for managing benefits in terms of coordinating between actors. The BCM's job, as set out in Figure 4-2, is to manage the attitude (assess, act on and review the attitude level) of the BO toward the change. This can be done by burning the bridges of benefits owners hesitating to believe in the change, managing to have magazines or leaflets circulated in the organisation to promote the change or perhaps understanding and resolving the issues behind resistance. Furthermore, the BCM, to overcome the lack of knowledge of benefits management practices in the BO, should organise workshops to train BOs on identifying and planning benefits. Additionally, to ensure that BOs are motivated to believe in and adopt the new technology, the BCM can show the BOs how the benefit is tied to their income, and work with the performance management department (or the financial department) to tie the benefits in with performance appraisal.

#### 4.3.5.2 Relationship between BCM and PM

Because BOs do not understand technical words easily, and because of their inability to translate business needs and benefits into technical requirements, the BCM should be able to work as a “translator” between the BOs and the PM. The BCM chairs the committee to design the blueprint required to deliver the benefits. Based on the blueprint, the project charter is issued to specify what the project manager should do, when and how. The BCM should translate the business needs of the BOs into technical acceptance criteria and service level agreements.

#### 4.3.5.3 Relationship between BCM and SRO

If the SRO does not have sufficient time to manage the planning process, the BCM takes over the chairing of the design, and of implementing, and reviewing the changes in the blueprint. The key aspect of benefits is this change. With a coherent blueprint, actors will act smoothly. The main coordinating document is the blueprint, which shows the future operating model of the business to get the best use of the technology. The blueprint includes the new decision-making process, technologies, communication channels, new power distributions among users, and the skills and knowledge required by the business users, together with any detail that could help to give a coherent future picture of the organisation. Furthermore, it is the responsibility of the BCM to ensure that the benefits review report (benefits audit) is conducted periodically. Thus, the BCM should work with the financial department or performance management to report on the progress of benefits.

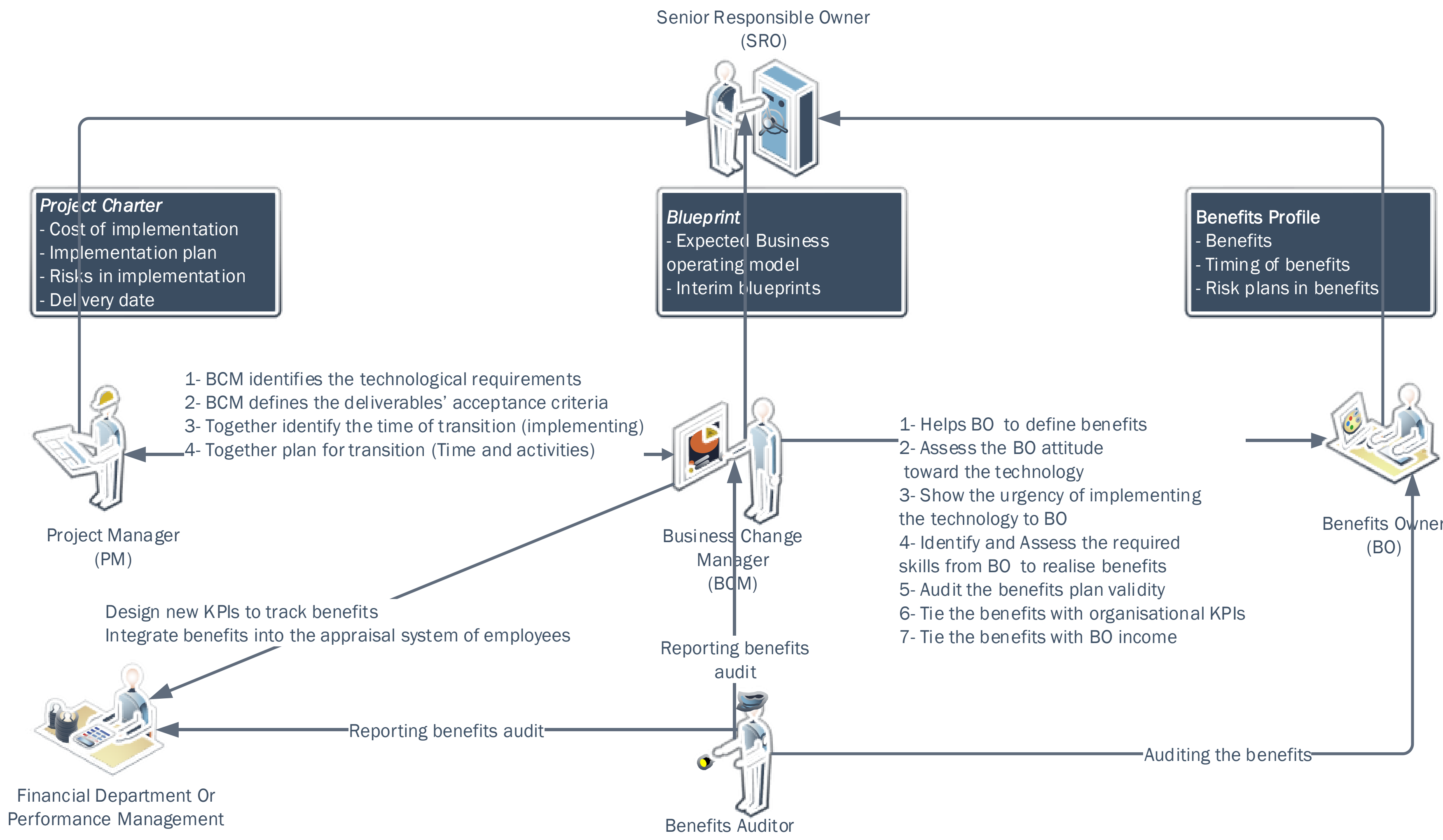



Figure 4-2: A model to conceptualise the telationships between different Benefits Management actors

### 4.3.6 Governance Documents

Based on Garland's principle (2009) of the singularity of accountability for outcomes, the one who owns the project, sometimes called the funder, or Senior Responsible Owner (OGC, 2011) should be responsible and accountable for its investment viability (Zwikael and Smyrk, 2011; Zwikael and Smyrk, 2012). Additionally, according to agent-principal theory (Eisenhardt, 1989), separation between ownership and control is recommended to enhance the performance (Bozec et al., 2010). Therefore, the principal (the funder) should control its agents' performance (i.e. the performance of the project manager and benefits owner). Consequently, there might be a conflict of interest between the principal and the agents. Therefore, the use of contracts to define the desired behaviours and outcomes is critical for realizing the expected outcomes (Eisenhardt, 1989). In the same way, contracts to identify the scope of the funder's work and clarify that of the project manager and benefits owner should be drawn up.

While the funder's contract (i.e. the business case, detailing the project cost, benefits, and scenarios for realizing benefits from the investments), is intended to define the funding and organisational change requirements, the benefits profile (which defines the benefits and how they will be measured) (OGC, 2011) and the project charter (Project Management Institute, 2013a) are the benefit owner's and project manager's contract. Accordingly, a business case is a benefit-planning tool. The view was found among the experts in the online focus group that the business case is a vital tool, as is clear in this argument:

> *"I am in complete agreement that the* ***business case is most critical****. A life without it has no meaning for a project or programme." Spoken by Expert F5*

Without an effective business case (reflecting the rolling wave programme concept), no benefit management can be performed. Benefit auditing and benefit measurements are vital for managing benefits. Both measuring and auditing benefits need a well-constructed business case. A business case is developed on the basis of two other documents; benefits profile and a project charter. As tabulated in Table 4-10, a benefits profile is another planning and controlling document. In it, the benefits owners define, describe, and detail the benefits and how and when they may be realized and become self-sustaining. However, a project charter is drawn up to detail the required project output scope, time, cost, risks, and mechanisms of implementing it.

Table 4-10: Summary of Governance Documents

| Governance Document | Description |
|---|---|
| **Business Case** | Summary of benefits, their forecasts, future patterns, risks to them and their values<br>Summary of costs (e.g. implementation, project management costs, benefits realization costs, changed costs, and initial costs)<br>Financial viability tests (e.g. return on investments or Net Present Value) |
| **Benefits Profiles** | Description and plan to realize benefits, validity check for the plan, risks to them, Time required to become self-sustaining, and the value of the benefit |
| **Project charter** | Project scope, time plan for deliverables, cost of implementation, risks to implementation, acceptance criteria and service level agreements |

As illustrated in Figure 4-3, while the benefits (the accountability of the business manager) is detailed, explained, and simulated in a business profile, the scope of the project is detailed in a project charter  (the accountability of the project manager). The purpose of the project charter is to declare and later to function as the performance metrics against, the project manager, the budget and the time requirements for delivering change of the required scope.

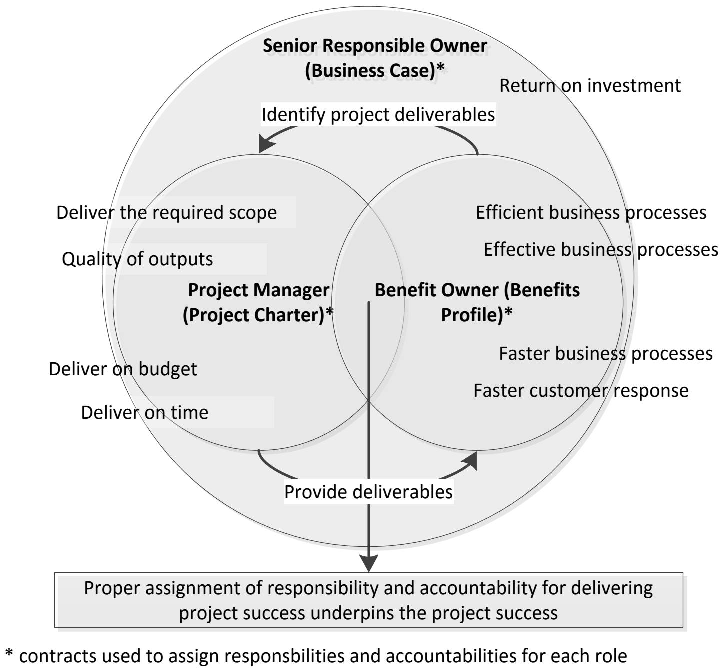



Figure 4-3: Circles of accountability between project manager and benefits manager (Badewi, 2015a)

## 4.4 Application of Project Benefits Governance on ERP

To apply this governance framework on ERP implementation, two things should be adopted. First, the conceptualisation of ERP as a project should be changed to make it a programme. Second, the institutionalisation of PM and BM logics in the organisational practices are a prerequisite for ERP success through this framework.

### 4.4.1 ERP is not a project: it is a programme

Integrating a new ERP-led capability into an organisation processes is not easy but should not be neglected (Brady and Davies, 2004). Badewi and Shehab (2013) set out in Figure 4-4, how organisations react to introducing a new ERP system in them. According to this curve, the implementation of an ERP system, as a new organisational capability, leads to organisational resistance, which affects organisational performance. ERP project implementation ends long before an organisation is able to achieve any business benefits from the ERP system. Similarly, one of the experts in online focus group argued that

> "*Programmes encompass the benefits realization phase to an agreed point with the tranche. Tranches are used in MSP (the Managing Successful Programmes method) to control and monitor the benefits realization and provide a feedback look if benefits are not as expected in the first instance, so that the next tranche can deliver a corrective approach with additional benefits*." stated by F5

ERP implementation needs more than one tranche (one blueprint); each module can be seen as a tranche needing to be implemented and so that organisational change occurs in such a way as to realize potential benefits. When ERP modules (e.g. accounting, HR, purchasing, and production) are well integrated; the method of organisational planning should be changed so that the expected benefits from this data transparency are realized. In the same way, a senior expert in ERP implementation, SAP Egypt, indicated that

> "*the problem is not in implementing the system; the problem always comes after the implementation*" described by EE2

Therefore, the role of the business change manager (BCM) should be spotlighted in the post-implementation period in such a way as to bring the performance curve up with steady improvements. This entails many activities such as continuous training in ERP as well as managing the attitude toward it. These deliberate efforts should continue until the performance stabilizes. Hence, the ERP programme can be closed, or a new programme can start to explore more benefits or to invest in buying more ERP support technologies to stimulate a quantum leap in performance.

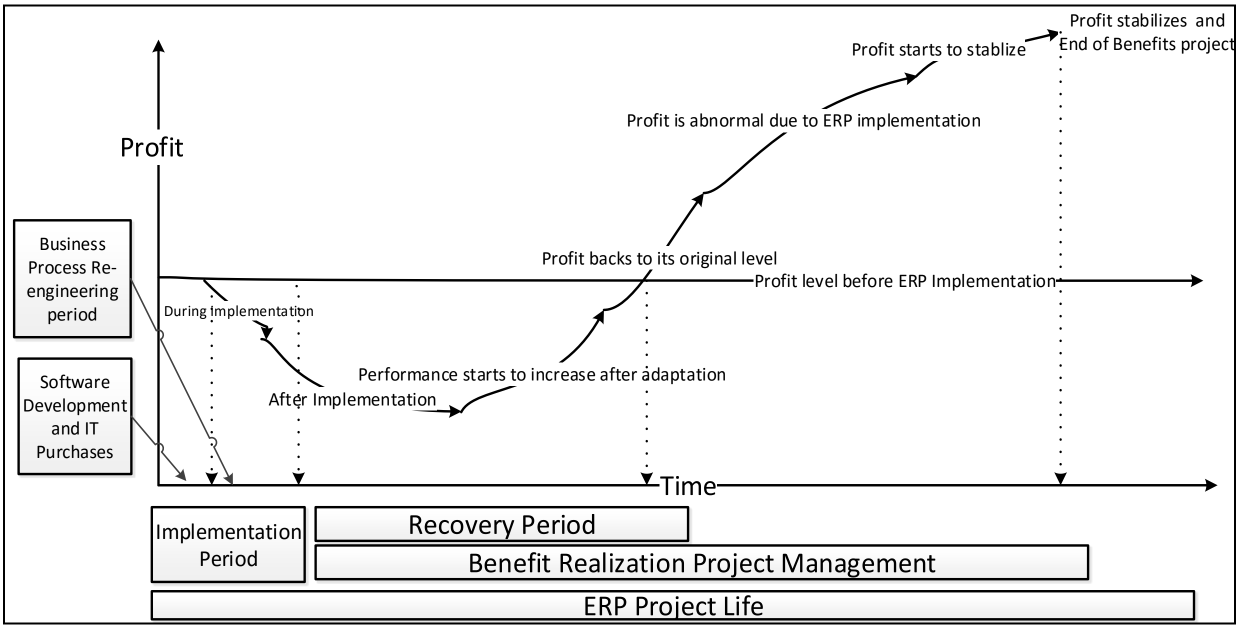



Figure 4-4: ERP Lifecycle (Badewi & Shehab, 2013)

### 4.4.2 ERP Benefits Management Governance Model

The ERP Benefits Management approach is used by three interviewed consultants. Their approach is aligned with the definitions formulated in the literature review, which are defined in Table 2-2. This is found to be consistent with the Managing Successful Programmes Guide (OGC, 2011). However, as set out in Figure 4-5, the new strategy in this research is to combine this process with attention to the different roles in the organisation as well as the application to ERP.

#### 4.4.2.1 Benefits Identification

Benefits should be identified by the benefits owners (e.g. head of warehouse for the ERP inventory module). Benefits owners should, with the help of BCM, define the ERP benefits, and their plans (what should be done and how), with the conditions and assumptions required to achieve them. Benefits should be validated by defining how to measure, observe and allocate them to certain users and departments.

#### 4.4.2.2 Benefits Planning

The second step is to define in depth how the benefits will be realized. For instance, now that ERP enables the data on the material-flow to be transparent, how can we use this outcome to reduce the inventory level by 10%? The benefits plan should be validated by articulating the benefits and finding the areas of consistency and inconsistency between the plans. An independent person/department should conduct the quality assurance on benefits plans and their expected outcomes before approving them to ensure they are realistic, achievable, measurable, observable and consistent with the organisation's policies and rules. All of these details should be reported in the benefits profiles for each benefits owner. The role of the Business Change Manager is to motivate and to help benefits owners to plan the benefits. However, the responsibility and accountability for planning and delivering the benefits still lie with the benefits owner. In other words, the new ERP benefits- related Key Performance Indicators (KPIs) should be linked to the benefits owners' income as the basis for reward or punishment for realizing what they claimed to have recouped before implementing the ERP. Thus, the BCM's role is to make such arrangements between the benefits owners and the performance management, the financial, and/or the human resources departments, that they become part of individual and departmental performance. If s/he does so, the ERP benefits are expected to be integrated in the organisation's mentality.

Based on benefits owners' plans in all departments and organisational units, the consolidated business benefits report is chartered to set the budget limit for each ERP project. This is the cash inflow side in the business case. On this basis, cash in and cash out are tailored to ensure the ERP's viability. Thus, the IT department should start selecting the ERP that can best align with the users' needs to achieve the expected business benefits. As noted in the literature, one of the main ERP critical success factors is the alignment with organisational practices. It is noted in this research that they should be aligned with the new practices, which are expected to bring the benefits to fruition.

Thus, the IT department (or ERP project team) should select, configure, and customize the ERP to fit the expected new business practices based on benefits plans recorded in a consolidated benefits profile document. The blueprint is designed by combining the expected project outputs with the proposed business processes and a new organisational decision-making process (e.g. how sales plans will be integrated with the purchasing plans and/or production plans in the new organisational state) recorded in the consolidated benefits profiles,. This process of chartering the blueprint should be led by the Business Change Manager (BCM) who can talk in both languages; business and technical. Once consent is obtained from the benefits owners on the expected blueprint, the implementation process should be commissioned.

#### 4.4.2.3 Benefits Delivery

This is the transition process, which causes many distortions in the Business As Usual (BAU) state. As spotlighted early in Figure 4-4, this is part of the ERP project life cycle, which consists of the implementation phase (the buying process of ERP, customising and configuring the ERP and business process re-engineering), and a recovery (i.e. stabilisation) period. The role of benefits owner is to use the ERP as detailed in the benefits plans toward realizing the benefits as promised. The business change manager is meant to ensure business stability and to ensure that project managers are delivering the accepted outputs (i.e. customisations, configurations, and installations) within the pre-agreed time.

#### 4.4.2.4 Benefits Review

In the post-implementation phase, the senior responsible owner (one of the board of directors who sponsor the ERP programmes) should commission periodical reviews of benefits owners to find the level of benefits realized and whether the benefits are realized according to plan. The Business Change Manager (BCM) should appoint an independent benefits reviewer for this. Benefits reviews are crucial if the organisation is serious enough to connect the compensation system with the ERP benefits. A benefits audit is not only an organisational process for ensuring benefits realization but also a psychological process to ensure the commitment and involvement of business users in proceeding actively to secure the proposed benefits. Finally, once benefits are self-sustaining, the review should stop, in order to achieve the pre-defined benefits. However, periodical meetings are required to leverage the ERP benefits and identify the new technologies and organisational resources required to achieve higher and more robust benefits from the ERP system.

#### 4.4.2.5 Benefits Exploitations

It goes without saying that ERP is too huge to be absorbed all at once. Hence, it is usually implemented in tranches. A tranche can be seen as an ERP module or can be seen as an upgrade, which ERP vendors do issue from time to time. Each upgrade can represent benefits, costs, and implementation risks. Therefore, from time to time, the business change manager (who can be called the ERP Manager once is ERP is established) chairs periodical meetings to bring different benefits owners together with IT managers to discuss new improvements in ERP in terms of acquiring new technologies or upgrading.

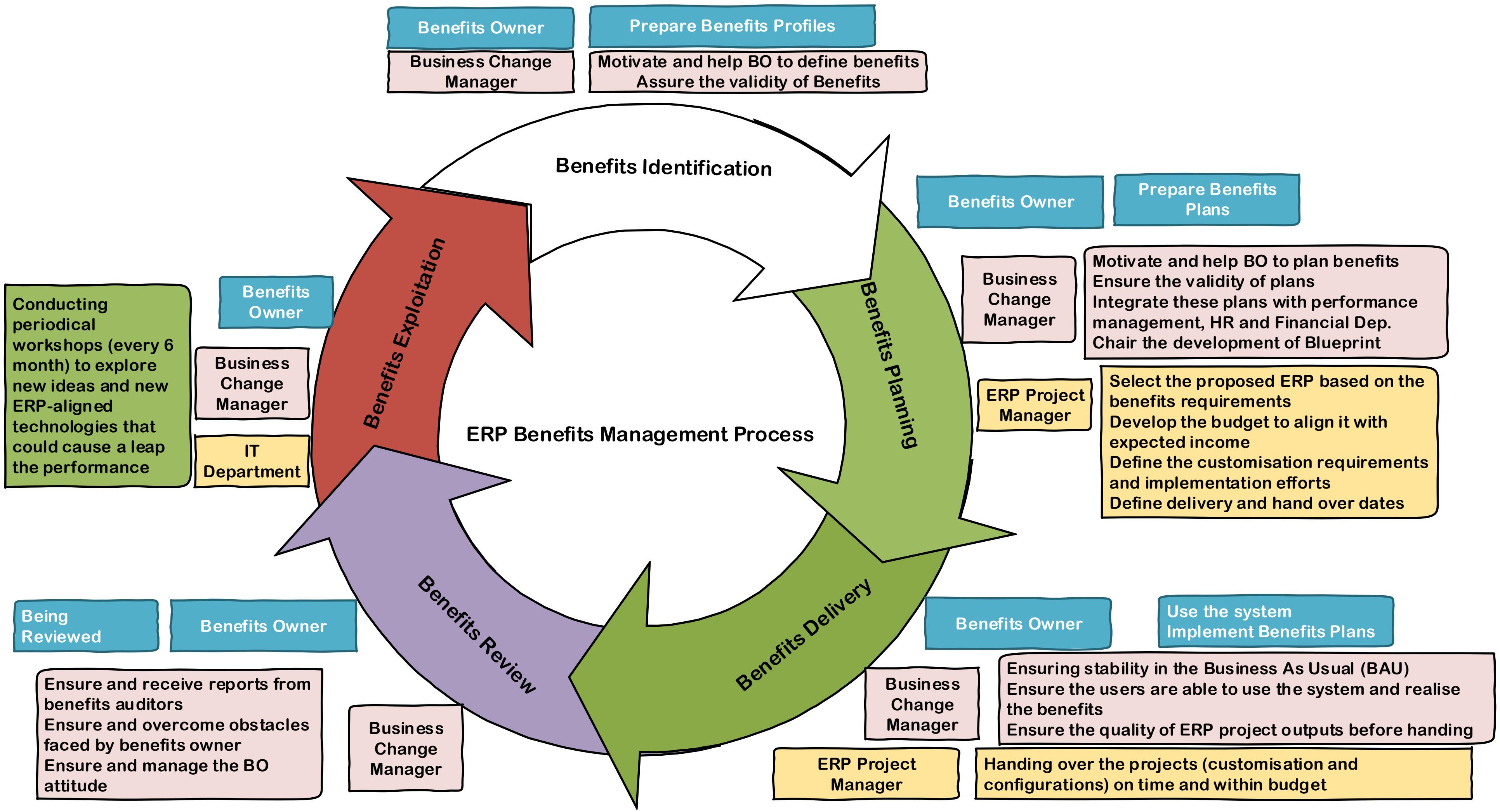



Figure 4-5: ERP Benefits Management Governance Model

### 4.4.3 Institutionalisation of Project Benefits Governance Framework

Implementing either PM or BM in the ERP context alone is found, in the literature, to have mixed results. The reason for this may be that because the PM and BM were not done in a professional way or because the PM and BM are not working closely as a couple.

PM logic is managed and governed by the project charter while the mentality of benefits management (Business change management, benefits audit and benefits owners) is managed by benefits profiles. As illustrated in Figure 4-6, the first is responsible for the technical side, whereas the second is responsible for the business and benefits side. When both mentalities are managed under a rolling wave programme controlled by a blueprint, it is expected that the success rate in routine projects will improve. However, if this framework is repeated often, i.e. institutionalised in the organisation, the relationship between actors will become more mature, and, therefore, the professionalism and the actors' ability to implement transformational programmes such as ERP is expected to increase.

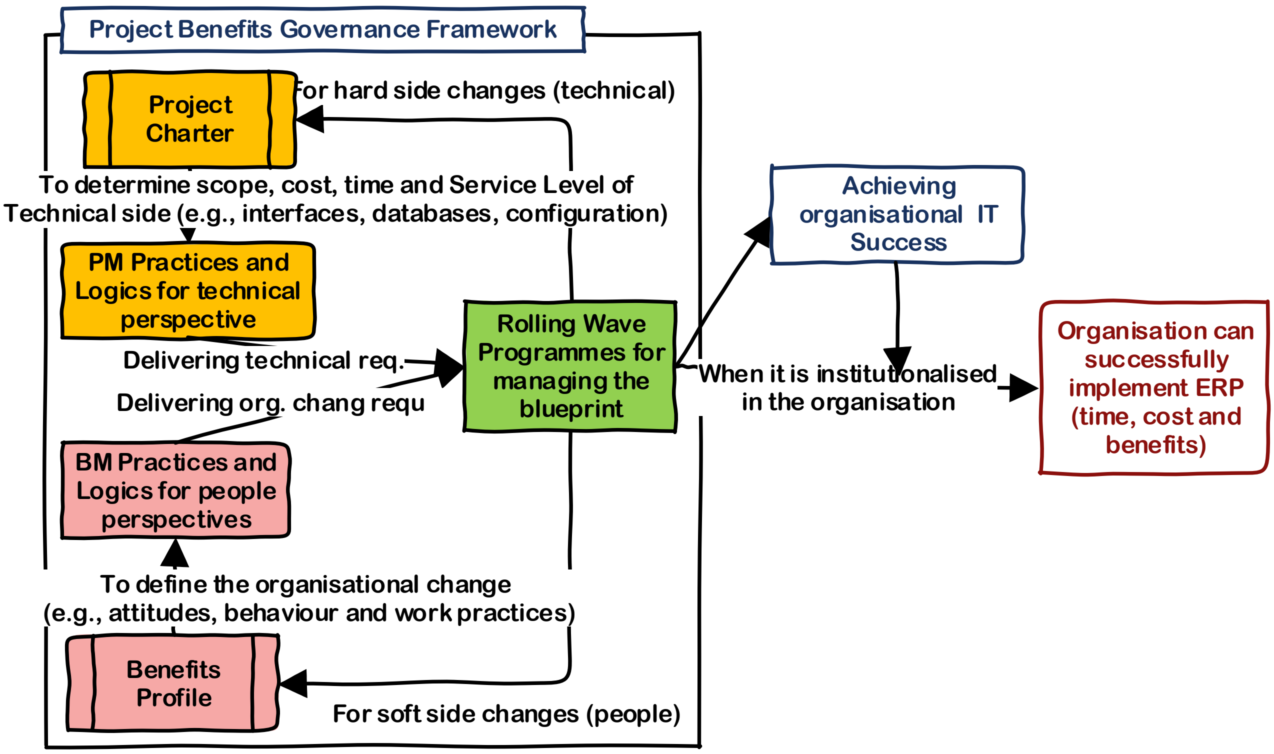



Figure 4-6: Institutionalisation of Project Benefits Management Framework

Therefore, there are three research propositions can be drawn from this conclusion. First, the ability of institutionalising project management practices alone in an organisation without considering any benefits management logics in implementing ERP project is flawed.

***Proposition 4-4:*** Institutionalising the traditional project management practices alone into an organisation do not affect the ERP project success

Likewise, institutionalising the logics of benefits management alone in an organisation would be imperfect without considering the project management logics which required for effective and professional implementation of projects.

***Proposition 4-5:*** Institutionalising the traditional benefits management practices alone into an organisation do not affect the ERP project success.

Therefore, when the both logics of project management and benefits management are combined into a single and a consistent framework, the ERP project success will increase

***Proposition 4-6:*** Institutionalising the both logics into an organisation improves the ERP project success rate.

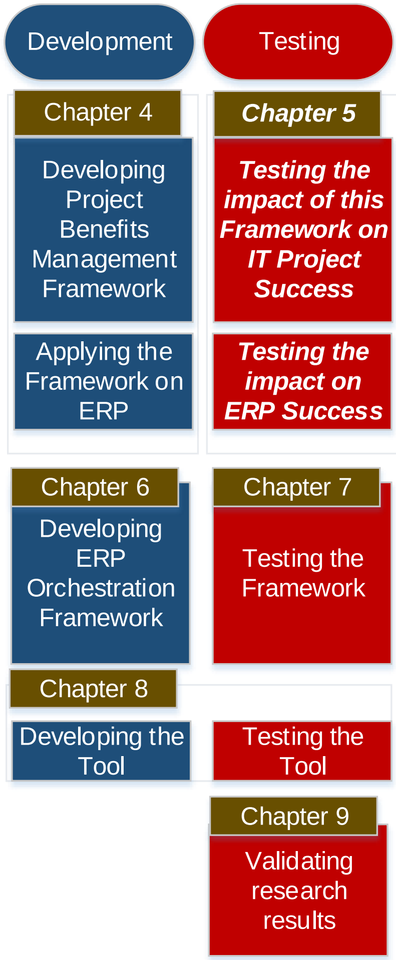
## 4.5 Summary

To sum up, this chapter explored and investigated the current practices in benefits management in the IT field. Based on these practices, these understandings were criticised using the literature and with the help of experts to improve the success rate of the IT projects. Afterwards, with the help of ERP benefits management experts, the application and adoption of this framework in the ERP field were investigated. The main differences between IT and ERP are that ERP needs a radical transformation of the business processes. But having different and incremental blueprints in a rolling wave programme vehicle requires a great deal of collaboration between the actors.

There are some research limitations in this research chapter. For instance, the researcher has not perceived and documented the weakness or strength of project management and benefits management by himself as part of research methodology. However, his background and experience enabled him to understand the context and address the weaknesses of project management and benefits management. Furthermore, this research with its concepts (e.g. SRO and BO) which are inherited from certificates such as (MSP, Managing Benefits, and Managing of Portfolios) is aligned with the British and European school of thoughts in project management (Jenner and Axelos, 2011). Indeed, it is not clearly known how the competing school of thoughts such as American with its certificates (PMP) can perceive, use, and utilise these research findings. For instance, the American school of thought, which represented by Project Management Institute (PMI), uses different concepts such as business analysis and business requirements. The concept of business analysis may imply different angels and perspectives to approach benefits realisation process.

To sum up, this chapter ends with two main propositions. First, when PM and BM are used in an organisation the success rate is increased. Second, when their roles are routinized (institutionalized), the organisation learns to implement radical transformation projects such as ERP. The aim of the next chapter is to test this pair of propositions.

# 5 Chapter Five: Testing Project Benefits Governance Framework




## 5.1 Introduction

The aim of the previous chapter was to understand how the Project Manager (PM) and Business Change Manager (BCM) can deliver ERP success when they work closely together. With this in mind, this chapter aims to test two frameworks: the impact of a project benefits governance framework (PBGF) on the IT organisation's success, and the impact on ERP success of institutionalising this framework.

Consequently, this chapter covers two consequential positivist studies, as illustrated in Figure 5-1. The first study is to test the impact of PBGF on IT project success. The second is to extend this framework by testing the impact of institutionalising PBGF on the ERP success mediated by the presence of Project Managers and Benefits Managers (Business change managers and benefits auditors) in ERP success. Each study has its own methodology, theoretical framework, operationalisation of concepts and analytic models.

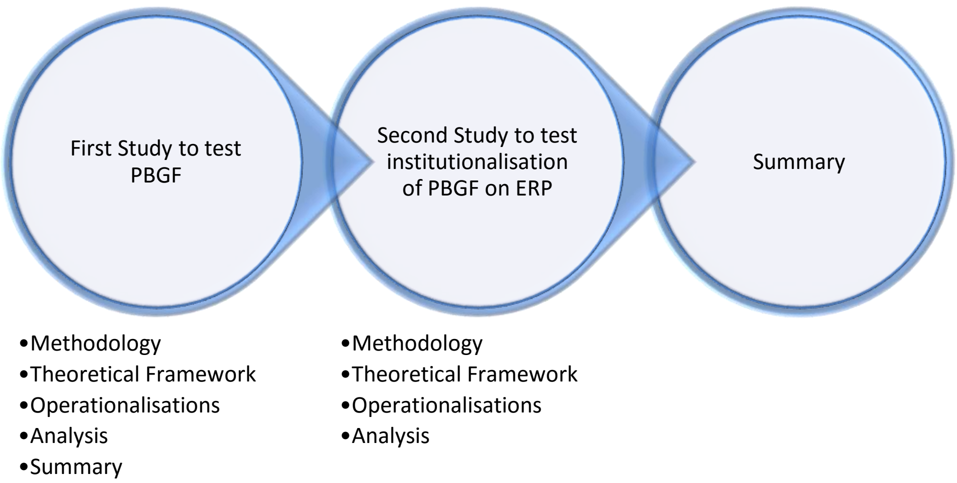



Figure 5-1: structure of Chapter 5

## 5.2 First Study: Testing the Project Benefits Governance Framework

This study was published in the International Journal of Project Management (Badewi, 2015b). It is summarised here because it forms the basis for studying the institutionalisation of a Project Benefits Governance Framework in ERP systems.

### 5.2.1 Theoretical Framework

The theoretical framework used to test the project benefits governance framework proposed below (PBGF) is illustrated in Figure 5-2. The theoretical framework aims to test which practices have more impact on investment success: Project Management Practices alone, Benefits Management Practices alone or both combined in a single framework (a project benefits governance framework). Based on the Proposition 4-1, 4-2 and 4-3, these study research hypotheses are

H5-1: Traditional Organisational Project Management Practices affect Project Management Success positively.

H5-2: Traditional Organisational Project Management Practices affect Project Investment Success positively.

H5-3: Organisational Project Management Success and Project Investment success affect each other positively.

H5-4: Organisational Benefits Management Practices affect Project Investment Success positively.

H5-5: When Project Management Practices are combined with Benefits Management Practices, the success rate increased significantly.

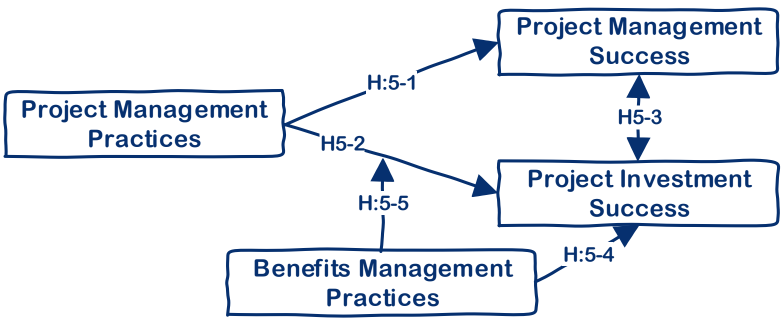



Figure 5-2: Theoretical Framework for Project Benefits Governance

### 5.2.2 Research Methods

An online survey was used to test this framework. An online questionnaire was distributed to a range of social media groups in LinkedIn and Facebook. Project managers were then identified and targeted on LinkedIn. 421 responses were received; when the incomplete ones had been deleted, 200 were found to be valid and were used in the subsequent analysis. The sample of respondents comes from all over the world, as illustrated in sample characteristics table, Table 5-1.

The units of analysis in this research were organisations with their own practices, not projects. Governance themes for both project and benefits management practices are enforced by each organisation's policies and standard operating procedures (SOPs), such as selecting the owner of the benefits and the project manager before initiating the projects (Müller et al., 2014).

Table 5-1: Sample characteristics used in testing the Project Benefit Governance Framework

| Characteristics of the sample (n=200) | | | | | |
|---|---|---|---|---|---|
| **Country** | **N** | % | **Experience** | **n** | **%** |
| Arab Countries | 71 | 36 | 0-3 Years | 71 | 36 |
| Europe | 56 | 28 | 4-8 Years | 60 | 30 |
| US | 26 | 13 | 9-15 Years | 35 | 18 |
| Others | 47 | 23 | More than 15 years | 34 | 17 |
| **Total** | **200** | **100** | **Total** | **200** | **100** |
| **Positions** | | | | | |
| Project/programme managers | 96 | 48 | | | |
| CIO/IT Managers/IT directors | 45 | 23 | | | |
| ERP project managers | 22 | 11 | | | |
| Missing (i.e. failed to specify) | 37 | 35 | | | |
| **Total** | **200** | | | | |

### 5.2.3 Operationalisation of constructs

This questionnaire is based on four constructs, as illustrated in Appendix A. They are project management success, project investment success, organisational project management practices, and benefits management practices. In order to examine the reliability of the measures, Cronbach's alpha was used as a measure of reliability. As long as the Cronbach's alpha of a construct is more than 0.6, it is considered reliable (Nunnally et al., 1967). All of the constructs, as illustrated in Table 5-2, have Cronbach values of more than 0.7, which indicates high reliability.

Table 5-2: Validity analysis for constructs used in testing PBGF

**Rotated Component Matrix[a]**

| | Component | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Cronbach's Alpha (Reliability measure) | .804 | .681 | .792 | .815 |
| Proj MGM Succ – Time | | | | .833 |
| Proj MGM Succ – Cost | | | | .785 |
| Proj Inv Succ – Benefits Realisation | | | .822 | |
| Proj Inv Succ - ROI Satisfaction | | | .881 | |
| BRM1 - Business Case | | .656 | | |
| BRM2- Periodical Benefits Audit | | .869 | | |
| BRM3-Assigning Responsibility for Realizing Benefits | | .672 | | |
| PM1- Project Charter | .742 | | | |
| PM2- Reviewing Cost Plan | .729 | | | |
| PM3- Reviewing Time plan | .785 | | | |
| PM4- Implementing Communication Plan | .720 | | | |

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

#### 5.2.3.1 Organisational Project Management Practices

The level of implementation is measured by the degree of agreement with the view that the respondents' organisations engage in their projects in the following practices: having a project charter before starting to implement a new IT project; reviewing cost plans periodically; reviewing time plans periodically; and implementing communication plans. These four practices are used to emphasize different aspects of the level of implementing the project management: project governance; reviewing and using the basic plans of time and cost; and using communication plans.

Therefore, the first question, on the use of a project charter before starting a project, was to be used as a governance requirement to delegate the responsibility for implementing the project to a project manager, as discussed in the previous chapter. The next two questions were about reviewing the cost and time plans. Unlike the studies that use specific practices to indicate planning (Papke-Shields, Beise et al. 2010, Zwikael, Pathak et al. 2014) as indicators for measuring the concept of planning, this research asked about "reviewing plans periodically". This is because changes in plans are more important in project success than the quality of planning itself (Dvir, Lechler 2004). Furthermore, plans in these projects, even when sophisticated tools are brought in, are useless unless they are reviewed; otherwise, the plans ignore the feedback that comes from controlling activities. Finally, a question was asked about implementing a communication plan, as one of the basic requirements for successful project management.

Only these four practices, as the main practices in implementing project management, were selected; if any of them is lacking, it is hard to tell whether project management methodology has been applied in the organisation at all. However, implementing other practices is subject to many other factors and they are not necessarily found in all projects. For instance, projects with less dependence on risk plans can sometimes be seen; they vary in the level of project uncertainty (Besner, Hobbs 2012). Likewise, other practices such as procurement, HR and so on vary with the nature of the projects being managed, for example, with the same degree of complexity and of innovation (Besner, Hobbs 2012, Besner, Hobbs 2008). The reliability of this construct, using Cronbach's alpha, is 0.8 and the factor load of all items was above 0.6. This indicates that the construct was valid for use and reliable.

#### 5.2.3.2 Organisational Benefits Management Practice

Benefits management logics were operationalised from the results in the previous chapter. The values underpinning the benefits management are as follows: benefits accountability and responsibilities assigned; benefits identified; and benefits audited. This scale has been used before (Badewi, 2015a and Badewi and Shehab, 2016). The reliability of this scale is 0.815, which indicates this construct is reliable.

#### 5.2.3.3 Project Success

Project success, as discussed in the literature, has two parts: project management success and project investment success. On the one hand, project management success focuses on the efficiency of a project in terms of delivering something of the right scope on time and within budget. Indeed, the use of "triple constraints" (cost, time and scope) as a criterion of project performance is the traditional way of defining project success (Atkinson 1999). Therefore, respondents were asked to indicate how far they agreed that their organisations' IT projects were delivered on time and within cost. These questions are derived from the literature and include questions used to measure project efficiency (Dvir, Lechler 2004, Zwikael, Pathak et al. 2014). The Cronbach's alpha for measuring the reliability of this construct was 0.815. In addition, based on Factor Analysis for measuring the validity of the constructs in Table 5-2, the factor loads of the items of scale were more than 0.6, which means that this construct is valid.

On the other hand, project investment success is the concern of the Senior Responsible Owner (SRO), who wants to know whether a project is worth investing in. Since the sponsor's financial satisfaction (in terms of the project's return on investments) cannot be realised without project deliverables that can secure the planned benefits (OGC 2011), project investment success focuses on the benefits which accrue from projects (Camilleri 2011) and on return on investment. Therefore, as the literature suggests, project investment success is operationalised in terms of return on investments and the successful realisation of the desired benefits (Serra, Kunc 2015, Besner, Hobbs 2006).

### 5.2.4 Analysis

Analysis was conducted on a sample of 200, to test the project benefits governance framework. The analysis for this testing was conducted in three phases: correlational analysis, Structural Equation Modelling (SEM), and stepwise analysis, as illustrated in Figure 5-3. The purpose of correlational analysis is conducted to understand the relationship between different factors and to prioritise the practices in terms of their importance to project investment success. The purpose of using SEM is to test the impact of Project Management logics and Benefits Management logics on organisational project investment success. Finally, the purpose of Step Wise analysis is to test whether it matters to combine the two logics in the same organisation.

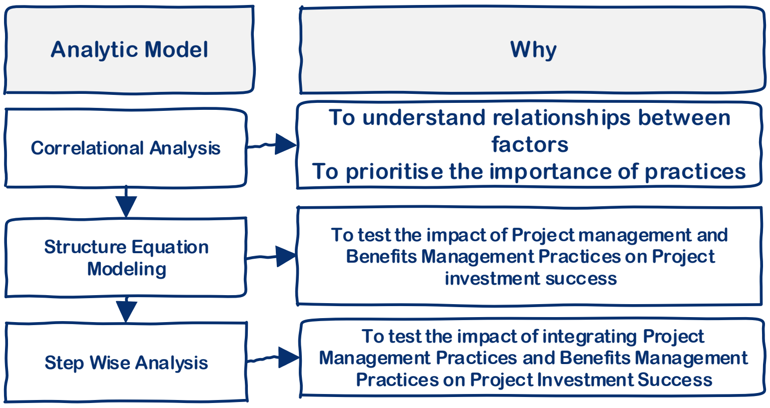



Figure 5-3: Testing PBGF Process

### 5.2.4.1 Correlational Analysis and Analytic model selection

Correlation analysis suggests that the highest correlation of project management practice with project management success is in "implementing the communication plan" and the "periodical reviewing of the time plan," found in the present research to be by 44.8% and 46.2% respectively. Nevertheless, the highest correlation with project investment success, by 42%, was found in the time plan. However, other practices were correlated with it by between 24% and 29%, approximately. This is an indication that the periodical reviewing of the time plan is one of the critical factors for project success.

Correlation analysis, as illustrated in Table 5-3, also revealed that the business case was the least important factor in benefits management, by a correlation of 25.8%. Indeed, after conducting regression analysis to find its individual impact on project investment success, the explained ratio (r-squared) was only 6.2%. Moreover, when it was considered in stepwise analysis, taking into consideration other practices in benefits management, this model was excluded because the t-value was 1.337.

Table 5-3: Correlational Analysis for the variables used in testing PBGF

| Correlations[c] | 1 | 2 | Pro MGM Succ | 4 | 5 | Pro Inv Succ | 7 | 8 | 9 | BM Prac | 11 | 12 | 13 | 14 | PM Prac |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.Proj MGM Succ – Time | 1 | | | | | | | | | | | | | | |
| 2.Proj MGM Succ – Cost | .693** | 1 | | | | | | | | | | | | | |
| **PM_MGM_Succ** | .922** | .918** | 1 | | | | | | | | | | | | |
| 4. Proj Inv Succ – ROI | .378** | .441** | .445** | 1 | | | | | | | | | | | |
| 5.Proj Inv Succ - Benefits | .429** | .507** | .508** | .661** | 1 | | | | | | | | | | |
| **PM_Inv_Succ** | .444** | .521** | .524** | .904** | .918** | 1 | | | | | | | | | |
| 7.BRM1 | .247** | .287** | .290** | .234** | .235** | .258** | 1 | | | | | | | | |
| 8.BRM2 | .223** | .257** | .260** | .281** | .283** | .309** | .500** | 1 | | | | | | | |
| 9.BRM3 | .408** | .398** | .438** | .295** | .387** | .376** | .319** | .479** | 1 | | | | | | |
| **BM_Prac** | .370** | .398** | .417** | .343** | .383** | .399** | .761** | .843** | .761** | 1 | | | | | |
| 11.PM1- Project Charter | .318** | .316** | .345** | .204** | .244** | .246** | .214** | .197** | .253** | .280** | 1 | | | | |
| 12.PM2- Cost Plan | .345** | .285** | .343** | .251** | .266** | .284** | .443** | .327** | .375** | .482** | .451** | 1 | | | |
| 13.PM3- Time plan | .435** | .415** | .462** | .366** | .399** | .420** | .343** | .181* | .291** | .342** | .520** | .610** | 1 | | |
| 14.PM4- Communication Plan | .437** | .387** | .448** | .223** | .300** | .288** | .189* | .190* | .289** | .282** | .530** | .477** | .542** | 1 | |
| **PM_Prac** | .479** | .437** | .498** | .322** | .374** | .383** | .366** | .279** | .377** | .431** | .788** | .786** | .820** | .807** | 1 |

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

### 5.2.4.2 Structural Equation Modelling (SEM) Analysis

Correlational analysis suggested a significant relationship among the independent variables (i.e. PM and BM were closely correlated). R-square was 43.1% (P<0.00) from one side and there was significant correlation between the dependent variables from the other (since the two kinds of successes were found to be closely correlated). Therefore, SEM was used to analyse the data because it takes into account these correlations between different concepts. The fitness of the SEM on the data is examined in the research methodology chapter.

The model in Figure 5-4 suggests that the organisational adoption of PM logics has a significant impact on its project management success (the standardized estimate was 0.632, with a critical ratio of 6.592) but a lower impact on its project investment success (standardized estimate 0.403, with a critical ratio of 3.926). However, both estimates were significant with P<0.00.

The impact of organisational benefits management logics on project investment success is roughly half that of project management practices. Organisational benefits management logics alone affect project investment success by only 0.21 with a critical ratio of 2.19, found to be significant only at a 95% confidence interval (Table 5-4). This evidence suggests that PM logics have a higher and more significant impact than BM logics on organisational performance in its investment success from its IT projects.

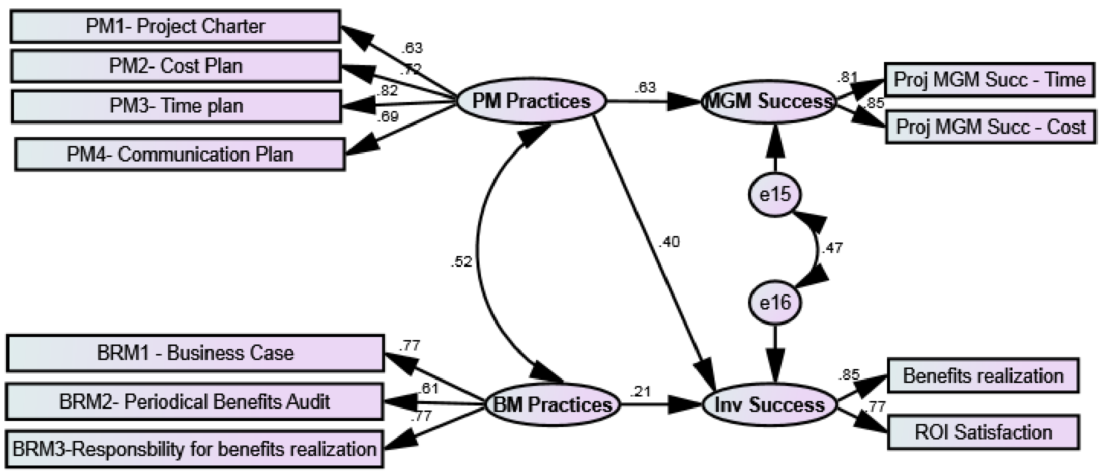



Figure 5-4: Project Benefits Governance Framework Model (Badewi, 2015a)

| Dependent | Independent | Estimate | S.E. | C.R. | P | Standardized Estimate |
|---|---|---|---|---|---|---|
| **MGM_Success** | **PM_Practice** | .722 | .110 | 6.592 | *** | .632 |
| **Inv_Success** | **PM_Practice** | .459 | .117 | 3.926 | *** | .403 |
| **Inv_Success** | **BM_Practices** | .207 | .095 | 2.183 | .029 | .206 |

Table 5-4: SEM results, Estimates, Standard Error, Critical Ratio, P-Value and Standard Estimate

#### 5.2.4.3 Stepwise Analysis: the impact of PBGF on Project Investment Success

A simple linear regression model was used to reveal the impact of BM and PM on project investment success; the results are illustrated in Table 5-5. BM alone, without taking account of PM practices, was found to have a significant impact on project investment success, with an adjusted R2 of 14.1% and a standardized beta 0.381. Likewise, PM alone was found to affect project investment success, with an adjusted $R^2$ of 14.9% and a standardized beta of 0.392.

Using Step Wise Analysis, two models were selected as significant and the less significant one was ignored. The first model, PM alone, has an adjusted $R^2$ of 14.9% and a standardized beta of 0.392. However, in the second model, the combined BM and PM, PM practices had declined in impact to .276 and the adjusted $R^2$ of the model had increased to 19.8%. This means that the entrance of BM in the regression equation increased the adjusted $R^2$ of the model by 5.2% ($P<0.001$). Therefore, finding the incremental explanation ratio of project management success by entering benefits management success was important; it increased the adjusted $R^2$ of the model by 35%. This indicates that the PBGF model (integrating the two practices) achieves significantly higher success than PM or BM alone.

Table 5-5: The impacts of BM and PM on project investment success

| Independent Variables | Adjusted R2 | Standardized Beta | Method |
|---|---|---|---|
| **BM** | .141 | 0.381 | Regression |
| **PM** | .149 | 0.392 | |
| **BM & PM combined** | .198 | BM=.257<br>PM=.276 | Stepwise Analysis |
| **Incremental Adjusted-$R^2$ between the PM model and the PM & BM model** | .052 | | |

*All values are significant at 99%

### 5.2.5 Summary of the first study

The research findings challenge many strong beliefs that benefits realization practices are a panacea for realizing benefits from IT. Indeed, the relationship between them, after separating the impact of PM on success, is weak but significant. Regarding the business case tool, it has been found that it does not affect IT project investment success. The reason may derive from the belief that the business case is nothing but an investment tool. Therefore, if a business case is not a tool for plotting and forecasting benefits over the time, what tool should be used for these activities?

> "*the business case tends to have a summary text and a level of information to understand the return to investment, it stops when it has achieved this conversation*". Narrated by F5

According to Ward and Daniel (2006), when they included the business case in their research, they used it as a way of planning benefits and merely as a means of convincing top managers. This misconception is believed to be the main reason for finding no relationship between using a business case and the realization of business benefits from IT projects

Moreover, the business case should not be used a tool to set expectations; rather it should be a mechanism to keep users' behaviours in alignment in such a way as to allow the benefits to be recouped.

> "*The problem is not to identify benefits. The problem is always with to **keep users strictly behaving** in such a way [as] to recoup these benefits*" narrated by EE2

Business case development, in most of the organisations interviewed in the previous chapter, is considered routine work requiring minimal attention. In many organisations, a business case is overstated in order to persuade decision makers to invest in the new technology; the same problem appeared in the views of the online focus group. Consequently, it is suggested that the business case should be developed by an independent entity if it is to retain its importance for the financial department and similar groups. Furthermore, the benefits validation (reviewing the plans for recouping the benefits to assure the plans can be set in motion) should be done before an IT project is chartered. Without a clear blueprint to detail how the business will work after the deployment of technology and the relevant organisational/behavioural changes, benefits validation will be impossible. A Project Management approach alone does not affect IT project management success and IT project investment significantly. However, when it is combined with Benefits Management practices, the probability of project investment success increases significantly. This indicates that the Project Benefits Management Framework is the best-known mechanism for implementing IT projects, as compared with BM or PM alone.

## 5.3 Second Study: Testing the Institutionalisation of a Project Benefits Governance Framework on ERP systems

This study aims to test the impact of institutionalising a project benefits governance framework on ERP success mediated by the existence of a business change manager and benefits auditors (Benefits management roles), and project management.

### 5.3.1 Theoretical Framework

This theoretical framework is developed on the basis of the literature review in Chapter2, Figure 2-5 . However, it is extended in the previous chapter. Based on propositions formulated and presented in section 4.5.3, this study tested the emergent hypothesis, as illustrated in Figure 5-5. First, it tested whether the institutionalising of PM practices affected the role of project managers and then whether the existence of Project Managers led to ERP investment success. Second, it assessed the impact of institutionalising benefits management practices on the existence of benefits management roles (i.e. business change management and benefits auditors). Third, it tested whether the existence of these benefits management roles affected the ERP investment success. Finally, it contrasted the solely PM approach, the solely BM approach and the institutionalising of the two practices, with the roles working closely together.

*In summary, these study research hypotheses are*

H5-6: Organisational Project Management Success mediates the positive relationship between the Organisational Project Management Success and the use of Project management in ERP implementation

H5-7: Organisational Investment Management Success mediates the positive relationship between the Organisational Project Management Success and the use of Project management in ERP implementation.

H5-8: the use of Project Management in ERP implementation mediates the positive relationship between Organisational Project Management and ERP success.

H5-9: Organisational Benefits Management Practices affects the use of Benefits Management in ERP implementation positively.

H5-10: the use of Benefits Management in ERP implementation mediates the positive relationship between organisational Benefits Management and ERP success.

H5-11: when Project Management and Benefits Management are institutionalised together in an organisation, the ERP implementation success increases significantly.

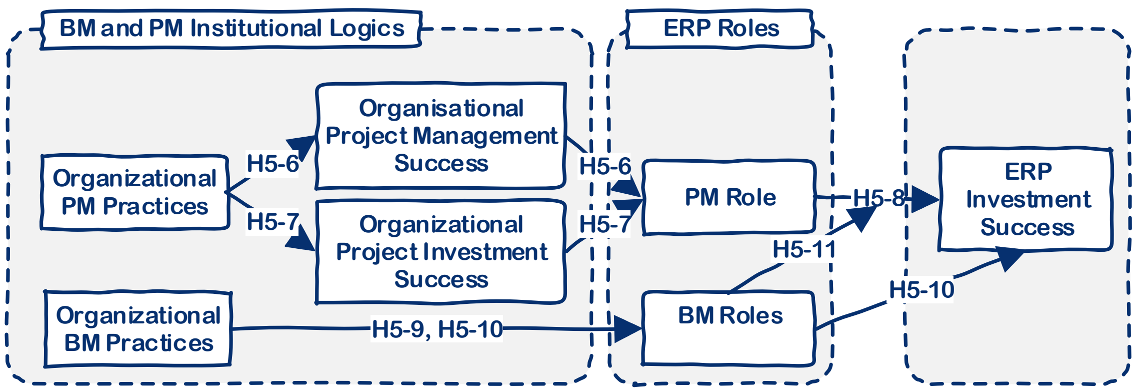



Figure 5-5: Theoretical framework for Institutionalising Project Benefits Governance

### 5.3.2 Research Methods

To online websites and addresses on a purchased database of organisations which had implemented ERP, a questionnaire was distributed through professional social media websites (LinkedIn) and e-mails sent directly using Qualtircs software. 223 responses were received, of which the useful filled responses numbered 130, and these were used in the analysis. The sample characteristics are illustrated in Table 5-6.

Geographically, to some extent, they represent Europe, the USA, and Arab countries equally, but at the same time, no differences in results were noted between countries or areas. About half of the respondents were project and programme managers. However, 17% of the respondents were ERP project manager. All of these sample characteristics assure the consistency of the results.

Table 5-6: Sample Characteristics used in applying a Project Benefits Governance Framework on ERP

| **Characteristics of the sample (n=130)** | | | | | |
|---|---|---|---|---|---|
| **Country** | **N** | % | **Experience** | **N** | **%** |
| Arab Countries | 25 | 19 | 0-3 Years | 41 | 31 |
| Europe | 30 | 23 | 4-8 Years | 38 | 29 |
| USA | 36 | 28 | 9-15 Years | 25 | 19 |
| Others | **39** | **30** | More than 15 years | 26 | 19 |
| **Total** | **130** | **100** | **Total** | **130** | **100** |
| **Positions** | | | | | |
| Project/programme managers | 63 | 48 | | | |
| CIO/IT Managers/IT directors | 26 | 20 | | | |
| ERP project managers | 22 | 17 | | | |
| Missing (failed to specify) | 19 | 15 | | | |
| **Total** | **130** | **100** | | | |

### 5.3.3 Operationalisation of Constructs

The distributed questionnaire consisted of seven sections: organisational project management logic; organisational benefits management logics; organisational project investment success; organisational project management success; benefits management roles in ERP implementation; ERP project success; and respondents' information. The questionnaire is in Appendix B.

Concerning the validity of the scales, Exploratory Factor Analysis (EFA) was deployed, using Principal Component Analysis with Varimax rotation to test the divergent validity of the constructs, as illustrated in Table 5-7. Based on KMO and Bartlett's test of the significance of the dimension reduction process for testing validity, this process is valid with P<0.000 and the sample characteristics for the dimension reduction process are adequate and accepted, as 0.884 (more than 0.6 is acceptable). Only the project management role fails to reach Cronbach's value because the construct is a single item construct.

Table 5-7: Validity (Factor Analysis) and Reliability Tests (Cronbach's alpha)

**Rotated Component Matrix[a]**

| | Component | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Cronbach's Alpha | .848 | .815 | .786 | .757 | .715 | .775 | - |
| PM_Succ_Time | | | | | | .840 | |
| PM_Succ_Cost | | | | | | .810 | |
| Proj_Inv_Realising Benefits | | | | .784 | | | |
| Proj_Inv_Return on investment | | | | .758 | | | |
| Proj_Inv_Users' Satisfaction | | | | .688 | | | |
| BM1_Business_Case | | | .511 | | | | |
| BM2_Benefit_Audit | | | .649 | | | | |
| BM4_Benefits_Identification | | | .738 | | | | |
| BM5_Benefits_Accountability | | | .745 | | | | |
| PM1_Project_Charter | | .627 | | | | | |
| PM2_Reviewing_Cost_Plan | | .771 | | | | | |
| PM3_Reviewing_Time_Plan | | .770 | | | | | |
| PM4_Imp_comm_plan | | .765 | | | | | |
| ERP_Bus_Chan | | | | | .747 | | |
| ERP_Benefit_Auditor | | | | | .738 | | |
| ERP_PM | | | | | | | .814 |
| ERP_Ease | .638 | | | | | | |
| ERP_Useful | .819 | | | | | | |
| ERP_ROI | .836 | | | | | | |
| ERP_Succ | .830 | | | | | | |

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 7 iterations.

### 5.3.3.1 Project Management Logics

#### 5.3.3.1.1 Practices and values

The level of adopting project management logics in the organisation’s projects is measured by the degree of agreement with the view that the respondents’ organisation engages in the following practices in its IT projects: having a project charter before starting to implement a new IT project; reviewing cost plans periodically; reviewing time plans periodically; and implementing communication plans.

This scale was used before in the earlier study in this chapter and also used in Badewi and Shehab (2016).This construct is reliable and valid because its Cronbach’s alpha is 0.815 and all items have loading scores of more than 0.6.

#### 5.3.3.1.2 Ability to deliver project management success

The basic assumption of the project management mentality is that the required project output must be delivered on time and within budget (Atkinson, 1999). Nevertheless, in recent project management research it is believed that project investment success should also be considered a proper subject for project managers if the desired results are to be delivered (Zwikael and Smyrk, 2012; Chih and Zwikael, 2015).

Therefore, the respondents were asked to indicate how far they agreed with the view that their organisations’ IT projects were delivered on time and within cost. These questions were used before in the previous study and also used in Badewi and Shehab (2016). The Cronbach’s alpha for determining the reliability of this construct was 0.775. In addition, as required by Factor Analysis for measuring the validity of the constructs, the factor loads of the items of scale exceeded 0.6, which confirmed that this construct is valid.

Organisational Project investment success is the concern of the project sponsor, who wants to judge whether a project is worth investment (Zwikael and Smyrk, 2012). Organisational Project investment success is operationalized in terms of return on investments, the successful realization of the desired benefits and users’ satisfaction (Serra and Kunc, 2015; Besner and Hobbs, 2006). A newer item in this construct than the one used in the previous study is the users' satisfaction. This to reflect the fact that investment success means not only return on investment but also the satisfaction of users with the project's outputs. This construct is used in Badewi and Shehab (2016). The reliability of the construct in the present study was 0.757 and the factor loads of the items under this construct were above 0.6. These figures indicate that these measures were reliable and valid for the analysis.

#### 5.3.3.2 ERP Benefits Management and Project Management roles

As discussed in the previous chapter, the presence of a Business Change Manager (BCM) and benefits auditor is crucial for applying benefits management logics. Likewise, the role of project management needs one actor at least, the project manager. But appointing them does not guarantee that they will be effective. Thus, the question arises "In implementing ERP, did you have one of the following roles"

In the present research, there were five possible responses: not available, part time but unsuccessful, part time and successful, full time but unsuccessful and full time and successful. After testing the validity and reliability of the construct, the two scales of BM and PM were found to be valid and reliable. The benefits management roles scale is used in Badewi and Shehab (2016).

#### 5.3.3.3 ERP Business Success

ERP project success is operationalized from two perspectives: the expectations of use and behaviour (Delone and McLean, 2002; DeLone and McLean, 2003); and the perception of project investment success (Zwikael and Smyrk, 2012; Zwikael et al., 2014; Badewi, 2015a; Badewi, 2015b). Therefore, respondents were asked to show their level of agreement on four aspects: ease of use, usefulness, return on investment and the perception of its success. This construct is used in Badewi and Shehab (2016). The construct was found reliable and valid for analysis with a Cronbach alpha of 0.848 and all factor loads for the construct above 0.6

### 5.3.4 Analysis

To test the impact of institutionalising PBGF on ERP success, after conducting correlational analysis to understand the relationship between the variables, three phases of tests were conducted, as illustrated in Figure 5-6. The first test was to assess the direct impact of PM and BM on the existence of PM and BM roles in ERP implementation, and to assess the impact on ERP success of the existence of these roles in ERP implementation. The second test was to find whether the existence of these practices without the presence of their agents affects ERP success. The last test was to judge whether or not it mattered to institutionalise the two practices with their agents present at the time.

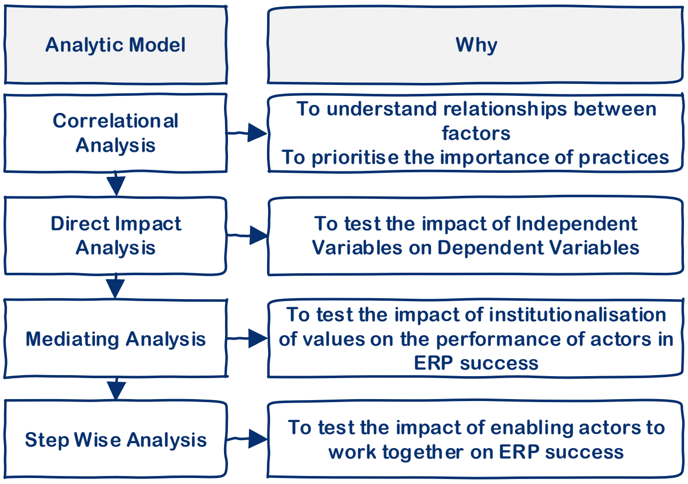



Figure 5-6: Analysis approach to test the institutionalisation of Project Benefits Governance on ERP

#### 5.3.4.1 Correlational Analysis

Correlational analysis was used to find the relationship between the different variables used in the analysis. Correlational analysis suggests that organisations which routinize benefits management practices are more likely than others to set up benefits management roles (business change management and benefits audit).

It is logical to find a correlation of 49% (P<0.001) for organisations which are used to benefits auditing for their routine projects and to allocating some role in ERP implementation and post-implementation to a benefits auditor. Furthermore, there is a close association (45.2% (P<0.001)) between the organisations which are used  to assigning accountabilities for benefits realization from IT investments by means of establishment a Business Change Manager in ERP implementation. In general, all benefits management practices are found by more than 40% to be closely associated with the existence of BM roles with a P-value of less than 1%. Regarding ERP success, the routinization of BM practices is not equally important. The business case shows the lowest association with ERP success, whereas benefits audit shows the highest association, by 18%, of all the variables in the study ($P<0.05$) and 44.7% ($P<0.001$).

As set out in Table 5-8, most of the variables are significantly correlated. This is due to measuring the variables that are correlated in real-life practices. In other words, the organisations which are used to a project management framework in their routine projects are used to it because of the correlation between the variables of 56.3% ($P<0.001$). Moreover, organisational project management success is correlated with project investment success by about 45.6% with a confidence interval of 99%. This implies that a significant number of the organisations that are happy with the delivery of their project outputs on time and within budget are happy with the benefits recouped from them and satisfied with them and with their return on investment from them.

Table 5-8: Correlational Analysis for variables used in testing the institutionalisation of Project Benefits Governance Framework on ERP Success

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PM_Success_1 | 1 | | | | | | | | | | | | | | | | | | | |
| PM_Success_2 | .636$^{**}$ | 1 | | | | | | | | | | | | | | | | | | |
| **PM_Success** | **.917$^{**}$** | **.891$^{**}$** | **1** | | | | | | | | | | | | | | | | | |
| Proj_Inv_Succ_Benefits | .370$^{**}$ | .454$^{**}$ | .452$^{**}$ | 1 | | | | | | | | | | | | | | | | |
| Proj_Inv_Succ_Sat_1 | .283$^{**}$ | .325$^{**}$ | .335$^{**}$ | .488$^{**}$ | 1 | | | | | | | | | | | | | | | |
| Proj_Inv_Succ_Sat_2 | .296$^{**}$ | .301$^{**}$ | .330$^{**}$ | .599$^{**}$ | .439$^{**}$ | 1 | | | | | | | | | | | | | | |
| **PM_Investment_Success** | **.387$^{**}$** | **.441$^{**}$** | **.456$^{**}$** | **.857$^{**}$** | **.774$^{**}$** | **.829$^{**}$** | **1** | | | | | | | | | | | | | |
| BM1_Business_Case | .287$^{**}$ | .328$^{**}$ | .338$^{**}$ | .239$^{**}$ | .165 | .308$^{**}$ | .290$^{**}$ | 1 | | | | | | | | | | | | |
| BM2_Benefit_Audit | .244$^{**}$ | .202$^{*}$ | .248$^{**}$ | .361$^{**}$ | .309$^{**}$ | .425$^{**}$ | .445$^{**}$ | .491$^{**}$ | 1 | | | | | | | | | | | |
| BM4_Benefits_identification | .259$^{**}$ | .337$^{**}$ | .327$^{**}$ | .391$^{**}$ | .253$^{**}$ | .317$^{**}$ | .393$^{**}$ | .508$^{**}$ | .430$^{**}$ | 1 | | | | | | | | | | |
| BM5_Benefits_Accountability | .185$^{*}$ | .239$^{**}$ | .232$^{**}$ | .313$^{**}$ | .172 | .307$^{**}$ | .324$^{**}$ | .351$^{**}$ | .538$^{**}$ | .562$^{**}$ | 1 | | | | | | | | | |
| **BM** | **.311$^{**}$** | **.351$^{**}$** | **.365$^{**}$** | **.417$^{**}$** | **.287$^{**}$** | **.436$^{**}$** | **.465$^{**}$** | **.749$^{**}$** | **.794$^{**}$** | **.790$^{**}$** | **.790$^{**}$** | **1** | | | | | | | | |
| PM1_Project_Charter | .305$^{**}$ | .329$^{**}$ | .349$^{**}$ | .280$^{**}$ | .183$^{*}$ | .323$^{**}$ | .321$^{**}$ | .358$^{**}$ | .262$^{**}$ | .416$^{**}$ | .318$^{**}$ | .431$^{**}$ | 1 | | | | | | | |
| PM2_Reviewing_Cost_Plan | .227$^{**}$ | .288$^{**}$ | .282$^{**}$ | .343$^{**}$ | .190$^{*}$ | .304$^{**}$ | .343$^{**}$ | .441$^{**}$ | .342$^{**}$ | .434$^{**}$ | .430$^{**}$ | .526$^{**}$ | .462$^{**}$ | 1 | | | | | | |
| PM3_Reviewing_Time_Plan | .264$^{**}$ | .227$^{**}$ | .272$^{**}$ | .333$^{**}$ | .191$^{*}$ | .307$^{**}$ | .340$^{**}$ | .334$^{**}$ | .228$^{**}$ | .345$^{**}$ | .365$^{**}$ | .407$^{**}$ | .426$^{**}$ | .689$^{**}$ | 1 | | | | | |
| PM4_Imp_comm_plan | .280$^{**}$ | .367$^{**}$ | .354$^{**}$ | .320$^{**}$ | .188$^{*}$ | .410$^{**}$ | .375$^{**}$ | .458$^{**}$ | .257$^{**}$ | .329$^{**}$ | .361$^{**}$ | .449$^{**}$ | .466$^{**}$ | .636$^{**}$ | .569$^{**}$ | 1 | | | | |
| **PM** | **.334$^{**}$** | **.382$^{**}$** | **.394$^{**}$** | **.393$^{**}$** | **.232$^{**}$** | **.420$^{**}$** | **.427$^{**}$** | **.497$^{**}$** | **.339$^{**}$** | **.473$^{**}$** | **.455$^{**}$** | **.563$^{**}$** | **.748$^{**}$** | **.854$^{**}$** | **.797$^{**}$** | **.836$^{**}$** | **1** | | | |
| ERP_Benefit_Auditor | .125 | .179$^{*}$ | .166 | .252$^{**}$ | .155 | .338$^{**}$ | .304$^{**}$ | .365$^{**}$ | .489$^{**}$ | .353$^{**}$ | .418$^{**}$ | .522$^{**}$ | .228$^{**}$ | .281$^{**}$ | .273$^{**}$ | .385$^{**}$ | .363$^{**}$ | 1 | | |
| ERP_Bus_Chan | .121 | .146 | .147 | .229$^{**}$ | .074 | .290$^{**}$ | .243$^{**}$ | .371$^{**}$ | .344$^{**}$ | .363$^{**}$ | .335$^{**}$ | .452$^{**}$ | .229$^{**}$ | .411$^{**}$ | .347$^{**}$ | .408$^{**}$ | .429$^{**}$ | .556$^{**}$ | 1 | |
| **BM_Roles** | **.139** | **.184$^{*}$** | **.177$^{*}$** | **.272$^{**}$** | **.129** | **.356$^{**}$** | **.310$^{**}$** | **.417$^{**}$** | **.472$^{**}$** | **.405$^{**}$** | **.427$^{**}$** | **.552$^{**}$** | **.259$^{**}$** | **.392$^{**}$** | **.351$^{**}$** | **.450$^{**}$** | **.449$^{**}$** | **.881$^{**}$** | **.883$^{**}$** | **1** |
| ERP_Ease | .248$^{**}$ | .293$^{**}$ | .298$^{**}$ | .345$^{**}$ | .219$^{*}$ | .340$^{**}$ | .369$^{**}$ | .118 | .394$^{**}$ | .176$^{*}$ | .232$^{**}$ | .297$^{**}$ | .065 | .196$^{*}$ | .074 | .166 | .158 | .283$^{**}$ | .214$^{*}$ | .281$^{**}$ |
| ERP_Useful | .132 | .309$^{**}$ | .237$^{**}$ | .249$^{**}$ | .204$^{*}$ | .377$^{**}$ | .337$^{**}$ | .167 | .343$^{**}$ | .184$^{*}$ | .233$^{**}$ | .299$^{**}$ | .293$^{**}$ | .308$^{**}$ | .285$^{**}$ | .264$^{**}$ | .355$^{**}$ | .263$^{**}$ | .315$^{**}$ | .327$^{**}$ |
| ERP_ROI | .266$^{**}$ | .435$^{**}$ | .381$^{**}$ | .218$^{*}$ | .202$^{*}$ | .350$^{**}$ | .312$^{**}$ | .180$^{*}$ | .370$^{**}$ | .263$^{**}$ | .290$^{**}$ | .355$^{**}$ | .274$^{**}$ | .212$^{*}$ | .272$^{**}$ | .290$^{**}$ | .324$^{**}$ | .333$^{**}$ | .220$^{*}$ | .313$^{**}$ |
| ERP_Succ | .250$^{**}$ | .377$^{**}$ | .342$^{**}$ | .249$^{**}$ | .291$^{**}$ | .309$^{**}$ | .344$^{**}$ | .141 | .383$^{**}$ | .241$^{**}$ | .339$^{**}$ | .356$^{**}$ | .247$^{**}$ | .215$^{*}$ | .272$^{**}$ | .223$^{*}$ | .293$^{**}$ | .301$^{**}$ | .286$^{**}$ | .333$^{**}$ |
| **ERP_Success** | **.267$^{**}$** | **.426$^{**}$** | **.377$^{**}$** | **.317$^{**}$** | **.275$^{**}$** | **.416$^{**}$** | **.410$^{**}$** | **.184$^{*}$** | **.447$^{**}$** | **.260$^{**}$** | **.329$^{**}$** | **.393$^{**}$** | **.270$^{**}$** | **.283$^{**}$** | **.277$^{**}$** | **.287$^{**}$** | **.345$^{**}$** | **.355$^{**}$** | **.313$^{**}$** | **.378$^{**}$** |

#### 5.3.4.2 Direct Effect Analysis

The results supported most of the research hypotheses, as illustrated in Figure 5-7. Organisational Benefits Management practices are found to be significant (with a Critical Ratio (CR) of 4.939 and P<0.001) on the use of benefits management roles (the existence and success of business change managers and benefits auditors). However, the direct impact, as illustrated in Table 5-9, of BM on ERP success is insignificant. Indeed, the routinization of these practices alone explains 44.1% (P<0.001) of the successful use of the BM roles. The existence of these BM roles and their success are found to affect ERP investment significantly by 0.371 (CR >2.337 with P < 0.02). Thus, by using indirect effect analysis, as shown in Table 5-10, the organisational use of benefits management is shown to affect ERP success indirectly by 0.246 with a confidence level of over 99%. This is a clear indication that the use of BM roles in ERP fully mediates the routinization of BM practices in an organisation as well as its ability to realize ERP business success.

Table 5-9: Total standardized impacts with their significance level and explanation ratios

| | | | St Est | S.E. | C.R. | P | R2 |
|---|---|---|---|---|---|---|---|
| **PM_M_Succ** | <--- | PM_Practices | .488 | .166 | 3.963 | *** | 33.5% |
| **PM_Inv_Succ** | <--- | PM_Practices | .579 | .140 | 5.512 | *** | 23.8% |
| **ERP_BM_** | <--- | BM_Prac | .664 | .145 | 4.939 | *** | 44.1% |
| **ERP_Project_Manager** | <--- | PM_M_Succ | .492 | .108 | 2.795 | .005 | 58.8% |
| **ERP_Project_Manager** | <--- | PM_Inv_Succ | .377 | .109 | 2.140 | .032 | |
| **ERP_Suc** | <--- | ERP_BM_ | -.371 | .124 | -2.337 | .019 | 55.1% |
| **ERP_Suc** | <--- | ERP_Project_ Manager | -.646 | .309 | -3.301 | *** | |
| **ERP_Suc** | <--- | PM_Practices | -.027 | .198 | -.176 | .860 | |
| **ERP_Suc** | <--- | BM_Prac | .169 | .147 | .967 | .334 | |

***at 99% **at 95%

The organisation's use of project management practices is found to be significant on both kinds of organisational project management and project investment successes, with an impact of 0.488 and 00.664 and a CR of 3.963 and 5.512 (both P<0.000). However, while organisational project management success affects ERP use and success by 0.492 with a CR of 2.795 (P<0.005), organisational project investment successes are found to have less impact (0.377) with a lower significance level (P<0.032) or significant at 95%.

Furthermore, 58.8% of the successful use of project management implementation from ERP comes from the ability of organisations to deliver routine projects successfully. Likewise, 44.1% of the successful use of BM roles in ERP implementation comes from the institutionalisation of BM logics in the organisation's routine projects.

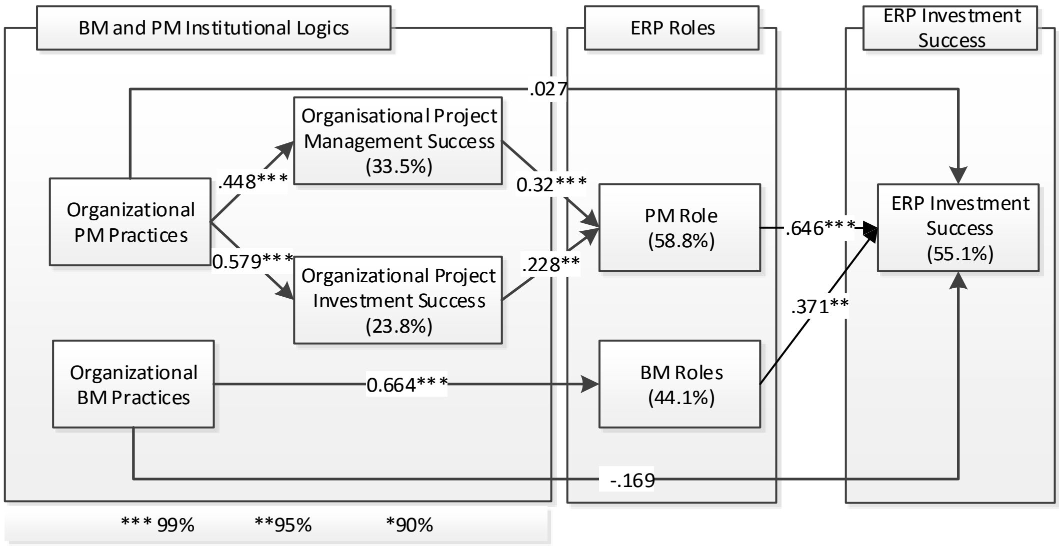



Figure 5-7: ERP Project Benefits Governance Model

### 5.3.4.3 Mediating Analysis

In order to discover whether the success of an organisation's implementation is important for achieving ERP success and whether the use of organisational benefits management practices need benefits management roles in ERP implementation, a mediation analysis was conducted. As the standardised indirect effects in Table **5-10** show, organisational BM and PM practices have a significant impact on ERP success. Nevertheless, no significant impact can be appreciated as directly affecting ERP success. This is a clear sign that the mediation hypothesis is supported. However, the PM practices that affect ERP success derive only from project management success and not from project investment success. This may indicate that the organisation's ability to realize ERP success does not necessarily mean that the organisation is required to be able to implement its project successfully from the financial perspective, as long as the benefits management practices are conducted properly.

Table 5-10: Standardized Direct and Indirect Effects on ERP success

| | BM Practices | PM Practices | PM inv succ | PM Mgmt Success | ERP PM | ERP BM |
|---|---|---|---|---|---|---|
| **Direct Effect** | 0.169 | -0.027 | 0 | 0 | 0.646** | 0.371*** |
| **Indirect Effect** | -0.246*** | -0.296*** | 0.243 | -0.318** | 0 | 0 |
| **Total Effect** | -0.078 | -0.323** | 0.243 | -0.318** | 0.646** | 0.371*** |
| **Impact** | Mediated by BM Role | Mediated by PM Mgmt success | No impact | Mediated by ERP PM | Affect ERP success | Affect ERP Success |

The significance level is estimated using Bootstrap of 2000 samples.

#### 5.3.4.4 Is PM institutional logic sufficient for ERP success? Step-Wise Regression Analysis

In order to find which institutional logic is more important, new variables were computed for analysis. Project management and benefits management logics are computed by multiplying the project management practices by the project management success and multiplying the benefits management practices by the BM roles in ERP implementation.

Stepwise analysis is used to find which logic is more critical and whether or not combining both logics would increase ERP success. In stepwise analysis, two competing models are compared, namely, project management logic and project management logic, combined with benefits management logic. The results suggest that PM logic alone explains only 17.8% of ERP success. However, according to Table 5-11, when PM and BM logics are combined in one model, taking into consideration the multi-collinearity problem, the explaining ratio is increased significantly by 8.1% (with P<0.000) to achieve more than 25%. Nevertheless, as the standardized betas in Table 5-12 suggest, the impact of institutionalising BM practices has more impact and more significant impact on ERP success than PM has.

Table 5-11: Explaining by stepwise analysis and significance level analysis

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | |
|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | Sig. F Change |
| 1 | .430[a] | .185 | .178 | .71233 | .185 | 29.017 | .000 |
| 2 | .516[b] | .266 | .255 | .67848 | .081 | 14.094 | .000 |

a. Predictors: (Constant), PMXPM_Success
b. Predictors: (Constant), PMXPM_Success, BMXBM_Roles

Table 5-12: Step-wise impact analysis

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 3.575 | .151 | | 23.624 | .000 |
| | PMXPM_Success | -.060 | .011 | -.430 | -5.387 | .000 |
| 2 | (Constant) | 3.703 | .148 | | 25.003 | .000 |
| | PMXPM_Success | -.041 | .012 | -.292 | -3.452 | .001 |
| | BMXBM_Roles | -.039 | .010 | -.317 | -3.754 | .000 |

a. Dependent Variable: ERP_Success

## 5.4 Summary

When a Project Benefits Governance framework is applied to ERP, the results are fuzzy. Thus, institutional theory is used to obtain more insightful views about the process of realising success. Indeed, this theory enables researchers to understand the phenomenon. Only when BM practices are institutionalised in the organisation do they affect ERP project success. Likewise, when project management practices are routinized in the organisation, ERP project success improves significantly. Indeed, institutionalising both practices in an organisation leads to a significant improvement in ERP investment success.

This research chapter can be criticised by it is inability to understand how the institutionalisation process happens in organisations. The main weakness of quantitative research is the incompetence in getting access to fresh and first-hand data. However, this research provides important quantitative and objective evidence that the institutionalisation process of project management and benefits management logics is critical for the ERP success. Therefore, it is recommended as a further to devote ethnographic case study research for understanding the factors affecting the institutionalisation process and understanding how to speed this process.

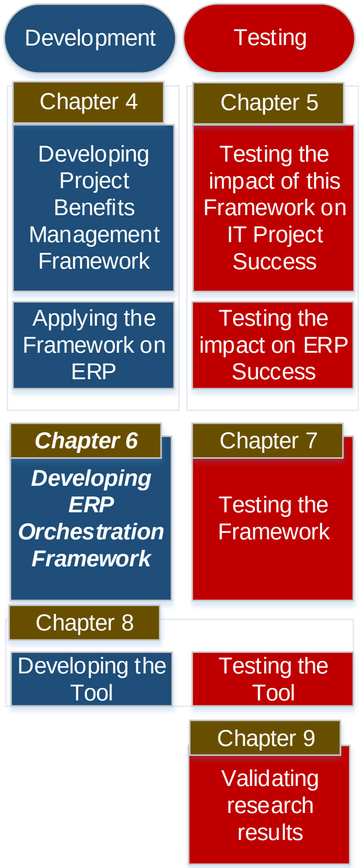
It seems, then, that the hard school, the benefits management school, alone is not sufficient to guarantee IS business success. However, the psychological schools of perception are found to have a significant impact on business success from IT projects (Petter et al., 2008b; Burton-Jones and Grange, 2012). This school of research claims that the major driver of success is "use" (Venkatesh and Bala, 2008). The “use” is the underpinning concept of these theories; the more the use, the more benefits will be realized and, in this sense, “success” will be achieved (Petter et al., 2008b). Consequently, all the researchers in this school consider the “use” variable as a mediator between what can be done and the success of the system (DeLone and McLean, 2003). These is a psychological school involved in learning (Burton-Jones and Grange, 2012), perceptions, attitudes, behaviour, motivation, and intention (Montano and Kasprzyk, 2008).

> *"People" is ALWAYS (the most) difficult - which is why people stuff is still mostly absent from best practice*” narrated by F3

Even though it seems that the psychological schools are more robust in interpreting the way to success than the action schools, it is not rational to claim that attitude alone can lead to success. If there is no systematic way of determining what is the meaning of success (benefits expected), proper planning to realize this success, effective implementation, and auditing of the results, success will not follow. Simply, there is no systematic way of determining what success means because it cannot be defined. Attitude points the way to identifying IS business success; however, if the way to success is not clear because success itself is undefined, then finding a path is meaningless.

Thus, this research goes a step forward in understanding the importance of bridging the space between the two islands. Benefits management without proper managing attitudes and perception is useless.  The bridge which is developed in the previous chapter is the blueprint design which connects Project management practices with benefits management practices. By developing the blueprint, the BM knows what should be done to motivate users, whereas the PM knows what should be implemented to enable BM to recoup the benefits. Thus, the aim of the next chapter is to design ERP blueprints for realising different ERP benefits.

# 6 Chapter Six: ERP Resource Orchestration Framework




## 6.1 Introduction

Benefits management practices combined with project management practices in a single project benefits governance framework were found to enhance the value of IT investments more significantly than merely using project management frameworks (Badewi, 2015a). It was found that studying the connection between project management and benefits management could lead to new and fruitful ways of overcoming the prevailing failures of IT investment. According to Badewi (2015b), the main connection point between project management and benefits management is the “blueprint”, or the future snapshot of how organisation will look like after IT-enabled change, including processes, information, culture, and attitudes to the IT artefact. This blueprint (the To-Be state) aims at delivering the organisational capability at the end of the day so that benefits can be realized (Ward and Daniel, 2006; OGC, 2011; Serra and Kunc, 2015).

Since ERP has a different group of benefits (Shang and Seddon, 2000; Shang and Seddon, 2002), it is expected that different, but complementary, blueprints for realizing ERP value (all potential benefits) would be found. To design each blueprint, standing on the shoulders of Melville (2004) and his followers (Schryen, 2013; Nevo and Wade, 2011) in understanding IT business value, IT resources (Technological IT Resources (TIR) and Human IT Resources (HIR)) could earn the expected benefits, even if conditioned by the existence of organisational complementary resources (OCR) such as a non-IT organisational structure and culture. This conceptual demarcation of resources made possible the use of orchestration theory to apply a certain group of IT resources to a set of organisational complementary resources. With this in mind, the research objectives of this chapter are to classify ERP benefits into groups and define ERP resources and organisational complementary resources for realizing each group of benefits. Finally, it is aimed to identify when extra resources shall be deployed (i.e. ERP technical resources) or developed (i.e. Organisational Complementary Resources). In other words, the aim is to develop the orchestration framework.

## 6.2 Research Methods

Data have been collected from interviews in 13 organisations which have implemented ERP and 8 consulting organisations in a range of developing and developed countries; namely, Egypt, Saudi Arabia, the UK, USA and Australia (Table 6-1). The participants were approached via a snowball process at some public and private organisations where ERP was implemented and/or where they worked as senior ERP consultants. The average interview time was four hours, including initial and follow-up sessions. In parallel, relevant documents were collected from each organisation. Annual IT reports (such as progress reports on plans for realizing benefits) and information about ERP implementation and post-implementation plans were analyzed.

Information Systems in Developing Countries (ISDC) are quite different from their counterparts in developed countries, in particular in the context of IS innovation (Avgerou, 2008). In addition, scholars working in the interpretive research paradigm believe that the reality of one organisation is not the same as that of another (Walsham, 2014). However, selecting organisations from different countries, contrasting and comparing the organisational factors, above all the cultural factors, has been found very helpful in theory development. In the present study, a critical realist paradigm was used, which contrasted transcripts. As shown in the interview guide ( 11Appendix E), peers were asked about what others had done, to see whether they agreed or disagreed and why, on the principle of “revealing and challenging prevailing beliefs and social practices” (Myers and Klein, 2011). In fact, getting rich input from different countries improved the process of theory development since different experiences in different contexts helped to explain the differences in realizing the benefits from the use of ERP.

A UK private organisation which was perceived to have shown unusual performance by means of its ERP system was contrasted with another private one from the USA which was perceived to have shown normal performance with the same means. In addition, a UK council which had a relatively well-integrated system was contrasted with an Australian council which had a less well-integrated ERP system. A Saudi ministry which had invested more in IT was contrasted with a Saudi Bank which had invested more in people.

Table 6-1: List of interviewees

| | Organisation | Country | Role | Exp | System |
|---|---|---|---|---|---|
| **1** | Pharmaceutical Company | Egypt | ERP Manager | 5 | SAP |
| **2** | Food and Beverage production | Egypt | ERP- Sales Business Consultant | 8 | Oracle |
| **3** | Health Care Services | KSA | SCM Manager | 4 | |
| **4** | Pharmacy Retailing Group | KSA | Corporate Sales Manager | 20 | EPICOR |
| **5** | Ministry | KSA | IT manager | 15 | BoB |
| **6** | Bank | KSA | ERP integration manager | 10 | BoB |
| **7** | Government | Australia | CIO | 17 | BoB |
| **8** | Safety and Security tools manufacturing | USA | ERP Analyst | 14 | Oracle |
| **9** | Nuclear Technologies | UK | ERP Consultant | 15 | Oracle |
| **10** | Food and Beverage production | UK | ERP Manager | 7 | SAP |
| **11** | Food and Beverage production | Emirates | Supply Chain Manager | 6 | SAP |
| **12** | County Council (Focus Group) | UK | ERP Manager | 8 | Oracle |
| | | | Programme Manager | 12 | |
| | | | ERP Customer Manager (ERP) vendor representative | 20 | |
| **13** | Food and Beverage production (Focus Group) | Egypt | IT Infrastructure Manager | 6 | SAP |
| | | | MM ERP manager | 5 | |
| | | | SD ERP manager | 5 | |
| | | | CIO | 20 | |

BoB: Best of Breed
KSA: Kingdom of Saudi Arabia

Moreover, five Fast Moving Consumer Goods (FMCG) organisations in Egypt, the Emirates, Saudi Arabia and the UK were contrasted because all of them face the same problems of tracking, planning and innovating in their product lines. Finally, a healthcare organisation which had a continuous innovation programme was contrasted with the other organisations. Later, eight consultants in the UK and Egypt were approached. They were selected for their long service (15 years or more) and for their experience in international projects involving ERP implementation and/or the management of realizing ERP benefits. The aim of these interviews was to grasp the social constructions of experts about the different ways in which they implemented the ERP and then to validate and contrast these with the results from the previous stage.

## 6.3 Framework Development

After axial coding and consolidating the qualitative analysis for ERP benefits, ERP resources, and ERP OCRS, a new conceptual framework was developed, as shown in Figure 6-1. In order to achieve each category of benefits, besides the ERP resources requirements to earn these benefits, certain complementary organisational resources (OCRs) are required as well. ERP resources are not only technical features of ERP, but also IT department competencies. Nevertheless, ERP resources are not sufficient to realize ERP benefits; rather, ERP organisational capabilities conditioned by practices, organisational characteristics and psychological factors are required to obtain the benefits. This framework was based on the IT Business Value model of Melville et al (2004) in the process of the value generating process. A business process, according to Melville (2004), is improved through IT resources, which consists of the technological and human resources in IT, and certain complementary organisational resources.  The theoretical foundations of this framework are developed in the literature and set out in Figure 2-7.

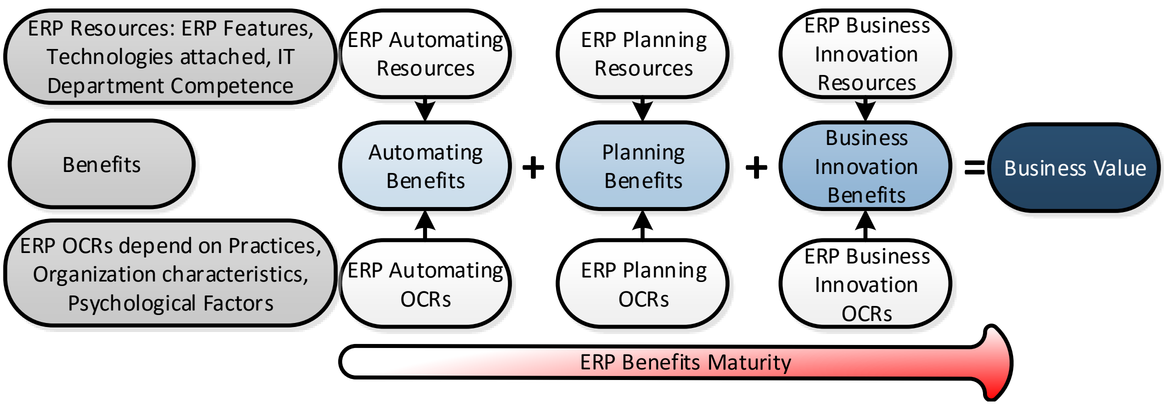



Figure 6-1: ERP Resource Orchestration Framework

## 6.4 ERP resources, Organisational Complementary Resources (OCRs) are required to gain the different kinds of ERP benefit

### 6.4.1 Benefit Matrix

A Benefit Matrix, as illustrated in Figure 6-2, is developed on the basis of two phases; departmental benefits (e.g. inventory benefits, production benefits, marketing benefits, and HR benefits) and benefits related to the capabilities required. After using memos and focused coding concurrently with analysing the OCRs required to achieve benefits, a new classification emerged. Initial coding was used to categorize the main themes from the respondents' point of view. The first interview questions clearly had to be open-ended because the themes were not clear enough at the time (Kvale and Brinkmann, 2009). However, a second look at the transcripts of the recorded interviews with focused coding (Charmaz, 2006), revealed new themes, i.e. a benefits matrix. This benefit matrix has two dimensions: importance to current business and importance to future business. This matrix was found close to the IT application portfolio (Peppard and Ward, 2002).

| Importance to Future Business | | |
|---|---|---|
| | **Middle Level Benefits (Planning & Controlling Benefits) – Decision Making Benefits** | **High Potential (Business Innovation Benefits)** |
| High | Higher reliability plans, (Higher use of resources)<br>Improved production scheduling,<br>Improved accuracy of forecasts (Increasing customer satisfaction)<br>Improved cash planning (decreasing the amount of organisational idle cash)<br>Improved inventory planning (lowering the Inventory level) | New improved ways of managing resources (inventory, receivables, and cash)<br>New improved ways of producing/delivering products and services<br>Developing new products and services using ERP<br>Developing new strategies for managing organisation<br>Capturing new customers |
| Low | Improving organisational efficiency,<br>Cost reduction through time reduction,<br>Customer responsiveness,<br>Eliminating double data entry,<br>Reducing errors,<br>Reducing the time needed for the purchasing and selling cycle. | Infrastructure for extended systems such as CRM, e-SCM, and Big Data.<br>Reduced IT costs.<br>Increased IT infrastructure Capabilities |
| | **Bottom Line benefits (Automating Benefits)** | **Support (IT Infrastructure benefits)** |
| | High | Importance to Current Business — Low |

Figure 6-2: ERP Benefits Taxonomy

It is illustrated in Figure 6-3 that ERP benefits may be classified into IT infrastructure benefits, automating benefits, planning benefits, and Business Innovation benefits.

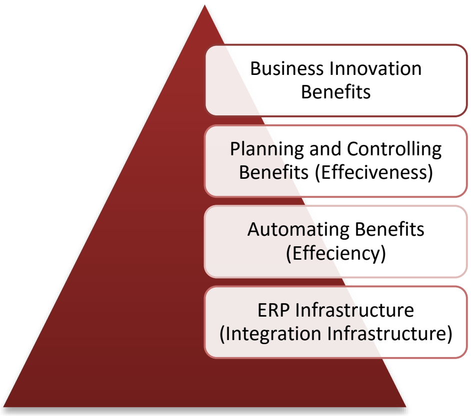



Figure 6-3: ERP Benefits Pyramid

To be fair, ERP infrastructure benefits are not business benefits in themselves; rather, they are IT benefits with no direct impact on the organisation. However, the ERP infrastructure as an integrating infrastructure is the most important benefit, since it enables the organisation to earn automating benefits and planning benefits. This was clearly grasped in most of the interviews; one respondent who worked in an organisation that enjoyed both automating and planning benefits believed that this was due to

> *"Integrating business processes. For example, even if your business operates formally in one country, ERP system allows you – inventory system to be integrated with sales order system which can be integrated with accounts receivable and this in general ledger for financial reporting. The number one benefit of ERP is … integration."* ERP expert user in the USA.

However, a member of one of the organisations that had not secured automating and planning benefits believed that

> *"we wanted monolithic ERP system but by the time we could not buy one, and that is why we ended up by best of breed, and yes this is our big problem actually, because we as councils I mean as a huge council we have to maintain all those internal linkages between the ERP system. For example I mean obviously expenditure and our payroll system goes out but needs to be fit in the financial system that also linkage here. So we have always problems with all those linkages in our ERP systems. And this is one of our core problems*" CIO at Australian Council

Indeed, although ERP as an IT infrastructure is not a business benefit, it is a very important enabler for gaining automating and planning benefits. Furthermore, once an organisation is able to control its data and to ensure the quality of the data, it can use them in planning, since the information in reports is reliable enough to be used. Furthermore, planning through the data in the system is a cornerstone for innovating through the ERP system. According to the present research findings on identifying benefits integrated with Zuboff's taxonomy of benefits, ERP benefits are here divided into automation, planning and innovation benefits. While automation benefits concern the productivity of the organisational processes and better management of warehouses, informational (planning) benefits concern improvements in production scheduling and in decision-making (Uwizeyemungu and Raymond, 2010). Transformational (innovative) benefits, for their part, relate to the development of new products.

To sum up, the lowest level benefits are integration infrastructure benefits whereas the highest-level benefits are business innovation benefits. The maximum benefits can be realised from ERP can be scaled on automating benefits, planning benefits and innovating benefits. The maximum automating benefits is no-paper work in the organisation whereas the maximum planning benefits is the ultimate use of ERP in planning so that the level of errors in forecasting and predicting is minimized. Finally, the maximum innovating benefits is the highest by the continuous successful innovation in an organisation in such a way to keep outperforming competitors. The definitions of these scales are further elaborated in chapter 8.

### 6.4.2 ERP Automating Benefits

Automating benefits are found, as illustrated in Figure 6-4, in this research to be improving organisational efficiency, cost reduction through time reduction, customer responsiveness, elimination of double data entry, reduced human data entry errors and less time needed for the purchasing and selling cycle. Thus, ERP automating benefits are defined as advantages perceived by benefits owners, which are realized once an organisation automates its value-engineered business processes.

Automating current processes does not add much value in itself; rather, automating the new processes that are value-engineered is the main way to derive value from automating benefits (Peppard, 1998). An American CIO asserted that not only was good implementation required for earning automating benefits, but also "*the type of business process*". From another angle, an Egyptian ERP expert believed that "*Automating, it does not need anything just a good implementation*". The main enablers for achieving automating benefits are good integration, success in ERP implementation as a project, bottom line users' acceptance of the system, and fitness between ERP functions and organisation processes.

> "*The problem that we faced in ERP implementation in our company* ***is automating the AS-IS.*** *We did not have at that time the* ***vision of the To-Be****. Indeed, it was a very big mistake which cost us a lot, later. Without understanding why do we do what we do, we will not be able to "fit" the ERP in a way that would let the benefits be realized*" ERP consultant from the UK food industry.

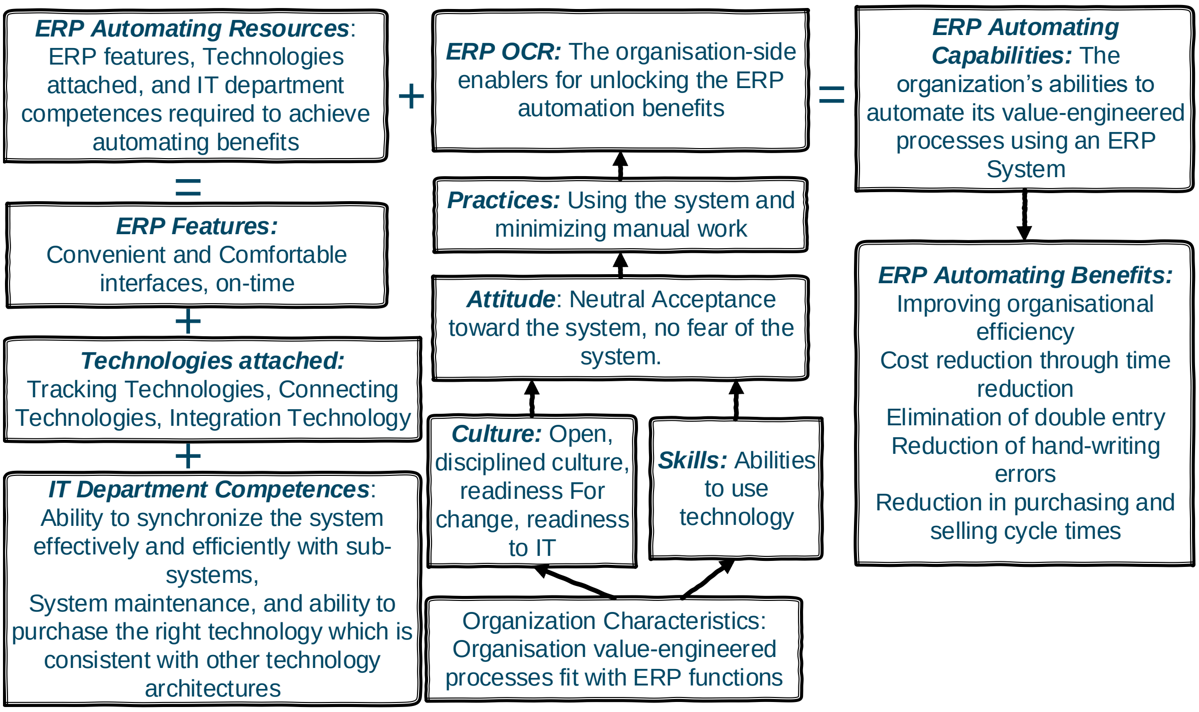



Figure 6-4: ERP Automating Benefits Blueprint

### 6.4.2.1 ERP Automating Resources

The ERP resources required to achieve automating benefits are classified under ERP technological and ERP human resources. The main purpose of ERP resources is to make data entry and information retrieval life easier for users. In other words, the ERP should be reliable, convenient, easy to use, and suitable for collecting data from its origins with fewer human interventions.

#### 6.4.2.1.1 ERP Automating Technological Resources

The features that appear important are those which allow people to adapt quickly to the system from the psychological point of view, such as convenience and comfortable interfaces and self-help support features that reduce anxiety for those using the new system. Although ERP is known as automation software, some organisations are not able to achieve the automating benefits of ERP. Automating benefits needs not only an integrating process in a certain department, but also needs the functions of the whole enterprise to be integrated into a single system. Thus, if ERP cannot complete this integration, it fails to earn the benefits of automation. The IT department competences required are the ability to synchronize the systems effectively and efficiently without breaching them, so that users can feel the reliability of the system and the adaptation process

The technologies that are perceived to be required are scanning and text reading technologies and tracking technologies such as RFID and Bar Codes, which connect an organisation via technologies to other external organisations and, most important, which integrate one technology with the others. For instance, unlike the British local authority body which has a “scanning” system (to digitalise the manual invoices and external documents with an external stakeholder), which is not integrated with the current system), the Australian governing council struggles hard to integrate its own system with those of its vendors, citizens and other external parties because they do not have a suitable integration platform

> “*I mean we would have focused **on our software suppliers** to move much faster into the area of **connecting with the core system.** For example, let’s say the taxation system – make that available for citizens as well itself: mobile*

*applications, hifi applications and IPad applications android, all that is very, very slow to come forward.* ***I mean that is one of the problems"*** CIO Australian Government

#### 6.4.2.1.2 ERP Human Automating Resources

Although ease of use and perceptions of usefulness are psychological factors, ERP resources can ease the way a job is done by using simple customized systems in routine places, as a Point of Sales (POS) system does. Unlike the Egyptian food company in which users were challenged in using the system because it caused a bottleneck in the processes of their sales functions, a pharmaceutical company in its marketing department overcame this problem by implementing an "easy-interface" system for sales representatives and integrating this system with the ERP.

> *"Yet our marketing department has struggled a lot in implementing the ERP. After discussing that with the XYZ consulting company, we implemented a very easy point of sale [application] which is integrated with ERP. Doing this made the implementation very successful and now the marketing and sales people are using the ERP in virtually all their transactions"* MM (Material Management) SAP consultant at an Egyptian pharmaceutical company

The IT department competences required are technical competences, such as the ability to synchronize the systems effectively and efficiently without breaching them, so that users can trust the reliability and adaptability of the process. Technically, the IT department should be able to manage any technical problems that might occur during use, such as a system block due to high levels of data entering at the same time. According to the Egyptian company, their ERP system ( SAP in this case) was often blocked because high volumes of data from different systems were entering at much the same time. This led to many business problems which made the users anxious about the system. However, the IT department studied the reasons for this "block" and worked carefully to overcome the technical problems underlying it. This caused the users to feel confident once more about using, relying on and believing in the ERP system.

Furthermore, the current ERP system sometimes needs to talk to other systems such as Customer Relationship Management (CRM) or Supply Chain Management (SCM). Not all organisations are found where different systems can talk at the same time. But the organisations whose IT department skills are advanced enough to integrate different systems are found to be better than those whose IT departments lack such skills. When the Australian council is contrasted with the British council, the Australian council seems to have struggled painfully because of its inability to integrate different systems, whereas the British council invested in IT departments and technologies which could integrate different systems.

### 6.4.2.2 ERP Automating Organisational Complementary Resources (OCRs)

Regardless of the importance of ERP resources in obtaining automating benefits, they are not sufficient unless they are complemented by the organisation's capacity to realize these benefits. Therefore, an organisation should have ERP automating OCRs if it wants to install ERP automating. ERP automating capability is defined as the ability of an organisation to map all business processes on its ERP system in such a way that all the data from their origin to their destination are recorded and analysed using ERP resources.

#### 6.4.2.2.1 Attitudes Required for Automating Benefits

The ultimate benefits of automating can emerge only when the users of the system integrate its use in their practices in such a way as to minimize manual work. These practices can be valid only if there is a positive attitude (based on ease of use, usefulness and the need to use) to the system, which inclines the employees to use it. This attitude may be governed by the organisation's values vis-à-vis changes and organisational transformations (Besson and Rowe, 2012).

#### 6.4.2.2.2 Users' Skills Required for Automating Benefits

The skill that has been found necessary for recouping benefits is the ability to use the ERP smoothly for data entry and to generate basic reports without difficulty. As long as users know how to use the system, it is expected that their efficiency will improve and errors will decrease.

#### 6.4.2.2.3 Organisational Characteristics required for Automating Benefits

A disciplined organisation (with its routinisation of its own processes) is found critical for successfully mapping the business functions on an ERP system. Undisciplined organisations (i.e. organisations that have no clear workflow for the documentation cycle) struggle more than disciplined ones. The latter have a clear structured workflow, whose users understand their positions in the organisation structure and there is no conflict between the roles and positions in the organisation. If all these factors exist after ERP implementation, it indicates that the ERP fits well with the organisational process and hence automating benefits may be expected. An organisation which was disciplined before ERP implementation would benefit because of its disciplined culture and its possession of clear circles of responsibility and authority, which make the business processes of re-engineering and value engineering easier. Furthermore, in such an organisation benefits can be attributed to specified departments/persons and thus can be traced better. All of these factors help in obtaining automating benefits from the ERP.

It must be admitted that an over-disciplined organisation before implementing ERP can hinder the progress of ERP because its structured workflow works against the ERP documentation workflow and they struggle for a period until the organisation and the ERP settle down together. Thus, in such organisations, openness and readiness to change are necessary (in fact the thirteen organisations surveyed included no example of a strong documentation cycle for a long time and none has faced huge resistance to ERP). To be sure, changing what people have been used to doing for many years affects their self-confidence because it reminds them of their inability to control the environment (the fear of the unknown represented by new technology and new business processes). Thus, one of the tricks used to overcome this problem was

> "*Before implementing the ER … [we tried] to make* ***business process re-engineering*** *before implementing the ERP. By doing so, we could hedge* ***the risk of the negative perception by the users and their reactions to the new processes*** *and the risks of* ***new technology***." ERP Consultant in Egypt

### 6.4.3 ERP Planning Benefits

The ERP planning benefits found in this research are a lowered inventory level, increasing customer satisfaction, higher use of resources, and more reliable plans with fewer errors. Thus, the ERP planning benefits predict the advantages perceived by the benefits owners (planners) from using ERP based reports. ERP planning capabilities are the ability to use the ERP system to understand, and therefore to predict, the behaviour of the internal and external environment so that an organisation can plan and therefore control its environmental factors. ERP, according to the claims in the literature, can affect the forecasting quality (Dorantes et al., 2013). Nevertheless, the present research found that this statement is based on many assumptions. The assumptions can be classified into OCRs and ERP resources, as illustrated in Figure 6-5.

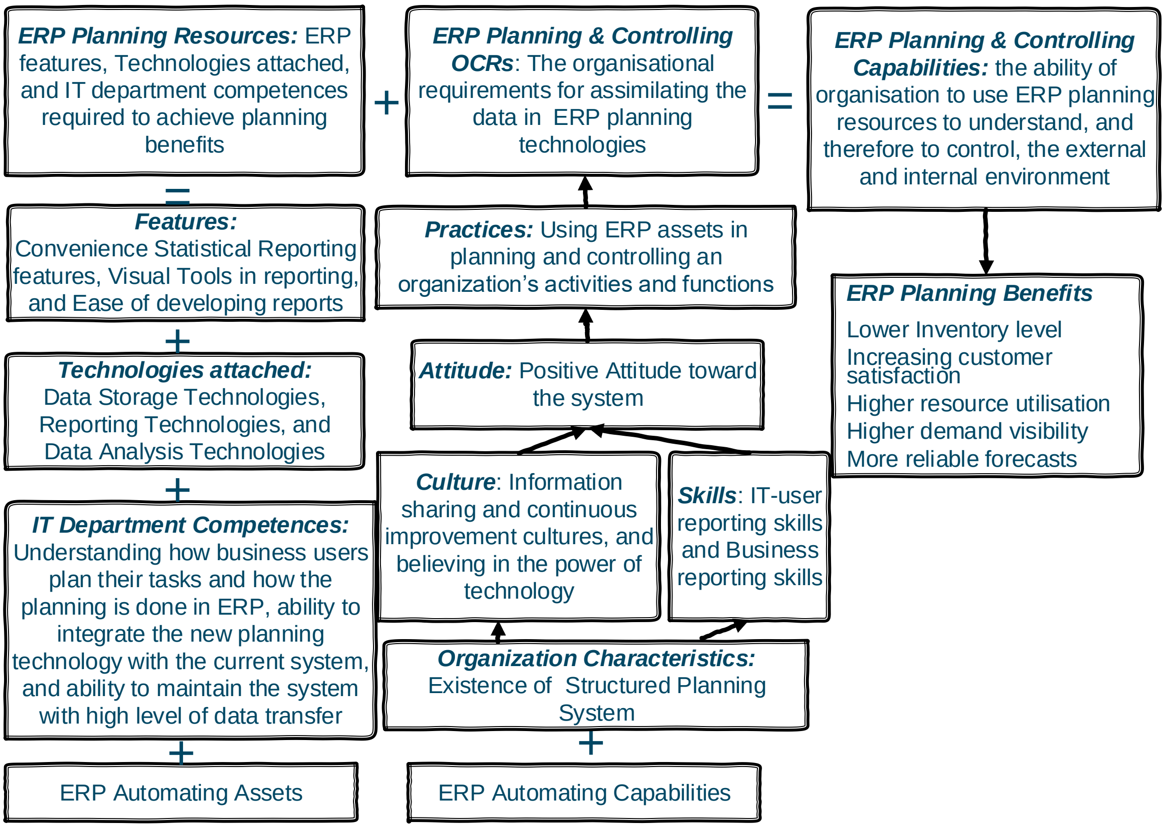


Figure 6-5: ERP Planning Benefits Blueprint

### 6.4.3.1 4.2.1ERP Planning Organisational Complementary Resources (OCRs)

A capability needs to be mature before it can realize its benefits and be self-sustainable. This will not happen until it is integrated in the organisational routine or becomes part of the users' practices. For it to be a part of the users' routine, they must value the use of it and perceive the ease of using it in the planning process. Both perceptions are required for a positive attitude toward it (Badewi et al., 2013). Without knowing how to use it, these perceptions will most deeply undervalue it and therefore it will not be used effectively enough for gain the expected benefits (Burton-Jones and Grange, 2012).

OCRs were found to be critical for building ERP planning capability (being part of the organisational routine) and were found to be either users' factors (skills and attitudes) or organisational factors (characteristics and culture).

#### 6.4.3.1.1 Users' Skills Required for Planning Benefits

In this research it was found that, to use ERP in planning their activities and tasks, employees need to be IT qualified (and able to work on reports) and qualified in business practices (able to recognize planning models in sales and/or inventories). As the quotation in Table 6-2 shows, the reporting skills of IT-users are their ability to comprehend and use the ERP reporting features smoothly, whereas the business reporting skills are the ability to understand and to apply the business planning principles and concepts of ERP reporting functionalities.

Table 6-2: sample of quotations showing the skills required for planning using ERP

| IT- users reporting skills | Business reporting skills |
|---|---|
| *"Although we gave them a lot of training on planning features, users do not know how to* ***use the planning features of the system****. They are not interested in the system. The* ***training*** *was* ***not effective*** *at all because they were* ***not involved in the system*** *itself"* Production Planning SAP consultant at Egyptian Food manufacturing | *"Based on my experience of ERP systems, a significant number of organisations fail to recoup planning benefits not because of the ERP; but because users* ***do not understand the planning concepts*** *in it."* ERP consultant in Egypt |
| *"Planning activities could be more abstract, as I mentioned before (realizing the benefits requires money and time). When I saw MRP* | "*In the Inventory department, the users and super users* ***do not understand the inventory models.*** *However, in the* |

| | |
|---|---|
| *implemented that essentially matched supply and demand, I saw the planning people* ***overwhelmed***. *They planned on a* ***spread sheet and implemented it on ERP***. *It is* ***more accurate*** *but it* ***is not easy for them***. *If users do not use it, then* ***you will not get the benefits***.*"* ERP analyst at an American company manufacturing safety equipment | *Accounting and Costing department, the new manager gives cost accountants training in modern accounting principles. This has had a significant impact on users to not only* ***believe in the power of the system***, *but also this* ***made them start to plan costs using the ERP***" MM SAP consultant at an Egyptian food manufacturing company |

#### 6.4.3.1.2 Users' Attitudes Required for Planning Benefits

A positive attitude toward the system with high expectations of planning benefits before ERP implementation and after ERP implementation affects the organisation's practices in this regard. In addition to a planning culture, the ability to acquire skills of a suitable kind leads to a positive attitude toward the system. All these elements are required for changing the organisation practices for integrating ERP planning practices into day-to-day organisational practice.

Organisations, which strongly believe in the power of technology in their planning and scheduling activities, outperform others which do not. This is consistent with another research belief: those pre-implementation expectations affect the use of the system in the post-implementation phase (Saeed et al., 2010; Veiga et al., 2013). However, some organisations value the culture of planning, but do not believe in the value of using ERP for planning.

> *"The users undermine the use of ERP in planning. They* ***believe that ERP is not for planning***. *It is just to automate the processes. They still plan using Excel. There is* ***no clear motivation to explore or exploit the ERP planning features****"* *MM specialist at an Egyptian food company*

#### 6.4.3.1.3 Organisation Characteristics Required for Planning Benefits

To enable an organisation to recoup the benefits of ERP, it requires three organisational characteristics. These are a knowledge share culture, an organisational structural planning system, and a culture of continuous improvement.

Hence, the quality of the planning system is found in some studies not to be critical for using these systems (Popovič et al., 2012), and in these cases a knowledge share culture may be the missing link (Popovič et al., 2014). In this research, it was found that a negative knowledge share culture affects management policies in setting different permissions and accessibilities regarding data in different departments in such a way as to hinder effective planning.

> *The problem in planning through the system is that **decision-makers want to hold on to the information:** they **do not want to share information** across different departments" ERP Implementation Consultant at an Egyptian Company*

> *"In my experience, there is **no clear intention to enable organisations to share data**. As a supply chain manager, I **cannot see** the demand forecasts from the marketing department although we have an integrated system. That is why we are still working on a **push inventory**. You cannot imagine **how much we lose because of that**. I have talked to top management a million times but no way." Supply Chain specialist in Food Manufacturing at an Emirates company*

Furthermore, if an organisation does not value the planning function of management, it cannot be expected to plan using ERP, which poses more challenges for learning and adopting. This idea arose when an Egyptian expert claimed that the first reason for not achieving any planning benefits from ERP is that the organisation in itself does not have any manual/structured method of planning.

> *"Planning!! They do not have **any structured planning system**. Planning in best cases is for the week. **I have never seen any of them using any ERP planning tools**. Organisations should know how to plan first before using ERP for planning" ERP Oracle Consultant in Egypt*

Thus, it has been found that an organisation which applies lean principles in Egypt has a strong planning system to minimize its costs. This indeed helped the organisation in question to realize the planning benefits that were beyond its peers.

### 6.4.3.2 ERP Planning Resources

#### 6.4.3.2.1 ERP Technological Planning Resources

The features found to be most important in this respect are an organisation's convenient statistical reporting features, convenient at least from the perspective of the users and visual tools in reporting features. In one organisation,

> "*I think one of the weaknesses of the ERP system is that sometimes tools for planning are **not too easy to use**. Planning data **can be overwhelming** to the user and I know upnext ….. In my other company, we have reliable custom reports and custom screens to **help users really be comfortable with planning, that are provided by the ERP system**.*" ERP Analyst at an American company producing safety equipment

In the same vein, since planning is almost wholly about using historical data to predict and therefore to control future behaviour, the power of ERP to provide the average person with high level statistical abilities conveniently, with easy-to-use statistical interfaces in an organisation helps ERP to be incorporated in his/her normal daily planning and controlling practices.

> "*Now, after we upgraded the Oracle ERP, we have **convenient and easy-to-use features** that enable normal users **to use the statistical power of the ERP system**. This has enhanced **many planning activities**"* ERP Manager of a Nuclear Power organisation in the UK

The technologies that are perceived to be relevant are the capacity to store data, speed of receiving and sending data and reporting technologies.

> *"If that were much more closely coupled with the finance system, it would be beneficial everywhere, because at the moment it is a whole section doing that. All its performance is to report on it. That is the next step, reporting, because there are many different systems and different databases. We **now** have to **develop our own data warehouse that we report** from. And that form would sort out a lot of problems as well"*

Reporting Flexibility is the power supporting the use of statistical models. The users must be taught to build their own statistical models and not rely only on the established ones. In other words, the current fixed statistical models represent a lens for decision makers. If they want to change the lens through which they look at the data, the system will stop them from doing that because of its inflexibility. These features are meant to enable users to change and customise the layout of their reports while taking into consideration the unified definitions. It should be noted that, according to this research, unified definitions of the terms used in reports are vital. Users become demotivated about customising reports because they do not know/understand the key words in reporting, such as ‘revenue and profit’, ‘inventory in hand’ and ‘available inventory’.

#### 6.4.3.2.2 ERP Human Planning Resources

Two main skills are required from IT department. First, business skills are required to understand are how current users plan the use of organisational resources (e.g. inventory planning, sales planning and receivables and payables planning), and how the planning process shall be done in ERP to get the best use of it. The second skills required from IT department are the technical ones, which enable them to integrate planning technologies with the current ERP systems (e.g. enabling high level of data transfer without interruption, security, and data encryption of the planning data).Technical skills are mainly for impressing the users by the reliability of the system in terms of data accessibility.

Regarding IT business skills, according to three experts in Egypt, the main obstacle that they face when they give users the freedom to customise their reports is the inability to pick the right key words, which leads to unintended consequences. Thus, the experts’ strategy was to block users from customizing reports; this work was done only by a committee convened from several departments. This strategy, as they agreed, was very slow and stopped users from customizing their reports. The alternative strategy, found extensively in the UK, was to have a unified clear dictionary of terms to help users and let them play freely with the data without fear of picking the wrong key words in their reports.

Indeed, although most well-known ERP systems (e.g. SAP and Oracle) enable the users to do all of these things because customizability is a built-in feature, the IT/ERP manager sets restrictions (either physical, such as closing this feature for their ERP accounts or psychologically, such as convincing the user that it is very risky to customize). This decision by the IT department or top management de-motivates users who want to know/use these features because the users need to avoid the risk of accessing intolerant data (such as could be perceived as risky to share but in fact are not). Thus, it is expected that the existence of proper data governance policies and privacy clauses would identify which information should be hidden and which should not. The certifications of the profession (for instance, the Certified Internal Systems Audit (CISA)) were set up for this task. A top management which had these might be motivated to encourage users to get the best use of the company data for planning purposes.

Employees do not readily turn to ERP to plan their activities without some incentive. Years of experience of planning by means of a certain technology (e.g. Excel) may hinder people's ability to explore new planning systems. This is the role of the IT department: to introduce, encourage and train users to use using ERP for planning. Indeed, unless the IT department takes on this fundamental role, the value of ERP will virtually drop to zero or even lower. As noticed early in the literature, the value lies in the incremental benefits minus the incremental costs of introducing a new system. If the planning capabilities of ERP are not used, there is no reason for implementing an "Enterprise Resource Planning" (ERP) system. The IT competences required would be those of understanding current business processes, giving advices to business users for using ERP in planning and promoting good planning practices through workshops and seminars.

### 6.4.4 ERP Innovating Benefits

The innovating benefits from ERP, as illustrated in Figure 6-6, are new improved ways of managing resources, of producing/delivering products and services, of developing new products and services using ERP, developing new strategies for managing the organisation and capturing new customers. All of these benefits spring from the ability in decision makers to understand and absorb the current environment. ERP business innovation benefits are the positive advantages perceived by benefits owners due to their ability to understand their environment.

To claim ERP improves the organisation ability to innovate is questioned in literature, as discussed in literature (section 2.7.2). The main argument against the ability of ERP to innovate was because the rigidity of ERP which structurizes the business processes of the organisation leaving it too rigid to innovate

(Davenport, 2000; Trott and Hoecht, 2004a). Therefore, without considering this perspective, the logic flow will be imperative. Consequently, this negative effect of the existence of ERP on innovation is proposed

***Proposition 6-1:*** Existence of ERP affects innovations in organisations negatively mediated by the created organisation rigidity from it.

In contrary to this traditional belief, this research found ERP could generate innovating benefits in case of having particular supporting technical resources as illustrated in Figure 6-6. Therefore, second proposition is

***Proposition 6-2:*** Existence of ERP affects innovations in organisations positively, if mediated by certain technical resources.

Moreover, as illustrated in figure 6-6 and explained in the following sections, ERP improves the organisation innovativess, only if supported by certain organisational complementary resources.

***Proposition 6-3:*** Existence of ERP affects innovations in organisations, if moderated by certain organisational complementary resources.

The following section is to present these certain technical and organisational complementary resources.

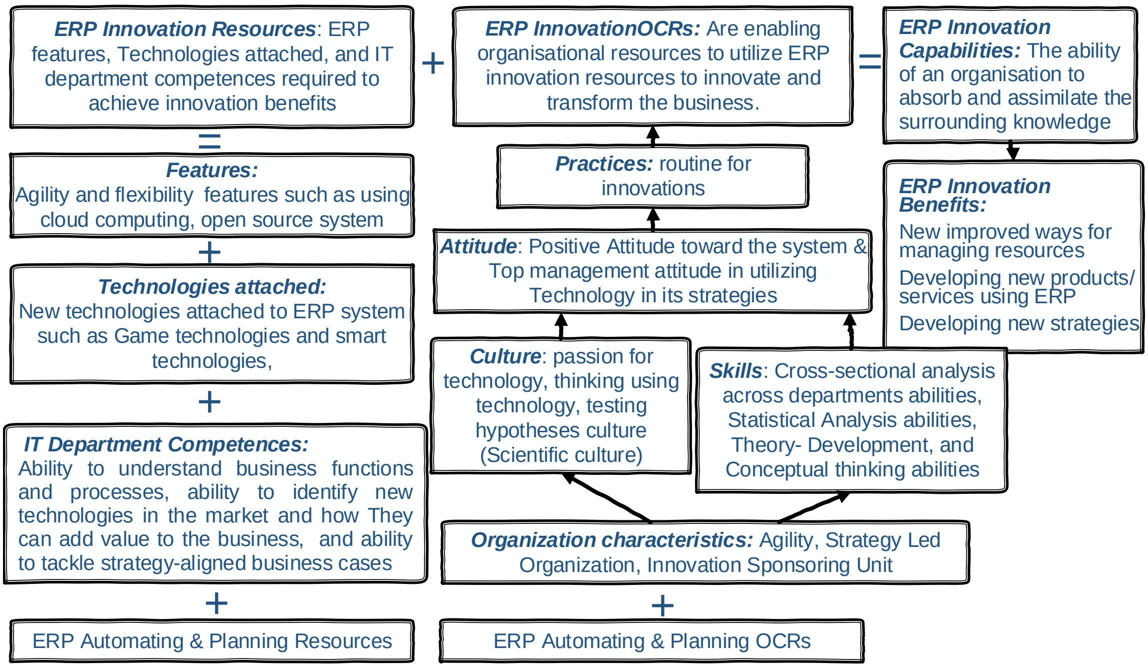



Figure 6-6: ERP Innovation Benefits Blueprint

### 6.4.4.1 ERP Innovation Organisational Complementary Resources

ERP innovation capability is the ability of an organisation to absorb and assimilate, and therefore to successfully change or hunt opportunities in, the environment via ERP.

#### 6.4.4.1.1 Users' attitudes required for Innovating Benefits

Once the organisation practices (routines) begin to help an organisation to innovate, they become the most robust enablers of innovation through ERP (Srivardhana and Pawlowski, 2007). This routine is mainly based on the following organisational mind-set.

> *"What you can say to* ***create a routine of innovation*** *by* ***a continuous alignment*** *and* ***improvement of business processes using IT****"* SCM of a healthcare service in Saudi Arabia

Once an organisation is able to understand its environment (and has incorporated this in its routines) or to examine its understandings using its IT resources and to buy and integrate the "novel" IT resources required to enhance its organisational processes, products and services, it will be able to tackle innovation from its experience of investing in ERP and its ancillary systems. Indeed, the mentality which creates this "routine of innovation" is conditioned by the organisation's belief (that of its top management, IT staff and non-IT staff) in the power of technology to make organisational innovation possible. This belief is reflected in the organisational attitude to using technology in setting the organisation's strategy and in its organisational culture. It was clear from the innovative organisations that their culture had an intimate knowledge of information technologies and their use.

However, some organisations share this attitude but do not have the ability to use the data available in datasets since they do not share the scientific approach to dealing with data; for example, they have no culture of testing hypotheses to differentiate between the valid and invalid ones (the scientific culture). The organisations that are not interested in understanding their environment are not expected to innovate using their data. Seeking to understand and examine one's surroundings is the cornerstone of innovation.

##### 6.4.4.1.2 Users' Skills Required for Innovating Benefits

ERP, if it is well integrated, can help people to understand and examine their circumstances by providing reliable, valid and timely data. Nevertheless, the main bottleneck is the ability to use statistics in creative ways to understand these data patterns so that the new conditions/perspectives/insights can be understood. Creativity in using the data for decision making opens the potential for unleashing opportunities that have not so far discovered cross-sectional analysis, through correlating different aspects in different departments. For instance, one UK respondent extolled

> "… *cross company data scientists, justifying the job role of an analytical centre of excellence. We have got health and safety analysts that can do Chi-square and do it from a health and safety viewpoint. If we can combine the health and safety with procurement information we can now say just one very simple thing, which is that the contractors working for us have more accidents*" Expert user in the UK (Nuclear Power)

Using a systematic approach to justify and understand data in the ERP system demands meetings with stakeholders to be sure of mutual understandings and to produce insightful ideas. Otherwise, the value of the data in the ERP will be undermined. Thus, not only quantitative skills are found to be required, but also qualitative skills. Qualitative skills are the users' abilities to comprehend, understand, and test this understanding of a phenomenon or a problem through interviewing stakeholders. Qualitative abilities are found to be needed for discovering and testing new ideas.

#### 6.4.4.1.3 Organisational Characteristics Required for Innovating Benefits

Innovation can emerge from a centralised unit employed to innovate (e.g. R&D) or through a decentralised mechanism, i.e. from users. There is evidence that ERP strengthens decentralised innovation. Organisations with decentralised innovation are found to encourage their employees to innovate through fostering creativity in the use of the data in ERP datasets. A UK expert in an innovative organisation suggested that if his organisation were able to share the best modelling techniques used to create creative ideas, it would be a source of sustainability in business innovation because it replicated the best analytical methodologies.

An Innovative Support Unit, also called a Centre of Excellence (CoE), allows innovative ideas to be filtered and shared across departments. Furthermore, if data need to be translated into projects or programmes, the Innovative Support Unit will sponsor the programmes (Govindarajan and Trimble, 2010). Although one of the Saudi companies has an innovation-supporting unit, under the name of "business development unit", the lack of a clear strategy for it impairs the alignment between the new initiatives, producing contradictions between different programmes and leading to unsatisfactory performance.

Furthermore, it has been found that a highly centralized bank in Saudi Arabia was unable to innovate although it had ERP innovation resources (but no centralised innovation centre), whereas a decentralized Ministry of Finance in Saudi Arabia tended to achieve more innovation from its ERP. This is due to the new power delegated to the users. This new power (i.e. the availability of accurate, reliable and timeline information) can be useless if organisations do not empower the bottom line employees to take decisions. This evidence supports the research findings of Tambe et al (2012) that organisational practices such as decentralization act as enablers for achieving innovation using IT.

### 6.4.4.2 ERP Innovation Resources

#### 6.4.4.2.1 ERP Technological Innovative Resources

One of the main problems of a traditional ERP system is that it is too strict to enable an organisation to use it in planning and innovation, as is widely accepted in the literature (Davenport, 2000). As a CIO at Australian Council says,

> "*However people normally do not like that because it means that they have to follow a very strict path how the system works. If it is outside the system, there is more flexibility*".

At the same time, It has been found that organisations which have a more flexible ERP infrastructure are more agile at seizing new opportunities. For instance, a Saudi enterprise has adapted a cloud ERP system in the belief that the staff will become flexible enough to implement a road map of the IT projects that will be integrated in its ERP system. The same applies to the safety and security equipment manufacturing organisation in the US:

> "*One brand factory cannot produce finished goods for the other brand… The ERP systems help facilitate the continuous transformation of our business because* ***they are more flexible*** *and rather than automate the business processes, I would agree that the ERP system could be a vehicle for transformation.*" ERP analyst in safety and security equipment manufacturing

Furthermore, sharing technologies is perceived to be critical for enabling innovation through the ERP system. ERP if it is used properly ensures that the data are reliable, timely, and useful. Therefore, sharing such data will encourage the accumulation of knowledge, which creates business acumen and hence innovations. Finally, gaming technologies, using Kinect technology, were used in one Saudi organisation in a limited way; this was enough to give it superiority to its competitors, at least in the short run.

#### 6.4.4.2.2 ERP Innovating Human Resources

According to the research findings, it is believed that this superiority in having the latest technologies will not be sustained once the competitors buy this new technology; however, the ability of an organisation to be superior in purchasing and fitting novel technologies is the main source of competitive advantage.

The ability in the IT department to purchase the best technology at the right time is sometimes limited by its ability to develop a business case that addresses this need. Many initiatives are rejected because of the inability of the IT department to develop a business case that address the S-curve behaviour of and cost of realizing benefits. It was found that the UK council, Australian council, Saudi Bank, and Saudi Ministry could not present the right business case for their new initiatives. Further investigation found that the problem was not that the CIO manager lacked a business background; in fact the UK programme manager had an MBA in finance. It also found that there was a need to improve the skills required to develop a business case which aligns the purchase of new ERP innovative resources with the organisation's broader strategy and for the ability to address benefits and the cost of realizing them so that the organisation could plan realistically to realize them.

In order to enable users to innovate using ERP, from the IT department's perspective, IT staff shall be well connected with and related closely to the business users. Indeed, IT plans and business plans should be interwoven in such a way as to enable the nerves (information technology), well aligned with the muscles (the business users) to make the origins (business objectives) move in a certain way efficiently and effectively. If this viable system (Beer, 1984) is to be innovative, interweaving between IT policies and strategies and the business's policies and strategies is required. It is worth noting that the Saudi organisation which has a high level of innovation through using ERP has changed the titles of its IT department staff to "Business development managers" and also change their job descriptions to include the words "enable innovation in business processes". The new job specification requires a clear understanding of business processes and functions. By such means, it is believed that IT will be able to support business people with innovative business ideas drawn from the innovations in technologies and markets.

*"I had a very good background in supply chain management before being a SAP consultant.* ***My understanding of the current business processes*** *enabled me to talk to functional managers to* ***introduce new ideas*** *in business by* ***using the unused ERP functionalities****. Now it becomes* ***part of my business*** *to help users* ***to introduce new services to the custome****rs …part of my job description is to train business users and* ***help them to increase their performance by innovating new ways for doing tasks*** *… Now my job is not technical troubleshooting; rather my task is* ***to improve business processes through the ERP****"* SAP SCM of a healthcare service in Saudi Arabia

## 6.5 When, and on what basis, should an organisation deploy more technologies to leverage the ERP Business Value?

In ERP business value literature (section 2.5), the ERP business value is perceived as the total benefits which can be recouped from implementing ERP system. Like Esteve (2009) findings regarding the timing of recouping ERP benefits, this research finds the business value from ERP does not come one time because different resources are required for different benefits. The ERP organisational resources required for all groups of benefits are not the same. In other words, as supported by Figure 2-9 and as the quotations show in Table 6-3, the expected planning blueprint (which is based on ERP planning resources and ERP planning OCRs) will not create the expected planning capability without having the automation blueprint. Likewise, the required blueprint for business innovation benefits will not achieve the desired capability until the planning capability is mature enough. This supports the theoretical framework developed in the literature (Figure 2-9). In other words, if the organisation is immature (unsatisfactory) in earning automating benefits, it is not advised to seek planning benefits. The rationale of the need for automating (integrating) ERP resources for planning is that production planning is based on the sales and material planning data (Günther et al., 2006). Without such data, the production manager will not be able to plan (understand) the production patterns using ERP-enabled features.

Furthermore, the ability to achieve planning benefits depends not only on ERP resources such as the integration of a production planning system with the master database of ERP, but also on ERP planning OCRs, which are dependent on, for example, employees' capabilities for business level analysis that would absorb these features of ERP. In the same vein, the ability to achieve the business innovation benefits from using an ERP system is conditioned by the deployment of ERP resources and ERP innovation OCRs, which depends on, for example, top management creativity in utilizing technology and the level of business background in the IT department.

Consequently, the ERP automation OCRs are important for the ERP planning capabilities. If there is a negative attitude to the system, (a positive attitude is required for the successful realizing of automation benefits) and if users were not skilled enough in business or IT to plan via the system, it would be difficult to expect these users to innovate their processes and products/services using the data in them. Likewise, in ERP resources, without having an integration platform to collect the current and accurate data from the source and send it to the data use locations (for automational benefits) and without the ability to synchronize a huge amount of data from across the organisation and its supply chain (a requirement for planning), the ability to identify new opportunities for improvement through the ERP data (ERP innovation benefits) declines.

Furthermore, to clarify the interdependence between resources for different benefits levels, interviews from thirteen organisations were analysed, using indices, to benchmark these organisations to each other over the three dimensions of Automating Benefits, Planning Benefits and Business Innovative benefits. Indeed, it is a measured level of automating benefits by the percentage of automated and integrated processes. Likewise, planning benefits are measured by the quantity and quality of report use and the way that these reports are used in decision making. Although these figures were not quantitative, they still give values since the expert users are aware of the figures. In some cases, the figure could not be elicited directly from respondents. In such cases the figure was taken from the in-depth analysis of the interview or covered in the second round of the interviews.

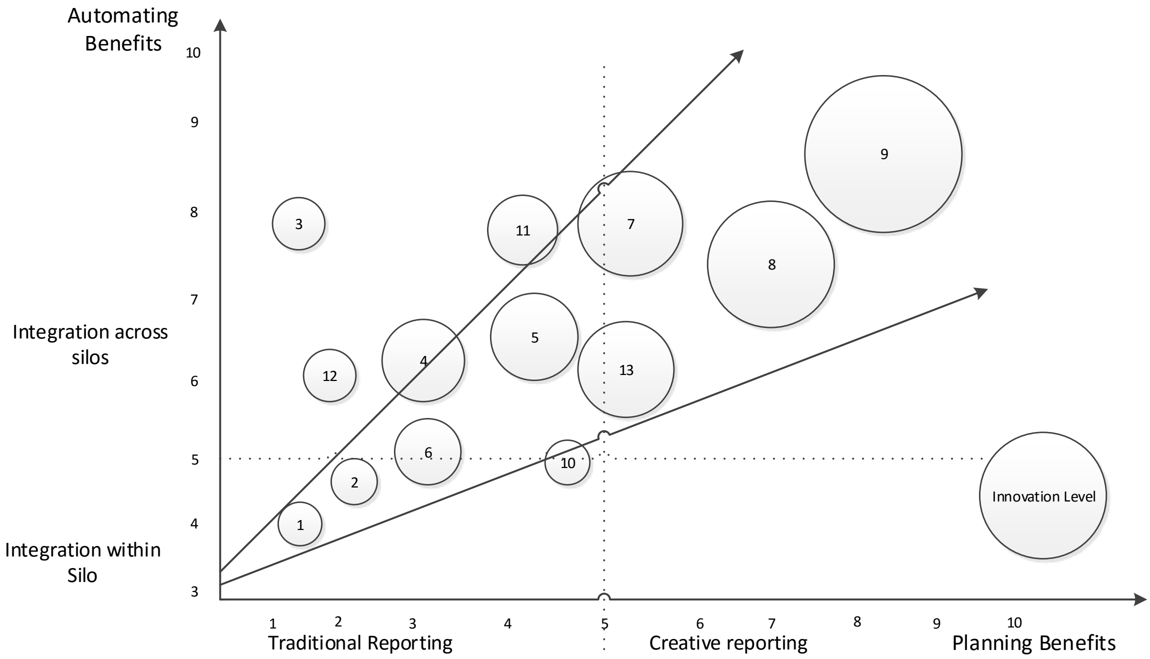
Table 6-3: Sample quotations showing the interdependence between Automation, Planning and Innovative ERP blueprints and capabilities

| | Planning | Innovation |
|---|---|---|
| **Integration** | *"if we could have a better-integrated planning system with 10 year financial and other business planning etcetera, a* ***lot of corrections for the moment, because planning is done in isolation****. Let's say this example with us. We plan all our budget scenarios with this thing but* ***we do not actually use the financial system for the planning.*** *We do financial planning outside of our system. So there is* ***a lot of excel spreadsheet*** *and other staff and discussions here and there but it is all* ***outside our financial system*** *and it would be a great benefit having all that in the system"* CIO Australian | "*So I would consider that this* ***global transformation*** *will – could – not achieve without the ERP system because* ***it is an integrated system****, it was a global system. Sales orders from US customer go to the same system, sales orders could be sourced from the Japan factory and they have the same shared system. If it was global systems, sales order were in the US part of the same system as the Japan factory*" ERP analyst in safety and security equipment manufacturing<br>ERP Analyst from a US manufacturing company |
| **Integration and Planning** | "*A lot of spreadsheets cut into small spreadsheets not in SAP.* ***Spreadsheets were everywhere.*** *No one knows what is going on. The tale is growing, growing and growing. Complexity is growing. Inventory is growing. We have no control. My point is how* ***we can control if we do not understand?*** *How can* ***we innovate and improve*** *while* ***we do not understand?*** *Once you control the data, you can control the environment and thus you can understand what is going on. By understanding you can build the improvement*." ERP UK consultant | |

As illustrated in Figure 6-7, although most organisations used traditional reporting, few organisations were able to use creative reporting. Integration and creativity in reporting are required to achieve innovation using an ERP system. This theory is consistent with the Absorptive capacity theory, developed by Cohen and Levinthal (1990) and used by Srivardhana and Pawlowski (2007) to explain how ERP could be used in business process innovation. The greater the creativity of reporting, the more the organisation is able to use its knowledge in the datasets.

It is noted that organisations which are able to achieve higher benefits from planning and higher automating benefits through good integration outperform others in achieving ERP innovation benefits, whereas organisations that cannot achieve automating benefits through proper integration (such as 1, 2, and 10) will not be able to gain much from planning benefits since the data are not well linked across departments. This affects the quality of data in terms of reliability and time.

It is also obvious that the greater the integration, the more an organisation can enjoy the use of real-time data for all departments and therefore, a higher planning performance through the ERP system. Only organisations 8 and 9 were able to earn superior and significant innovation benefits to outperform their competitors. This pair of organisations performed well in automating and planning capabilities and resources.




## 6.6 Figure 6-7: ERP Cone of Innovation ModelSummary

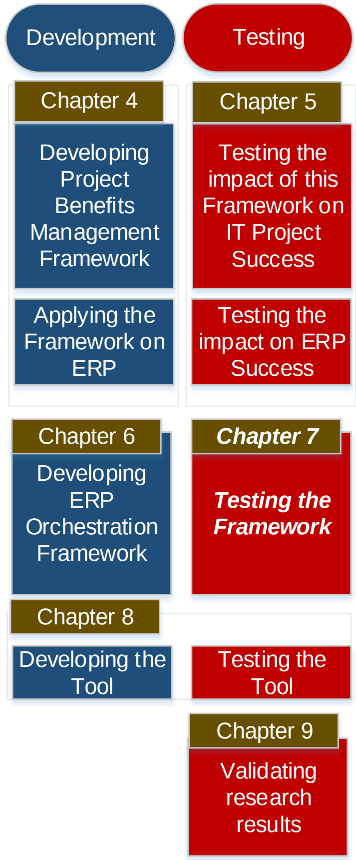
ERP, nowadays, is an IT infrastructure for integrating different systems in a single system. It needs dynamic capability, which as defined by Helfat et al (2007), is “the capacity of an organisation to purposefully create, extend, or modify its resource base”, in order to achieve the innovation benefits of ERP.  It is not cost effective to push an organisation to achieve all benefits at one point; rather, it is clearly appreciated that an organisation would not be able to earn higher levels of benefits until it achieves a significant level in the lower-level benefits. This is consistent with the “dynamic capabilities” definition of Winter (2003): dynamic capabilities are those “that operate to extend, modify or create ordinary (substantive) capabilities”.

Thus, investing in higher-level benefits resources just after the implementation, when there are no organisational capabilities available to use these resources, may be inefficient. Moreover, it could be frustrating for users to see plenty of new ERP resources without the ability to use them. Although it could be a minor benefit to introduce, for example, business intelligence to employees in the "stabilizing period", from the financial perspective, it is a waste of money since the benefits will not be realized as expected. Therefore, ERP asset orchestration with the development of organisational capabilities is important for achieving the maximum effectiveness and efficiency of the resources available to the organisation.

Without the ability to have reliable, timely and valid data from the current IT resources (by matching and integrating ERP functions to organizational functions and processes (Soh et al., 2000)), planning (understanding the data patterns) would be impossible, even new planning if resources are invested in it. Without understanding the patterns, innovation is difficult. Thus, as supported by the literature (Gupta and Kohli, 2006), the organization's ability to integrate ERP in its current processes so that data are collected from their source to be used (on condition of having the users' and organization's ability to absorb and assimilate) in information and knowledge creation is the key to realising the potential value of investment in ERP.

It is interesting to note that interviews with people in developing countries enrich the analysis in planning and automating benefits, forming a contrast to interviews with people in developed countries, which focused on the benefits of ERP business innovation. This is one of the main benefits of the critical realist paradigm. Furthermore, diversity in the countries participating in this research allows insightful analysis of new organizations that do not have enough experience with ERP systems to guard against deriving the benefits from automating and planning before seeking to achieve business innovation benefits through buying more ERP resources.

# 7 Chapter Seven: Testing ERP Innovation Framework




## 7.1 Introduction

According to the findings of the previous chapter, ERP resources can be classified into automation resources, planning resources and innovation resources. Automation technological resources are the technological artefacts which enable an organisation to computerise routine activities in such a way as to obviate the need to use paper for communicating routine data. Indeed, the existence of automation technological resources is believed to make data reliable, valid and timely because the data originate with minimal human intervention (such as using RFID or bar code technologies). The quality of data can be a driver for using planning technological resources (data analytical technologies). Indeed, as discussed in the previous chapter, the innovation process through ERP is conditioned not only by the ability to analyse the data but also by the ability to share the consequent knowledge through the current IT platform, which is not part of the ERP package.

ERP is understood in the literature to be a mechanism for structuring an organisation so as to enhance its efficiency as regards the price of innovativeness. Nevertheless, the previous chapter found that when ERP is supported by particular organisational capabilities, innovativeness emerges. The main capabilities found in the previous chapter of organisations to innovate, supported by a theoretical framework developed in Chapter 2, Figure 2-10, through the ERP system are categorized in this chapter as either ideation capabilities (the ability to generate valid ideas) or implementation capabilities (ability to use these ideas and put them into action).

All of the previous claims are nothing but arguments supported by evidence from the interviews. However, they are not yet validated. Therefore, the aim of this chapter is to test the theoretical framework developed from the literature, now enriched and refined by the findings of the previous chapter.

## 7.2 ERP Innovation Framework

The ERP innovation framework is developed from the literature in Chapter 2, Figure 2-10. However, it is refined and operationalised from the previous chapter findings, as illustrated in Figure 7-1 and discussed in section 6.4.4.This chapter goes on to propose that ERP technological resources (the blue boxes) affect the innovation process positively. However, the ERP as a series of automating resources may hinder the innovation process because it reduces the organisation's flexibility (the green box). Therefore, there are three main possibilities.

The first possibility is that ERP will hinder the innovation process because it leaves the organisation too inflexible to innovate. The second possibility, automation capability of ERP enables the organisation to have reliable, valid, and timely data, which represent the innovation blood.

The last possibility is that ERP resources affect innovation but the impact increases when the organisation has the relevant abilities (orange boxes). In other words, according to the previous chapter, when employees master quantitative methods in their analysis, they will get the best out of their analytic systems and therefore more successful innovations may be expected.

Furthermore, because automation resources leave no room for employees to have as much freedom or as many resources as they need to think and innovate (efficiency), the existence of a sponsor to collect and fund new ideas would be crucial; it would enable an organisation to jump from being an efficiency vehicle to being an innovative vehicle. Lastly, sharing knowledge will be harmful if employees do not test and validate their understanding by meeting and interviewing stakeholders in a professional way. Thus, the ability to understand a situation through appropriate informative and constructive meetings with stakeholders might leverage the usefulness of the knowledge share system.

*To sum up, this study research hypothesis are*

H7-1: Organisational flexibility mediates the negative relationship between Automation capabilities and Innovation

H7-2: Innovation Sponsorship moderates the relationship between Automation and innovation to be significantly positive

H7-3: Analytical system capabilities mediates the positive relationship between Automation capabilities and Innovation

H7-4: Knowledge Share system mediates the positive relationship between Automation capabilities and Innovation.

H7-5: The Organisational Quantitative Abilities moderates the role of Analytical System positively

H7-6: The Organisational Qualitative Abilities moderates the role of Knowledge Share System positively.

H7-7: Automation capabilities, if supported by previous assumptions, affect innovation positively

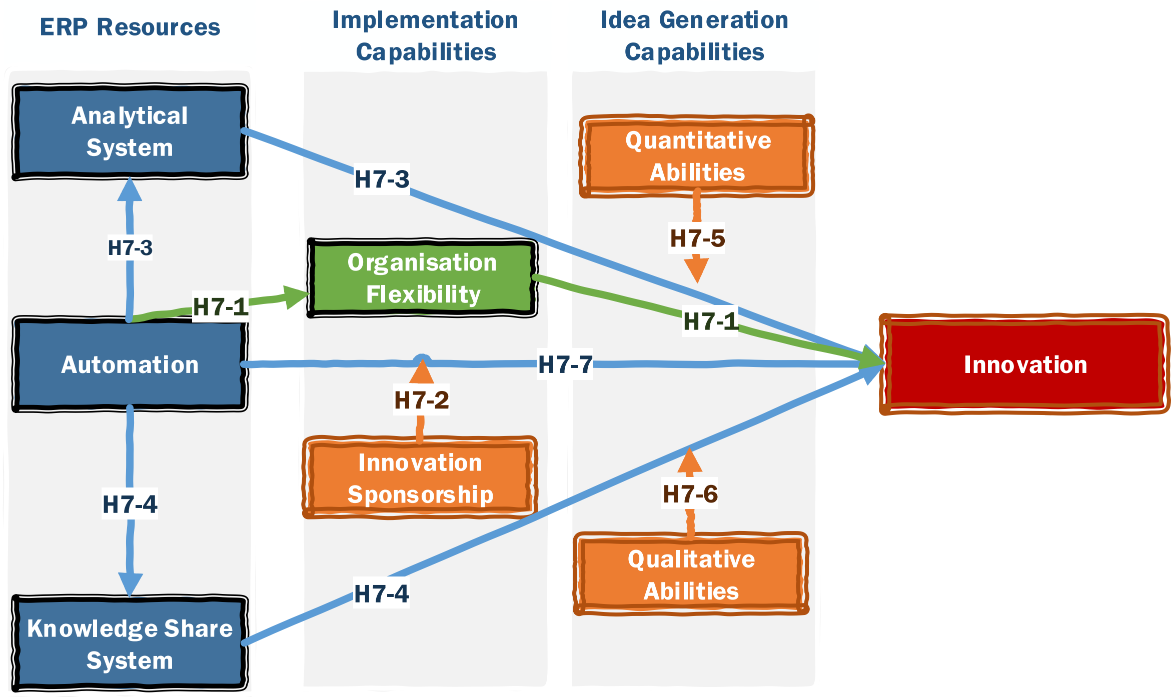



Figure 7-1: ERP Innovation Framework

## 7.3 Research Methods

The social media, plus a purchased database of manufacturing organisations in the UK and USA, was used to find a set of production managers working in organisations, which had adopted ERP from other countries. As the sample characteristics show in Table 7-1, about 80% of the respondents are from Europe and the USA. The respondents are from either an ERP background or have held a position related to production, such as production or operations management. About half of the sample had between 4 and 15 years' experience. Only 9% had more than 15 years. This may be the result of distributing the questionnaire electronically. In summary, a total of 126 questionnaires was received (without missing values) which were suitable for analysis.

Table 7-1: Sample characteristics

| **Characteristics of the sample (n=130)** | | | | | |
|---|---|---|---|---|---|
| **Source** | **N** | **%** | **Length of time in this position** | **N** | **%** |
| **Arab countries** | 15 | 12% | 0-3 Years | 30 | 24% |
| **Europe** | 52 | 41% | 4-8 Years | 37 | 21% |
| **USA** | 48 | 38% | 9-15 Years | 33 | 26% |
| **Other** | 11 | 9% | More than 15 years | 12 | 9% |
| | | | Missing (Refused to specify) | **14** | 11% |
| **Total** | **126** | | **Total** | **126** | |
| **Positions** | | | | | |
| **ERP Managers** | 26 | 21% | | | |
| **CIO/IT Managers/IT directors** | 25 | 20% | | | |
| **Production Managers** | 25 | 20% | | | |
| **Operations Managers** | 26 | 21% | | | |
| **Missing (failed to specify)** | 24 | 19% | | | |
| **Total** | **126** | | | | |

## 7.4 Operationalisation of Constructs

This research chapter framework is based on four concepts: Innovation, ERP technological resources (automate resources, planning resources, and knowledge sharing resources), capacity for Idea Generation (reflected in employees' quantitative and qualitative skills) and capacity for Idea Implementation (reflected in organisational flexibility and innovation sponsorship). Questionnaire is in Appendix C. Based on EFA, as the summary report shows in Table 7-2, all the constructs are valid because all the factor loads of items constructing the concept are more than 0.6. Furthermore, these constructs are reliable to use; their Cronbach's alpha are all more than 0.7.

Table 7-2: Validity and Reliability test for questionnaire constructs

**Rotated Component Matrix[a]**

| | Component | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Cronbach's Alpha | .912 | .920 | .925 | .898 | .896 | .878 | .809 |
| Innov1 | | | | | | | .685 |
| Innov2 | | | | | | | .817 |
| Innov3 | | | | | | | .734 |
| Sponsor1 | .763 | | | | | | |
| Sponsor 2 | .770 | | | | | | |
| Sponsor3 | .776 | | | | | | |
| Sponsor4 | .827 | | | | | | |
| Sponsor5 | .754 | | | | | | |
| Sponsor6 | .813 | | | | | | |
| Qual_1 | | .820 | | | | | |
| Qual_2 | | .850 | | | | | |
| Qual_3 | | .812 | | | | | |
| Qual_4 | | .631 | | | | | |
| Qual_5 | | .738 | | | | | |
| Qual_6 | | .631 | | | | | |
| Statistic_1 | | | | | | .749 | |
| Statistic_2 | | | | | | .891 | |
| Statistic_3 | | | | | | .864 | |
| Analytica_1 | | | | .885 | | | |
| Analytical_2 | | | | .903 | | | |
| Analytical_3 | | | | .652 | | | |
| Analytical_4 | | | | .898 | | | |
| Automation_1 | | | .850 | | | | |
| Automation_2 | | | .894 | | | | |
| Automation_3 | | | .891 | | | | |
| Automation_4 | | | .853 | | | | |
| Knowledge_Share_1 | | | | | .819 | | |
| Knowledge_Share_2 | | | | | .869 | | |
| Knowledge_Share_3 | | | | | .719 | | |
| Knowledge _Share_4 | | | | | .791 | | |

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

### 7.4.1 Innovation

Innovation in this research is operationalised according to Nerkar and Roberts (2004), Dougherty and Hardy (1996) and Micheal et al. (2003) in terms of being the first to introduce a new product to the market, creating and selling new products with completely new features and creating and selling products with new styles and services. As shown in Table 7-2, this construct is valid and reliable for analysis since Cronbach's alpha is 0.809 and all the factor loadings are more than 0.6.

### 7.4.2 ERP Innovation Resources

ERP is perceived primarily to be an automation technology. The automation construct is developed on the basis of the previous chapter's results. Since the aim of automation technology is to replace the manual work in an organisation's routine work flow in such a way to enable data to be captured from its origins while retaining their integrity, accuracy, and consistency, automation technology is measured using second order constructs. The questions used polarising techniques to reflect two extremes: full computerisation of the formal routine communications (workflow) and a full manual version (paper) of the formal routine communications. Four questions were used to reflect the computerisation of the communication channels between respondents and their colleagues in the same department, across departments, with the boss and with subordinates. This construct is reliable and valid for use since its Cronbach's alpha is 0.925 with factor loads more than 0.6, as illustrated in Table 7-2.

On the one hand, ERP can be a source of planning if its planning capabilities are believed in and used. Planning technology is operationalised on the basis of the previous chapter, which states that some technologies enable organisations to understand, and therefore to predict, the data pattern so as to produce more accurate plans. In other words, it is operationalised in terms of using Data Analytical Systems. On the other hand, in the previous chapter, one of the technologies to be added to the ERP portfolio (besides integration and data analytics) is the knowledge share system. As detailed in the previous chapter, a knowledge share system enables its users to share the new ideas emerging from using the analytical system. Therefore, since the benefits of the data analytics system and the knowledge share system are conditioned by a use of them that is efficient and effective, they are operationalised in terms of level of use and belief in the system. Thus, they are operationalised on the basis of the level of perception of their ease of use and usefulness, the percentage of other employees using it and the level of the respondents using it.

The first two questions in this construct are based on the Information System success model, which shows that the employees use the system once they perceive its ease of use and usefulness (Petter et al., 2008a; Delone and McLean, 2002). Furthermore, when one employee in an organisation perceives that others are using a system, it becomes a subjective norm to use it, which motivates the users to use and believe in the system (Taylor and Todd, 1995). Thus, a second pair of questions concerns the perception that “other employees” are using the system and the respondents’ own use of it. In summary, these two constructs of planning and knowledge sharing technological constructs are found to be reliable and valid because their Cronbach’s alpha are each more than 0.6 with factor loads of more than 0.6 (See Table 7-2)

### 7.4.3 Idea Generation Capability

From the previous chapter, supported by the literature in chapter 2, it appears that idea generation is based on the employees’ ability to discover new patterns in the data and/or to test new ideas to find out if they are viable. Ideas can be generated or tested through the use of qualitative or quantitative competences. One example of an item used to measure the use of qualitative data for understanding or testing the viability of new ideas is the degree to which interviews with customers/vendors are used to understand market needs and the degree to which interviews with customers/vendors \are used to test new ideas before implemeting them. Quantitative abilities are examined by asking about the level of use of advanced statistics such as ANOVA, Neural Network, SEM, and other advanced statistical models in the organisation. Indeed, both constructs are found to be viable and reliable for use snce their Cronbach’s alpha and factor loads of all items are more than 0.6.

### 7.4.4 Idea Implementation Capability

Two capacities are found in the previous chapter to be critical for enabling an organisation to innovate after using an ERP system: is the First, either the organisation flexible or does it have a sponsor to fund and implement new ideas. The organisational flexibility construct is borrowed from the literature (Camisón and Villar-López, 2012). Sponsorship operationalised as a role is operationalised like the other roles mentioned in Chapter 5 by asking for a response to one of five items: not available, part-time but not successful, part-time but successful, full-time but not successful or full-time and successful. The sponsorship role is defined as scouting for new ideas and funding their implementation. Both constructs (organisational flexibility and innovation sponsorship) are valid and reliable, since the Cronbach's alphas and factor loads are more than 0.6.

## 7.5 Analysis

The analysis, as visualised in Figure 7-2  was started as correlational analysis, intended to understand the relationship between the constructs. Structural Equation modelling was done to test the impact of the existence of ERP innovation assets on innovation. In addition, moderating analysis was used to test the moderating impacts of the organisational capacity to leverage the innovation performance from the ERP innovation assets

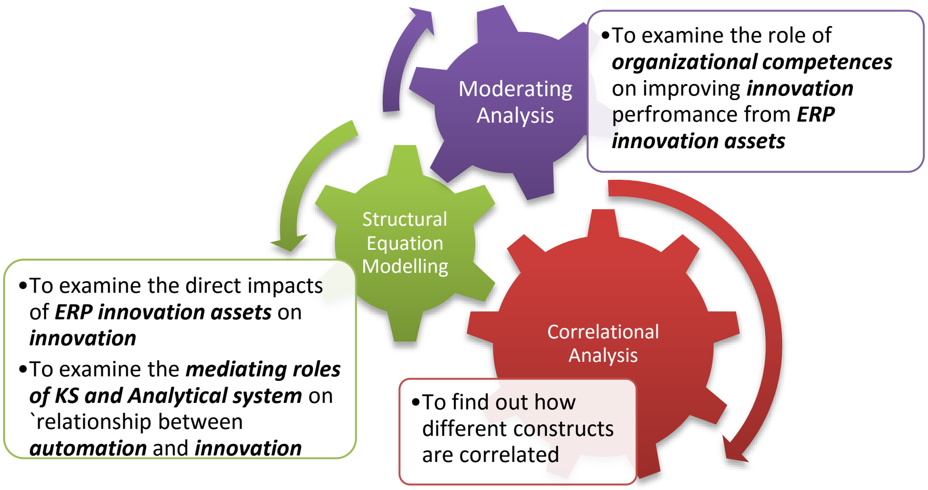



Figure 7-2: Analytical models used in this chapter

### 7.5.1 Correlational Analysis

According to the correlational analysis in Table 7-3, all the constructs are significantly correlated with P<0.00. This means that ERP innovation assets (Automation, Knowledge Share, Analytics), and the capacity to generate ideas (Quantitative and Qualitative) and implement them (sponsoring innovation and organisational flexibility). The qualitative ability to find new ideas and test their viability is found to be number one with 54% (P<0.00) while quantitative abilities are lowest (24.4%) with P<0.00. This can be understood to mean that the qualitative abilities are not conditioned on any other factors to affect the innovation. Regardless of the technologies available, the organisations that have the qualitative ability to understand the market through qualitative tools are more able to innovate than those who do not.

However, it seems that quantitative competence may need other factors to enable an organisation to innovate in its products. Among ERP innovation technologies, as expected from the previous chapter, the highest correlation is with knowledge share technology by 37.7% with P<0.00. Moreover, as expected from the previous chapter, automation is lowest by 27.4% even if it is still significant based on a 99% confidence level. These results can support the whole framework (Figure 6-1) in the previous chapter which shows that ERP can lead to innovation but only if it matures in its use from integration to planning and from planning to sharing the knowledge that has been created (knowledge share is not part of the ERP assets but supports the ERP platform for innovation).

Table 7-3: Correlational Analysis between ERP innovation framework concepts

**Correlations**

Pearson Correlation

| | Average | STDV | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|
| **1. Innovation** | 3.27 | .88 | **1** | | | | | | |
| 2. Automation | 3.67 | .96 | **.274**** | 1 | | | | | |
| 3. Knowledge_Share | 3.34 | 1.13 | **.377**** | .538** | 1 | | | | |
| 4. Analytics | 2.26 | 1.20 | **.312**** | .140 | .277** | 1 | | | |
| 5. Quantitative | 2.19 | 1.11 | **.244**** | .171 | .287** | .353** | 1 | | |
| 6. Sponsoring | 3.34 | 1.09 | **.389**** | .098 | .260** | .254** | .322** | 1 | |
| 7. Qualitative | 3.33 | 1.06 | **.540**** | .090 | .238** | .266** | .403** | .591** | 1 |
| 8. Flexibility | 3.10 | .82 | **.063** | -.240** | -.173 | .016 | .067 | .088 | .165 |

**. Correlation is significant at the 0.01 level (2-tailed).

### 7.5.2 SEM for the impacts of IT Assets on Innovation

The presentation of results discusses the direct impacts first, to find the impact of each technology (automation, planning, and knowledge share) on innovation. Analysis is followed by moderating analysis to study the interaction between different technologies and different organisational capabilities. Finally, indirect analysis is conducted for testing whether the restrictive impact of ERP on innovation is bigger or less than the impact of ERP supported by different technologies on innovation.

It is worth noting that SEM is different from correlational analysis. Correlational analysis shows, for example, that automation is correlated with innovation. Nonetheless, this relationship is not clear; does it occur because automation affects innovation? Could it occur because automation affects other things that lead to innovation? Alternatively, automation in itself has no impact but when the impact is leveraged by organisational capabilities, an impact becomes apparent. After testing the direct impacts, SEM was used to test the indirect impacts such as the mediating impact of knowledge share or the analytical system on the relationship between automation and innovation.

According to the SEM results in Table 7-4, the highest impact on innovation is made by the analytical system by 0.272 with P<0.01 whereas the lowest is made by automation. Indeed, automation does not have any significant direct impact on Innovation (0.097 with p<0.1). This partially supports argument of this research that automating business processes in itself is not a source of innovation. In other words, ERP as automating tool is not important for innovation.

Table 7-4: Summary of impacts and their significance for ERP innovation assets and Innovation

| Dependent Var | Dependent Var | Standardised Estimates | Estimate | S.E. | C.R. | P |
|---|---|---|---|---|---|---|
| **Knowledge_Sh** | Autom | .593 | .828 | .142 | 5.823 | *** |
| **Innovat** | Autom | .196 | .150 | .089 | 1.692 | .091 |
| **Analytical_System** | Autom | .097 | .139 | .089 | .994 | .320 |
| **Innovat** | Knowledge_Sh | .239 | .131 | .067 | 1.962 | .050 |
| **Innovat** | Analytical_System | .272 | .145 | .052 | 2.776 | .006 |

***significance 99%  **significance 95%  *significance 90%

However, when the mediating analysis was conducted, as illustrated in Table 7-5, the indirect impact was found to be significant by 0.108 with P<0.00 and total was 259 with P<0.00, which indicates that the relationship with innovation was fully mediated by other factors. Indeed, Automation does not affect the use of Analytical systems but significantly affects the knowledge sharing system. Therefore, it is concluded that when ERP as an automation tool is supported by the existence of a knowledge share system, the organisation is able to innovate better than it would without the existence of knowledge share. Furthermore, the existence of ERP as an automation tool enhances the use of knowledge share for circulating more accurate, valid and reliable information, which can lead to innovations.

Table 7-5: Direct, Indirect and total impacts

| | | Analytical | Automation | KSS |
|---|---|---|---|---|
| **KSS** | Direct | .000 | .828*** | .000 |
| **Innovation** | Direct | .145*** | .150 | .131** |
| | Indirect | .000 | .109** | .000 |
| | Total | .145*** | .259*** | .131** |

***significance 99% **significance 95% *significance 90%

A summary of the analysis is shown in Figure 7-3. The knowledge sharing system and analytical systems affect innovation with a confidence interval of 99%. However, automation does not have a direct impact on innovation. Yet there is a total impact because of the indirect impact which comes from the impact of automation on Innovation.

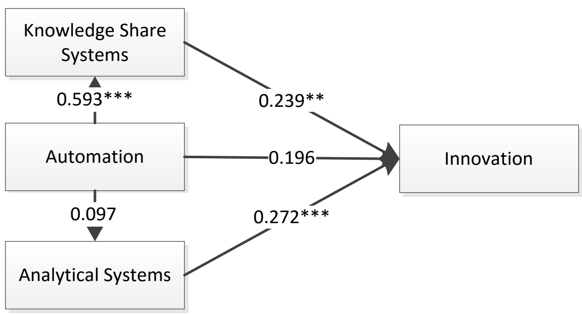



Figure 7-3: Impact of ERP on Innovation (Model 1)

### 7.5.3 Moderating impact of Organisational Competences

In order to find the interaction effect, the analysis proceeds by finding out the interaction impact (e.g. increasing, decreasing) by classifying the moderating variable score as low, medium or high. Then the conditional impact is measured for each level and contrasted using t-value, as explained in Aiken et al (1991). Sponsorship, but not flexibility, is found to have a moderating impact on the relationship between automation and innovation, as summarised in Table 7-6. Furthermore, surprisingly, the quantitative competences have a significant negative moderating impact on the relationship between quantitative competences and innovation. Finally qualitative competences have no moderating impact on the relationship between knowledge sharing and innovation.

Table 7-6: Conditional effect of X (ERP innovation assets) on Y (Innovation) at the values of the moderator (Organisational competences)

| X | Moderator | Conditional Effects | | | Reflection |
|---|---|---|---|---|---|
| | | High | Medium | Low | |
| **Automation Systems** | Sponsorship | .32*** | .23*** | .13 | Sponsorship is not important when automation is low. But the higher the automation in an organisation, the higher the role of sponsorship seems. |
| **Knowledge Share Systems** | Qualitative | .28*** | .26*** | .25*** | Employees' qualitative abilities are important for all levels of adoption of the knowledge share system in organisations, |
| **Analytical Systems** | Quantitative | .11 | .27*** | .42*** | The effect of employees' quantitative abilities is more critical for innovation when the organisation has no analytic systems. However, the role .is diminished when the organisation uses more analytical systems |

***significance 99% **significance 95% *significance 90%

#### 7.5.3.1 The moderating role of sponsorship on innovation

According to the results in the previous chapter, the existence of a sponsor is necessary for innovation in particular for organisations which adopt ERP. ERP increases the rigidity of the system, which constrains the freedom of the organisational members to break out of the system's routine workflow. The results, as tabulated in Table 7-6, support this argument; it has been found that the importance of sponsorship in low automation organisations is not critical as it is when the organisation becomes more automated The need for a sponsor is not significant when the organisation is low in automation, as illustrated in Figure 7-4.

Indeed, the total model is significant at P<0.00. As shown in Table 7-7, the impact of automation on innovation is significant but with less impact than sponsorship has. However, the interaction role is relatively weak and significant only at the 70% confidence level. This indicates that the moderating effect for the whole model is insignificant at P=0.1. The reason for this may be that the scale used in measurement is a five-item and not seven-item scale. It is not believed that this can distort the conclusion that the importance of sponsorship for innovating increases by creating a more automated organisation.

Table 7-7: The impact of automation, sponsorship and interaction between automation and interaction on Innovation

| | Effect | P | Fitness |
|---|---|---|---|
| **Automation** | .2289 | .0071 | $R^2 = 21.7\%$ |
| **Sponsor** | .3632 | .000 | $P = 0.000$ |
| **Interaction** | .094 | .2669 | |

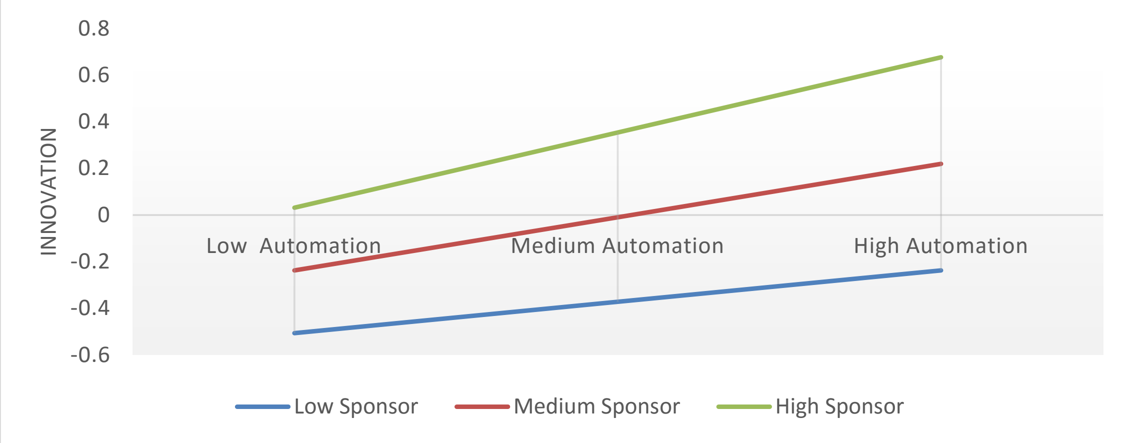



Figure 7-4: The moderating impact of sponsorship on the relationship between automation and innovation

#### 7.5.3.2 The Moderating role of Quantitative competences on the use of Analytics

According to the arguments stated in the previous chapter, quantitative abilities (e.g. familiarity with statistics) is critical for using the role of analytics in organisations. However, the findings are surprising because they imply that they have a negative significant moderating relationship. In other words, the more the organisation goes toward a full use of analytics, the more the need for statistics diminishes (P=0.0436), as pointed in Table 7-8.

This can indicate that modern analytic systems make it easier for an organisation to innovate without the need to know or to use advanced methods. As clearly illustrated in Figure 7-5, quantitative abilities are critical for innovation when an organisation does not have an analytical system. However, the more it has and uses an analytic system, the less it needs to use or to know statistics.

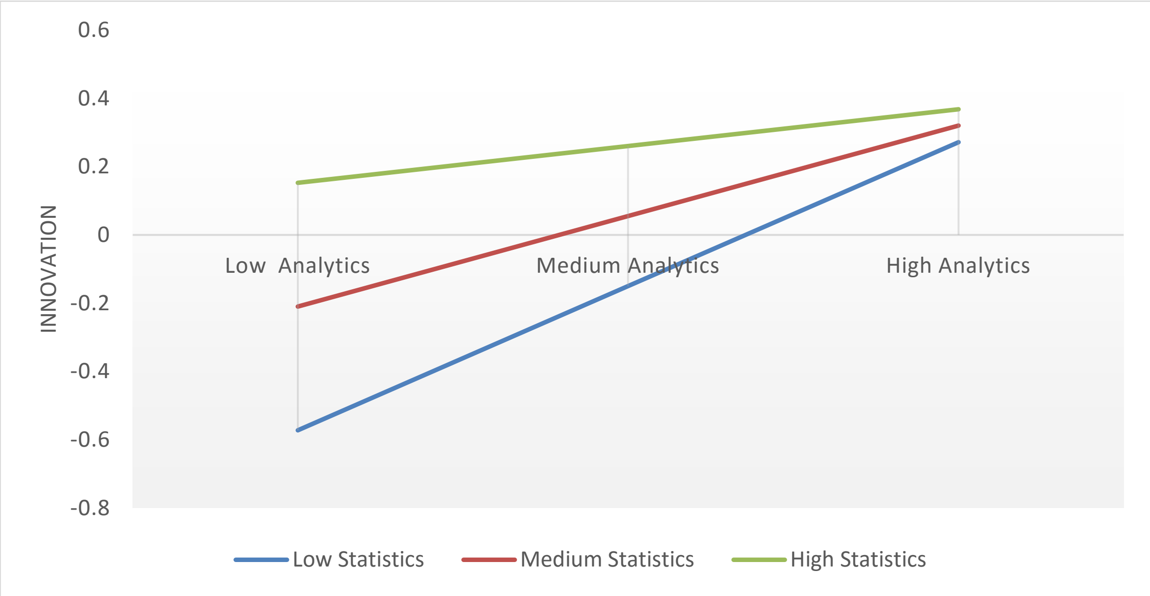



Figure 7-5: The moderating impact of quantitative competences on the relationship between using analytics and innovation

Regarding the impact, as summarised in Table 7-8, both analytics and quantitative abilities have a significant impact on innovation. However, the interaction is significantly negative at P<0.05. Furthermore, the whole model is significant at 99% confidence. All of these figures confirm the significant negative interactions between two positive significant factors (analytics and quantitative) affecting innovation.

Table 7-8: The impact of Analytics, quantitative competences and the interaction between them on Innovation

| | Effect | P | Fitness |
|---|---|---|---|
| **Analytics** | .270 | .0046 | $R^2 = 14.6\%$ |
| **Quantitative** | .210 | .000 | $P = 0.0012$ |
| **Interaction** | -.157 | .0436 | |

### 7.5.3.3 The Moderating role of Qualitative competences on the use of Knowledge Share System

Qualitative competences to discover new patterns or to test new ideas significantly affect innovation in itself; the impact is .4788 with P<0.00 (Table 7-9). Furthermore, knowledge share alone is also found to have a significant impact on innovation. However, it is believed that this relationship is affected by the organisational culture in question (a searching and testing culture). Nevertheless, the interaction impact is weak (b=0.0103) and not significant at all, as illustrated in Table 7-9.

Table 7-9: The impact of Knowledge Share, Qualitative competences and the interaction between them on Innovation

| | Effect | P | Fitness |
|---|---|---|---|
| **Knowledge Share** | .2645 | .000 | $R^2 = 35.7\%$ $P = 0.000$ |
| **Qualitative** | .4788 | .000 | |
| **Interaction** | .0103 | .854 | |

As set out in Figure 7-6, the lines of qualitative competence are parallel. In other words, although of the impact on qualitative competences on innovation is significant, it has no impact on the relationship between knowledge share and innovation. In other words, there is no moderating impact from an organisation's searching and testing culture on the effectiveness of the use of knowledge sharing.

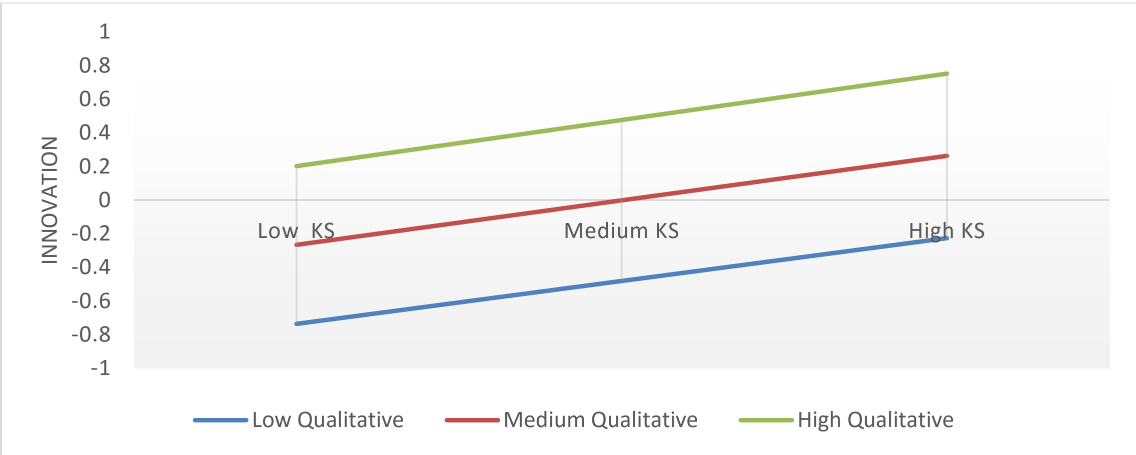



Figure 7-6: The moderating impact of the qualitative competences on the relationship between using knowledge share and innovation

### 7.5.4 Automation, Flexibility, knowledge share and innovation

Automating a business process, through ERP implementation, is always perceived in the literature as a structuration technology to make a business inflexible enough to absorb innovations. Thus, if this argument were true, to verify the argument that ERP is an enabler of innovation would be difficult to prove. Thus, structural equation modelling, as shown in Figure 7-7, was used to analyse the relationship between automation, flexibility, knowledge share and innovation.

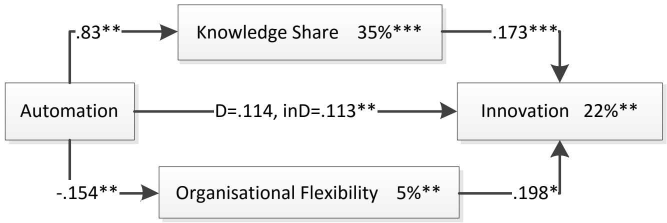



Figure 7-7: the impacts of automation on innovation (Model 2)

Indeed, the argument that automation reduces organisational flexibility is sound, since the direct impact of automation on organisational flexibility is negative by 0.154 with $P<0.05$. Furthermore, flexibility is important for innovation; the analysis shows that flexibility has a positive (.198) significant ($P<0.1$) impact. However, automation can explain only 5% of the variation in organisational flexibility, which means that ERP is not the main reason for organisational rigidity. Therefore, automation has neither a significant direct negative nor positive impact on innovation, because the impact is found to be insignificant (as illustrated in Table 7-10).

Table 7-10: Total impact matrix (Structure Equation Modelling)

| | Automation | Flexibility | Knowledge Share |
|---|---|---|---|
| **Flexibility** | -.154** | .000 | .000 |
| **Knowledge Share** | .830** | .000 | .000 |
| **Innovation** | .257*** | .198* | .173*** |

***significance 99% **significance 95% *significance 90%

However, the total impact, as shown by conducting mediating analysis (see Table 7-11), is significant by .257 with $P<0.00$. Indeed, 0.257 is a big impact in relation to the impact of organisational flexibility or knowledge share. The mediating analysis shows that automation is fully mediated by other factors (i.e. knowledge share). Automating technology, in fact, brings reliable and timely data. If this capability is absorbed and assimilated, through sharing and accumulating knowledge, innovation will follow. Thus, the conclusion is that ERP can kill innovation only if the data from it are not used, absorbed and assimilated.

Table 7-11: The mediating analysis of impacts of automation on Innovation

| Independent | Automation |
|---|---|
| Dependent | Innovation |
| Direct | .144 |
| Indirect | .113** |
| Total | 0.257*** |
| Implication | Fully mediated by knowledge share |

***significance 99% **significance 95% *significance 90%

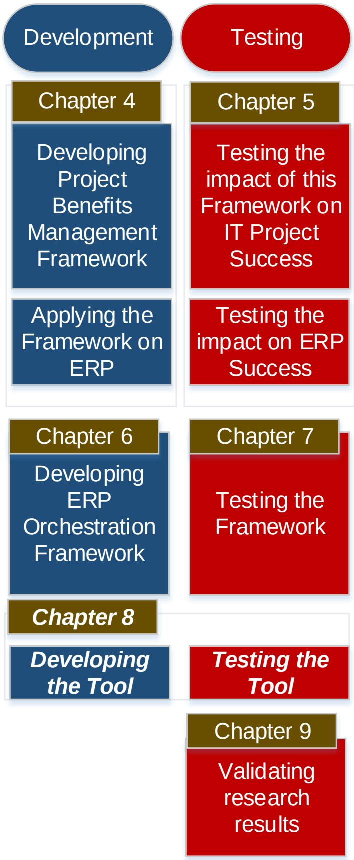
## 7.6 Summary

ERP can be a source of innovation but only in certain conditions. The findings of this chapter show that supporting an ERP system with a knowledge share system is worthwhile. Knowledge share can range from an e-mailing system to a social media system such as a forum. What is interesting in the findings, contradicting the experts' view that a knowledge sharing system is best accompanied by the users' ability to test new ideas through talking to stakeholders, is that this research found that knowledge share and qualitative abilities were not interrelated in such a way as to improve innovation performance. Nevertheless, for all levels of adopting and using a knowledge share system, the organisations that have employees with higher qualitative abilities always innovate more than those that do not. The weakness of this research is that it does not specify the quality and criteria for selecting the best knowledge share system, for this is beyond the scope of this research. Its purpose was simply to measure the level of use of any knowledge sharing system within organisational boundaries.

In fact, ERP analytic capability has not been found to be conditioned by the level of integration or automation in an organisation. Nevertheless, business analytics is an integral part of an ERP system. Surprisingly, the more employees of a particular organisation have quantitative abilities, the less their need and reliance on the business analytics system for innovation purposes. This may be due to the use of customisable and flexible systems such as excel in analysing data. Certainly, business analytics does not need to be Business Intelligence but can be any ERP ancillary system that enables the user to undertake statistical analysis. This research has the limitation that it cannot specify the quality of business analytics; it focuses only on the use, usefulness, and perceptions of the people who use it as a second order measurement of the quality of business analytics.

To sum up, ERP reduces an organisation’s flexibility, which may hinder the innovation process. Nevertheless, this statement is criticised because flexibility represents a small impact on innovation, although the impact of ERP on automation is significant. The reason for this may be that this research studies product innovations, which may entail no need for organisation flexibility. Maybe the results would be different if the innovation were defined as a business innovation in terms of business models and business processes. Nevertheless, what can be said here is that ERP encourages product innovation significantly in three conditions. First, a knowledge share system must be present and in use. Second, the existence of sponsorship (as a moderating factor) increases the ability of an organisation to innovate even if it is highly structured, because of the existence of ERP. Third, business analytics must be used by the employees.

# 8 Chapter Eight: ERP Maturity Model Assessment Tool




## 8.1 Introduction

Chapter Six aimed to develop an ERP orchestration framework to show different roadmaps for achieving different ERP benefits through investing in different ERP resources when supported by Organisational Complementary Resources (OCRs). Within this framework, ERP is an innovation enabler. Nevertheless, this contradicts the literature where ERP is always recognized as an automation tool only. In other words, it leads to a structuration of the business processes making them too inflexible and too rigid to innovate. Therefore, Chapter Seven was necessary to show that ERP can be a driver of innovation only if certain conditions which are considered in the orchestration framework are filled. Without demonstrating this with empirical evidence from a large number of organisations (sample of 126), it would be difficult to defend he view that a valid and reliable tool could be built in this framework.

This chapter, which is based on the conceptual and theoretical finding in Chapters 6 and 7, aims at developing a tool for professionals to get best out of these research findings. This tool is developed to assess the maturity of organisations in recouping the ERP benefits from automating, planning and innovating.

The following sections, after a discussion of the research methodology, define each group of benefits with the help of experts. Next, the benefits are validated and their reliability tested. Following this, each factor (e.g. attitude, skills or technologies) is detailed, validated and the reliability of its measures is tested. Then the impact of each factor (e.g. automating attitude, planning attitude or innovating attitude) is examined in the category of its relevant benefits (e.g. automating, planning or innovating benefits) using simple regression analysis.

Finally, the impact of all the factors required for each category of benefits is analyzed, taking into consideration the interaction impacts (the synergetic impacts of the existence of all the factors at the same time. The chapter ends by presenting the weights of the different factors on the different levels of benefits in one radar.

## 8.2 Research Methods

### 8.2.1 Data Collection Methods

The items and relations of each tool are developed from the results of Chapters 6 and 7. However, these items are validated (evaluating the importance of each factor) by interviewing seven experts for between one and two hours, from different backgrounds and specializations in ERP (HR, CRM, MM, and Basis), as set out in Table 8-1. The experts were from Egypt and the UK. The effect of the interviews was to modify the wording of the items and make them more understandable, and to remove non-essential items.

Table 8-1: Interviewees List for enhancing the tool

| Company | Position | Country | Experience |
|---|---|---|---|
| **ERP Company** | ERP Project Manager | Egypt | 8 Years |
| **ERP Company** | ERP HR SAP Consultant | UK | 15 Years |
| **ERP Company** | ERP Project Manager | UK | 7 Years |
| **Pharmaceutical Company** | Materials Management (MM) SAP ERP Consultant | Egypt | 7 Years |
| **Business Consultant** | Business Analyst (ERP systems) | Egypt | 8 Years |
| **Food Company (1)** | ERP Basis Manager | Egypt | 6 Years |
| **Food Company (2)** | ERP CRM Oracle Consultant | Egypt | 8 Years |

After this, the tool was distributed among ERP managers on LinkedIn, a UK manufacturing Database, and a US ERP Manufacturing Database. About 100 participants started the questionnaire but relevant results were yielded by only 63 of them and completed questionnaires, as illustrated in Table 8-2, by only 43. All 63 were used in factor analysis and reliability analysis, although it should be noted that 63 is not a large enough number to declare insignificant relations. However, it can be used as evidence to support significant relations in “what is found”.

Table 8-2: Sample characteristics for validating the tool

| Answer | Response | Country | |
|---|---|---|---|
| **Retailing** | 2 | Arab | 15 |
| **Manufacturing of Slow Moving Consumer Goods (e.g. Cars, TVs, Computers)** | 5 | Europe | 14 |
| **Manufacturing of Fast Moving Consumer Goods (FMCG) (e.g. Food industry, Grocery items)** | 17 | US | 8 |
| **Oil and Gas** | 2 | Australia | 3 |
| **Construction** | 2 | Others | |
| **ERP Consultation** | 4 | | |
| **Missing** | 22 | Missing | 22 |
| **Total** | 63 | Total | 63 |

### 8.2.2 Analytic models

The aim of this survey was to ensure that the factors in measuring different aspects of ERP resources were valid. The items' constituting factors were categorized through Exploratory Factor Analysis using Varimax rotation. The aim of the factor analysis was not only to classify the items of the factors but also to reduce the number of items. From the previous chapter, 122 items needed consideration. This was a challenging total for inclusion in a single questionnaire. After meeting experts, the total was reduced to 82. Following factor analysis, the total was reduced to 68 items only. This chapter considers only what was perceived to be valid and reliable by all participants and the survey results. Based on the Qualtrics report (the software provided by the university and used to administer the tool), the average time needed to answer the questions of the assessment was within a range of 30 – 40 minutes, which was accepted by most of the respondents.

After ensuring its reliability, the constructs were built on an average of the factors constituting the construct. It was not found by the experts that there were significant relative weights among the items constituting the factors/constructs. Therefore, the normal average was taken in building the constructs.

As indicated in Figure 8-1, bivariate correlational analysis and simple regression were used to confirm and test the relationships between different constructs to validate the tool empirically. Multiple regression could not be used because the sample size could not be used to test more than two factors. Thus the tool was validated in a positivist epistemological and axiological approach. In other words, it was assumed that nobody knows reality, but it exists and can be discovered through objective numbers and relations supported by rationale or theory. Finally, the radars of the tools are presented to show out the relative importance of the different factors for each blueprint.

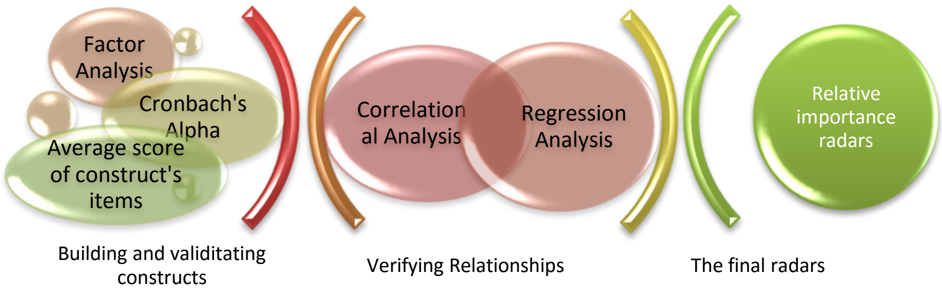



Figure 8-1: Statistical Models used for validating the radar

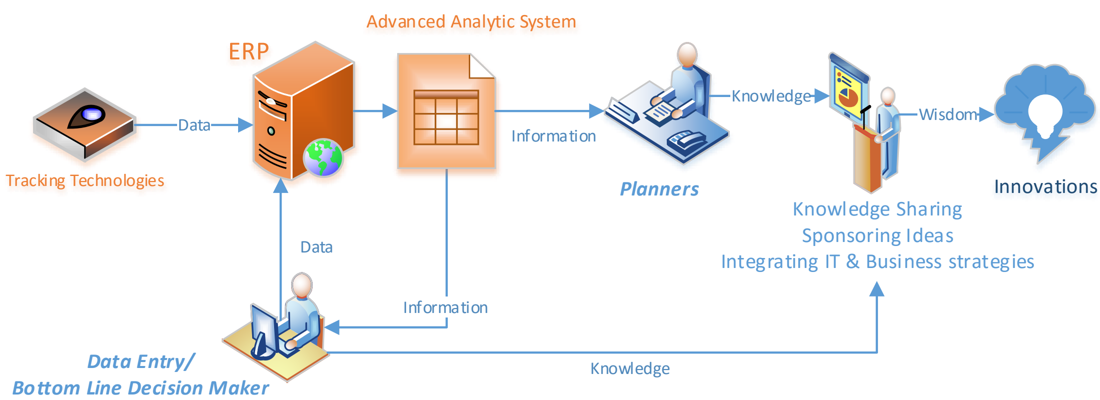
## 8.3 ERP Maturity Model Components

The tool was developed on the basis of Figure 6-1 and consists of 9 areas: three for benefits, three for ERP resources and three for OCRs. The tool was developed according to a questionnaire aimed at this assessment. All indicators are based on a 5-item Likert scale.

ERP benefits are classified into automating (AB), planning (PB), and innovating (IB) benefits. According to the conceptual framework developed in Chapter 7 and partially tested in Chapter 6, ERP benefits are levels. They depend on each other. Automating benefits (AB) help to enable an organisation to plan better because all the data are recorded from its origin on a real-time basis that makes data accurate, reliable and timely. Being able to understand the environment and thus plan better could enable an organisation to unleash new opportunities in developing new products, ways of producing current products or new business models for introducing the product to the market (i.e. to innovate.)

For each benefits category, there are certain requirements. These requirements are conceptually the same but operationalized differently, as illustrated in Figure 8-2. In other words, all the benefits need certain enabling ERP technologies, an IT department to link users with technologies (either by their technical skills for supporting technologies or their business skills to translate technical language into business language for users), attitude toward technologies, skills to use technologies and organisational characteristics enabling the users and organisation to optimize the use of technology. The operationalization of each factor is different for each category of benefits.

| | | | |
|---|---|---|---|
| IT HR competencces | Ability to maintain the system reliability | Ability to help planners to plan through Data in ERP | Ability to add to value creation process and be integrated with business strategies |




| | | | |
|---|---|---|---|
| Users' Attitude | Little/no resistance to ERP | ERP is necessary for planning | ERP is necessary for innovation |
| Users' Skills | Users are able to deal with data entry and basic reports | Users are able to know the planning processes of ERP | Users are able to use advanced statistics |
| Organisation Characteristics | jobs should be well defined and everyone understands his position after ERP | there is an organisational structured planning system using ERP | Existence of sponsorship, Knowledge Share and Benefits accountability |
| ERP Benefits | Reduction in purchasing and selling time | Improved production scheduling, improved quality of decisions and better forecasts | Continuous Innovation, developing new products and differentiating the products |

Figure 8-2: ERP benefits road map

## 8.4 ERP Benefits

Operationalising benefits is crucial for the validation process. Thus, after conducting interviewees with experts, it was agreed that there were 3 indicators for measuring the automation benefits, four indicators for planning benefits and four indicators for the innovating ones. In fact, indicators must be generic and capable of use in any industry if this tool is to be validated across different industries from different countries. After conducting the validity analysis and reliability analysis, all the items reported in this chapter were found valid for building the constructs (e.g. automating, planning and innovating benefits). The results of factor analysis and reliability analysis are reported in Table 8-3. In addition, all the factor loads were over 0.6 and they were located in the right place. In other words, all the benefits relevant to a single level were located in the same column. Furthermore, the Cronbach's alpha for the three constructs is more than 0.6, which means that the constructs are reliable (Nunnally et al., 1967; Nunnally and Bernstein, 1994).

Automating benefits, as suggested in Chapter 6, are normal benefits which do not need much effort. Thus, they are measured by their reduction of the time needed for the purchasing and selling cycle. Any normal organisation is involved in buying and selling products (perhaps as raw material, as work in progress or as a finished product for trading). Additionally, they are measured by the saving in operational time. The reliability of the construct, based on Cronbach's Alpha, is 83.1% which means that it is a reliable construct.

In planning, questions arise about production scheduling, the improved quality of decisions, improved accuracy of forecasts and enhanced cash planning. All of these items, except improving the production scheduling for production industries, are used by any industry. However, improving production scheduling is critical for indexing complicated and integrated planning procedures such as production planning (i.e. those which involve demand (from the marketing department), supply (from warehouses and purchasing departments) and capacity planning (maintenance and facility departments)). The internal consistency, i.e. the reliability, of this construct is 87.6%, which means it is a reliable construct.

Innovation benefits are indexed by three factors: the degree to which the ERP enabled the organisation: 1) to differentiate its products from competitors' products; 2) to continuously improve the ways of producing new products; 3) to continuously develop new successful products and services. The Cronbach's alpha is 0.812 which means that the construct is reliable for use.

Table 8-3: Benefits validity and reliability tests

**Rotated Component Matrix[a]**

| Items | Component | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Cronbach's Alpha | .812 | .876 | .831 |
| Auto_1 ERP-Reduced purchasing cycle time. | | | .851 |
| Auto_2 ERP-Reduced selling cycle time. | | | .655 |
| Auto_3 ERP-Saved operational time | | | .736 |
| Plan_1 ERP-Improved production scheduling | | .612 | |
| Plan_2 ERP-Improved quality of decisions | | .823 | |
| Plan_3 ERP-Improved accuracy of forecasts | | .705 | |
| Plan_4 ERP-Enhanced Cash Planning | | .795 | |
| Innov_1 Enabled building business innovations | .774 | | |
| Innov_2 Enabled your organisation to successfully differentiate its products from the competitors' | .736 | | |
| Innov_3 Enabled your organisation to continuously improve the ways of producing/delivering products and services | .767 | | |
| Innov_4 Enabled your organisation to continuously develop new successful products and services | .703 | | |

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

### 8.4.1 Maturity in ability to realize ERP benefits

After building the constructs by taking the average of the constituent items, correlational analysis was conducted between benefits to find whether there were a relationship between them. As illustrated in Table 8-4, all the benefits were found to be highly correlated. This could indicate that achieving automating benefits can lead to planning benefits because they are highly correlated by 70.4% with P<0.00. Furthermore, because the correlation between PB and IB is 68.3% with P<0.00, achieving planning benefits can enable the organisation to innovate. In other words, the organisations that are not able to achieve automating benefits from ERP are struggling to gain planning benefits. Additionally, without achieving automating and/or planning benefits, it would be difficult to use ERP for innovation.

Table 8-4: Correlational Analysis between ERP benefits

| | | Benefits | | |
|---|---|---|---|---|
| | | AB | PB | IB |
| Benefit | AB | 1 | .704** | .626** |
| | PB | .704** | 1 | .683** |
| | IB | .626** | .683** | 1 |

## 8.4.2 Automating Benefits (AB)

Automating benefits are not difficult to recoup. According to the findings in Chapter 6, once the system is implemented successfully, these benefits are obtained. The sample results support this argument. As illustrated in Figure 8-3, the average, which is 3.6, is more than 3.00 (the middle point) and most organisations, about 86.5% as set out in Table 8-5, do better than 3.00. This can be interpreted to mean that automating benefits are not difficult to realize. Indeed, as reported in Table 8-5, about 50% of organisations score 4 out of 5 in automating benefits from ERP systems.

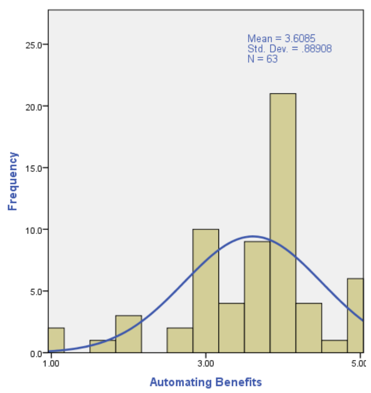



Figure 8-3: Automating Benefits - Descriptive Data

Table 8-5: Automating Benefits- Frequency Table

| Score | Frequency | % | Cumulative % |
|---|---|---|---|
| **1.00-1.99** | 3 | 4.7 | 4.7 |
| **2.00-2.99** | 5 | 7.9 | 13.5 |
| **3.00-3.99** | 23 | 36.5 | 50 |
| **4.00:5.00** | 32 | 50 | 100 |
| **Total** | 63 | 100. | |

## 8.4.3 Planning Benefits Index (PB)

Few organisations, based on this sample, are struggling to recoup the planning benefits of the ERP system. The average score is 3.7 with a standard deviation of 0.81, which means that the coefficient of variation (standard deviation/ average) is 21.8%. This indicates that the dispersion (the variation) in the planning benefits is relatively low and it is clustered around a few scores. This can easily be visualized in Figure 8-4. Most organisations are clustered between

3 and 5 to take a negative skewedness by -.928 because there are two organisations which score only between 1 and 2, while 16 organisations (25% of the total) score from 4 to 5 and 50% score between 3 and 4, as illustrated in Table 8-6. Although the average score of the sample for planning benefits is higher than for automating benefits, in the latter 50% of the sample score more than 4 out of 5 in contrast while for PB it is only 25% . This indicates that it is not so difficult to do very well in planning but it is challenging to do this when planning benefits.

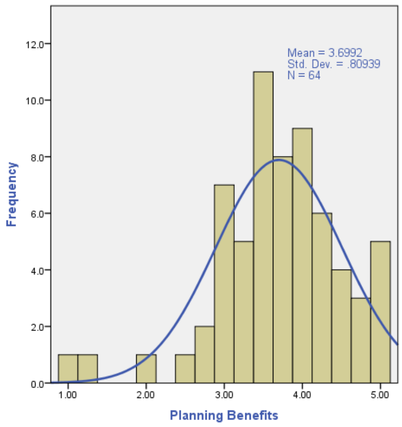



Figure 8-4: Planning Benefits - Descriptive Data

Table 8-6: Planning Benefits- Frequency Table

| Score | Frequency | % | Cumulative % |
|---|---|---|---|
| **1.00-1.99** | 2 | 3.2 | 3.2 |
| **2.00-2.99** | 14 | 21.8 | 25 |
| **3.00-3.99** | 32 | 50 | 75 |
| **4.00-5.00** | 16 | 25 | 100 |
| **Total** | 64 | 100 | |

### 8.4.4 Innovating Benefits (IB)

ERP as an enabler of innovation is a debatable concept in the literature. The present research found, as illustrated in Figure 8-5 and reported in Table 8-7, that 25% of the organisations surveyed believe that ERP is a source of innovation to them, while 50% of the sample either merely agree with this statement or are neutral about it. Only 25% have a tendency to disagree with it. However, the average score is 3.33, which is significantly below the average scores for other benefits (they are around 3.7). This reflects that recouping innovating benefits from ERP systems is less probable or needs more effort than organisations might easily surmise.

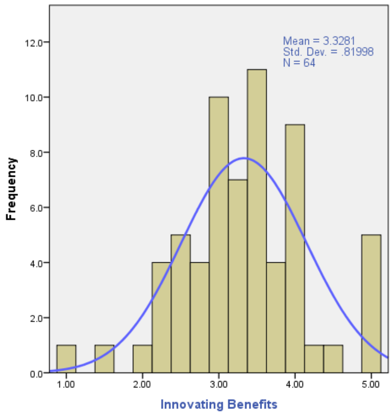



Figure 8-5: Innovating Benefits - Descriptive Data

**Table 8-7: Innovating Benefits- Frequency Table**

| Score | Frequency | % | Cumulative % |
|---|---|---|---|
| **1.00 – 1.99** | 2 | 3.2 | 3.2 |
| **2.00 – 2.99** | 14 | 21.8 | 25 |
| **3.00 – 3.99** | 32 | 50 | 75 |
| **4.00 – 5:00** | 16 | 25 | 100 |
| **Total** | 64 | 100 | |

Unlike ERP automating benefits, which come with less effort, innovating benefits (IB) are more difficult to recoup. Indeed, after comparing the mean score of AB and IB using a paired t-test, as the output report in Table 8-8 shows, there is a significant difference of 0.279 between the two means (P<0.00).

Table 8-8: Paired samples test

**Paired Samples Test**

| | | Paired Differences | | | | | |
|---|---|---|---|---|---|---|---|
| | | Mean | Std. Deviation | Std. Error Mean | t | df | Sig. (2-tailed) |
| Pair 1 | AB - IB | .27910 | .74357 | .09368 | 2.979 | 62 | .004 |

## 8.5 Factors affecting Benefits

### 8.5.1 Organisational Complementary Resources (OCRs)

In Chapter 6, it was found that a set of OCRs was required to enable an organisation to realize different groups of ERP benefits. OCRs are classified into users' factors (abilities and attitude) and organisational factors. As illustrated in Figure 8-6, OCRs are interwoven into the effects. From the qualitative analysis in Chapter 6, the users' abilities are key to determining their attitude. The main reason for resistance (anxiety) is the inability to cope, which comes mainly from the inability to do. Furthermore, the organisation characteristics affects, and is affected by, this attitude. For instance, the existence and routinization of structured planned methodology across departments (e.g. if production planning starts by demand planning followed by inventory planning and production plans start on the basis of these plans,) will make users believe in the viability of the planning process. Therefore, organisations which have such a methodology are believed to outperform (in the planning dimension, at least) others which have neither a structured planning system nor positive attitude towards planning.

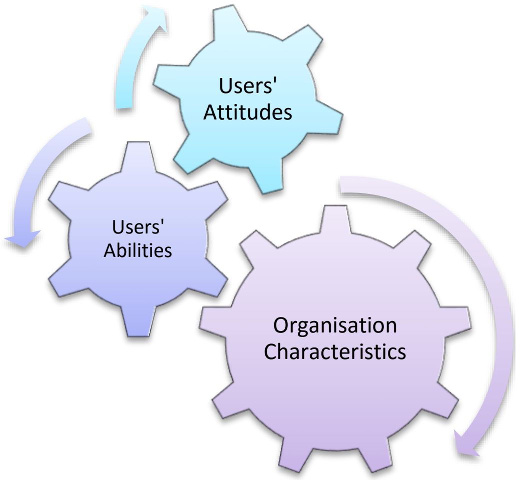



Figure 8-6: Organisational Complementary Resources (OCRs)

### 8.5.1.1 Users Attitude

#### 8.5.1.1.1 Attitude definitions, validity and reliability

Attitudes are classified into attitude toward the ERP as a technology, that towards planning and the ERP technologies used in planning and that towards innovation and its ERP technologies. Attitude toward the technology determines the level of organisation use and finally the benefits (Badewi et al 2013). Factor analysis and reliability analysis of the items constituting the attitude factors were conducted. The reported items are valid and reliable because all the factor loads of the items are more than 0.6 and Cronbach's alpha, the reliability index, is higher than 0.6, which means that the constructs are valid and reliable. The operationalization of the required attitudes toward ERP was adapted from the literature and from the findings. Three items were used for measuring the attitude (AA) required for automating benefits (AB). The items were the users' belief that ERP is easy to use, that it is helpful and useful and the positive attitude toward the ERP. All of these items are found to be valid and reliable because Cronbach's alpha is 0.87.

The attitude toward planning and its technologies (PA) was operationalized by 4 items: the positive belief that planning is critical for organisational success, the positive belief that ERP is helpful in planning and the users' belief that planning technologies are helpful and reliable. There are factor loads for the statement 'ERP is helpful in planning' and believing that planning technologies are helpful, with the AA construct. However, the load is lower than 0.6. Still, being above 0.5 can indicate that the two constructs share similar characteristics - the attitude toward technology – but they are different in another aspect, the "planning". Besides its validity, it is reliable also because its Cronbach's alpha is 0.892, which is higher the cut-off point of 0.6.

Regarding innovation, employees should be oriented toward a passion for innovation and should also believe that ERP can be the mechanism for innovation. The attitude required for innovation (IA), according to this research, is operationalized into the belief that innovation is critical for the organisation, belief that there is a need for innovating in products, and believing in ITs as innovation enablers. The validity and reliability in Table 8-9 show that the construct is valid and reliable because all the factors are more than 0.6 and the Cronbach's alpha is 0.861

Table 8-9: Users' attitudes: validity and reliability tests

**Rotated Component Matrix[a]**

| | Component | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Cronbach's Alpha | .87 | .861 | .892 |
| Users believe the system is easy to use | .889 | | |
| Users believe the system is helpful and useful | .764 | | |
| Users have a positive attitude toward the ERP system | .790 | | |
| There is a positive belief that planning is critical to organisational success | | | .764 |
| There is a positive belief that ERP is helpful in planning | .592 | | .638 |
| Users believe that planning technologies are useful, helpful and reliable | .530 | | .613 |
| There is a positive belief that innovation is critical to the organisation | | .858 | |
| Planning technologies are required for innovation | | .753 | |
| Users believe that there is a need to innovate in products | | .829 | |
| Users believe that Information Technologies are innovation enablers | .507 | .672 | |

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

#### 8.5.1.1.2 The maturity of attitudes

Attitudes are believed in this research to look like a stepping up process. In other words, the attitudes grow steadily more mature from the attitude toward basic ERP to a higher level of the positive attitude toward its planning technologies and finally to positive attitudes toward the more sophisticated tools of ERP. This argument is supported from the correlational analysis reported in Table 8-10. The automating attitude (AA) is highly correlated with the planning attitude (PA) at 80% with P<0.00. This indicates that the positive attitude toward ERP is critical and represents 64% of the reasons for having a positive attitude toward ERP planning technologies. Because innovation requires more sophisticated ERP technologies, the attitudes toward ERP are less correlated with innovating benefits (45.5%). Nevertheless, the planning attitude (PA) is the middle point because it is correlated by 63.3% with P<0.00.

Table 8-10: Attitudes: correlational analysis

| | | Benefits | | | Attitudes | | |
|---|---|---|---|---|---|---|---|
| | | AB | PB | IB | AA | PA | IA |
| Benefit | AB | 1 | .704** | .626** | .420** | .444** | .391** |
| | PB | .704** | 1 | .683** | .375** | .377** | .336* |
| | IB | .626** | .683** | 1 | .399** | .220 | .303* |
| Attitude | AA | .420** | .375** | .399** | 1 | .800** | .455** |
| | PA | .444** | .377** | .220 | .800** | 1 | .633** |
| | IA | .391** | .336* | .303* | .455** | .633** | 1 |

#### 8.5.1.1.3 The regression analysis of attitudes on ERP benefits

Attitudes toward ERP and its technologies have different impacts on different categories of benefit in different ways, as illustrated in Figure 8-7. According to simple regression analysis (i.e. one independent on one dependent), the impact of AA on AB is the highest by 0.43, with an explanatory ratio of 17.7%. Nevertheless, the lowest is the impact of IA on IB, by 0.31 with an explanatory ratio of 9.2%. This indicates that the impact of attitudes declines by stepping from a lower benefits category (i.e. automation benefits) to a higher one (i.e. planning or innovating).

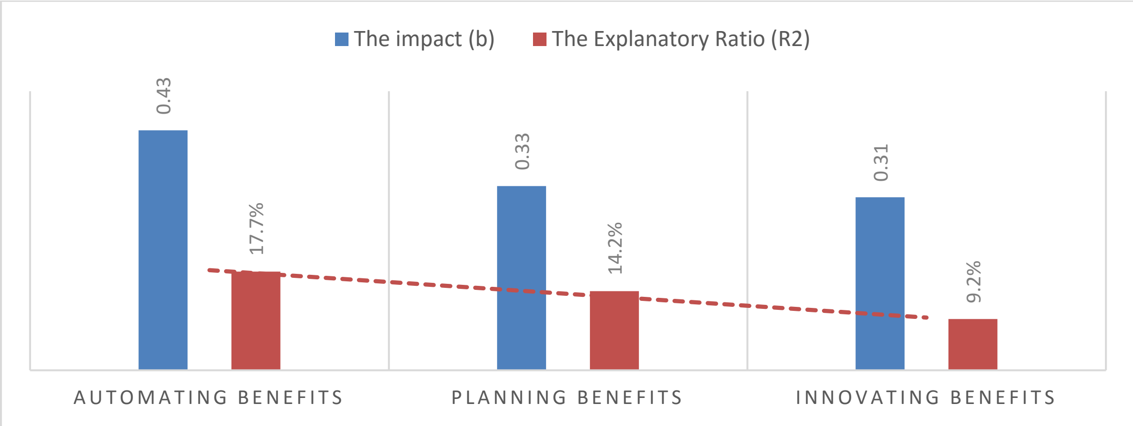



Figure 8-7: The impacts (b) and explanatory ratio (R2) of attitudes on different benefits

### 8.5.1.2 User Skills

#### 8.5.1.2.1 Skills definition, validity and reliability

ERP benefits will not be realized until the users have the ability not only to make best use of it but also to integrate data from ERP into the innovation processes. Skills are classified into three types: ERP technical skills, planning techno-business skills, and innovation techno-business skills.

The automating ERP technical skills (AS) are operationalized into five items: a. ability to use the basic features of ERP (data input), b. ability to jump between forms and screens easily and smoothly, c. ability to use the basic reports, d. knowing which reports they want to use, and e. ability to reach the desired reports easily and smoothly. This construct is valid and reliable because all factor loads are more than 0.6 and the Cronbach's alpha is 0.819.

The planning techno-business skills are an understanding of the planning processes of the ERP system, planning reports within the system, using planning reports of the system and the ability to customize the reports to fulfil different planning needs. In other words, without having professional business knowledge about planning (for instance, knowing the Material Requirement Model (MRP) and Capacity Requirements Planning (CRP), these planning models available in ERP will not make any sense to users. This construct is valid and reliable because all the factor loads of the constituting items are more than 0.6 and the Cronbach's alpha is 0.909.

The innovating techno-business skills are operationalized into 2 main skills: quantitative abilities (understanding their importance, understanding and using advanced statistics) and quantitative technical abilities (using business warehouse analytic models, using artificial intelligence available in the analytic systems supporting ERP (e.g. business intelligence) and developing and customizing reports to do advanced statistical analysis). Although the previous chapter (Chapter 8), shows that the importance of statistical ability diminishes by the increase in the adoption of data analytics (i.e. the users do not need to know much about statistics because the system does everything for them), understanding the importance of using numbers in decision making is still a critical factor for understanding environment in an objective way. The construct is valid because, as reported in the factor analysis in Table 8-11 all the factors are more than 0.6 and are also reliable because Cronbach's alpha is .853.

Table 8-11: Users' Skill validity and reliability tests

**Rotated Component Matrix[a]**

| | Component | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Cronbach' Alpha | .853 | 0.819 | 0.909 |
| Users are able to use the basic features of ERP (data input) | | .683 | |
| Users are able to jump between forms and screens easily and smoothly | | .630 | |
| Users can use the basic reports | | .839 | |
| Users know which reports they want to use | | .761 | |
| Users are able to reach their desired reports easily and smoothly | | .735 | |
| Users understand the planning process of the ERP system | | | .694 |
| Users understand the planning reports of the system | | | .865 |
| Users use the planning reports of the system | | | .856 |
| Users are able to customize the reports to fulfil different planning needs | | | .673 |
| Users understand how using statistics can enhance their job performance | .799 | | |
| Users use an advanced level of such as correlational analysis, regression, and multi-regression | .832 | | |
| Users use ERP business warehouse analytic models to an advanced statistics level | .689 | | |
| Users use the artificial intelligence capabilities of ERP (such as Genetic Algorithms & Neural Networks) | .877 | | |
| Users are able to develop their reports to do the calculations of advanced level statistics | .816 | | |

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

#### 8.5.1.2.2 The maturity of skills

The maturity of skills goes from the ability to use the system for entering and reporting basic data (i.e. purely technical) to ability to customise the reports for planning scenarios to be held from these data (between technical skills for customising reports and business skills for understanding best planning models). Once users master the data management and are able to plan using the data, the importance shifts to quantitative business skills for understanding the data behaviour in such a way as to unleash new opportunities (innovation).

The correlational analysis in Table 8-12 shows that all the skills are correlated. Furthermore, the correlations are higher between AS and PS (47.9%) and between IS and PS (54.1%) than between AS and IS (40.4%). This indicates that the existence of PS can be the mediating factor between AS and IS. This can be underlined as a representation of the maturity concept of the skills in the organisations, from AS which is dominated by technical abilities, to IS, which is dominated by the ability to apply business knowledge to ERP technology (i.e. ERP Business quantitative skills).

Table 8-12: Skills correlational analysis

| | | Skills | | |
|---|---|---|---|---|
| | | AS | PS | IS |
| Skills | AS | 1 | .479** | .404** |
| | PS | .479** | 1 | .541** |
| | IS | .404** | .541** | 1 |

#### 8.5.1.2.3 The regression analysis of skills on ERP

Unlike the inverse proportion of the attitude which accepts ‘the higher the benefits category, the lower the importance of attitude’, skills run in direct proportion, as set out in Figure 8-8. In other words, the higher the benefits category targeted, the higher and more sophisticated the required skills are. Hence, the impact of technical skills (AS) on automating benefits (AB) (b=.32, r2 =5.8%) is lower than the impact of innovation techno-business skills (IS) on innovating benefits (IB) (b=.35, 15%). However, the planning techno-business skills (PS) is in the middle in the explanatory ratio ($r^2$= 10.9) but the impact is the lowest b=0.2.

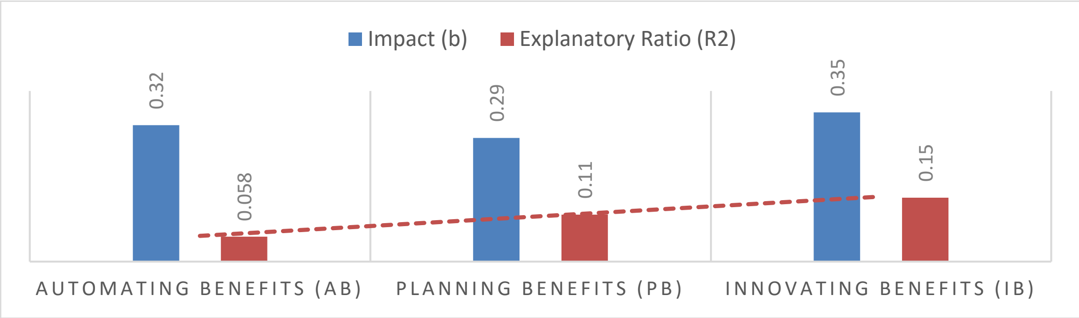



Figure 8-8: The impacts (b) and explanatory ratio (R2) of skills on different benefits

#### 8.5.1.3 Organisation Characteristics

##### 8.5.1.3.1 Organisation characteristics: definition, validity and reliability

Integrating practices into business processes to be routine matters (the institutionalisation of practices) has a significant impact on the benefits (as demonstrated in Chapter 5). Therefore, the structuration (making something structured and part of the organisational practices) of the organisational requirements for benefits is believed to be necessary, as shown in Chapter 6

For automating benefits to be realized, business processes should be well structured and defined. Therefore, three items are used to measure the organisational characteristics required for making automation benefits possible. They are a proper definition of the job description and roles, clear flowcharts of business processes after ERP implementation and an understanding by users of their positions and their roles in the business process. This construct is valid and reliable because all factor loads are more than 0.6 and Cronbach's alpha is 0.872.

Regarding planning benefits, if the planning process is not integrated in the organisation culture and people's ways of doing their job (routinisation of the planning process), benefits will not be forthcoming. Therefore, the presence of the structured planning system is a requirement for realizing ERP benefits. Thus, the organisational characteristics for planning (PO) are operationalised into the following: a clear planning methodology used in the organisation, the application of a planning methodology and the organisation's structured planning system that fits the ERP system, and having standardized definitions of concepts used in the organisation (for enabling users to customise reports freely without troubles from misunderstandings when different uses are given to words in the organisation by different departments). The validity and reliability of the construct is assured because the factor loads are more than 0.6 and Cronbach's alpha is 0.875

Finally, Innovation needs certain organisational requirements, as revealed in Chapter 6 and tested in Chapter 7, such as the existence of innovation sponsorship, testing new ideas and organisational flexibility. Thus, five items were used to operationalise and measure the organisational characteristics required for perceiving innovating benefits from ERP. They are the organisation's ability to change its process structure efficiently and effectively, ability of the organisation to change easily to reflect unforeseen changes in the market, having a benefits accountability position to follow up the benefits realization process from the implementation of new ideas, and the existence of a sponsoring unit to pick up new ideas from knowledge sharing systems and sponsor them. After validating the concept and measuring its reliability, the factor loads of all items are more than 0.6 and the Cronbach's alpha is 0.882, as illustrated in Table 8-13.

Table 8-13: Organisation Characteristics validity and reliability tests

**Rotated Component Matrix[a]**

| | Component | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Cronbach's Alpha | .882 | .875 | .872 |
| There is a proper definition of job descriptions and roles | | | .825 |
| There are clear flowcharts of business processes after ERP implementation | | | .823 |
| Users understand their position and their role in their business processes | | | .923 |
| There is a clear planning methodology used in the organisation (applying to process, batch, or repetitive production systems) | | .825 | |
| Planning methodology is applied in the organisation | | .882 | |
| The structured planning system fits the ERP system | | .834 | |
| There are standardized definitions of the concepts used in the organisation | | .605 | |
| Your organisation is able to change its process structure easily and efficiently | .821 | | |
| Your organisation changes easily to reflect unforeseen changes in the market | .732 | | |
| There is a benefit accountability position to follow up the benefits realization process from the implementation of new ideas | .718 | | |
| There is a sponsoring unit (senior manager(s) or department) to pick up new valid ideas from the knowledge sharing system in the organisation | .836 | | |
| There is a sponsoring unit to implement/sponsor the new ideas | .695 | | |

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

#### 8.5.1.3.2 Characteristics of the Maturity of the Organisation

Efficiency and innovation are always contradictory objectives. Whereas efficiency seeks to minimize slack and increase the use of resources, innovation needs slack resources for trials and errors, for experiments and for having the time to think and to do unusual tasks. Thus, it could not be claimed that the organisation characteristics take the form of maturity as other factors do (e.g. attitude and skills). As tested in the previous chapter, in efficient organisations (i.e. highly automated ones), the role of sponsors in innovation becomes critical and is extremely important for innovation. Sponsors, having the organisational characteristics for achieving automating benefits (AO) as the first step, increase the importance of having organisation characteristics for innovation (AI) to increase innovation capabilities. Regarding the organisational characteristics for planning (PO) is acknowledged to be necessary for having a shared vision and point of view which could improve the organisation's ability to innovate.

#### 8.5.1.3.3 The regression analysis of organisation characteristics on ERP benefits

The importance of organisational characteristics is roughly similar for all benefits within a range of 10% difference. As illustrated in Figure 8-9, the impact of organisational characteristics for automation (AO) on automation benefits (AB) is 0.4 whereas the impact of the organisational characteristics for innovation (IO) have a slightly higher impact on innovation benefits (IB) by 0.03 (scale of 5). However, the impact of PO is slightly lower, at 0.38. Nevertheless, the variation is slightly higher and takes an upward trend for the explanatory power of the organisation's characteristics on benefits. From 13.3% to 19.2% the explanatory ratio increases from AO to PO on the AB and PB, respectively. Indeed, IO alone explains about 20% of the variation in the organisation's ability to innovate through ERP, in contrast to only 13.3% for AO on AB.


Figure 8-9: The impact of organisation characteristics on ERP Benefits

### 8.5.2 ERP Resources

Investment in ERP resources has two dimensions: investing in, or making possible, technologies and investing in IT human resources competences. For each benefits level, a particular set of technologies and IT human resources competences is required, as illustrated in Figure 8-10. While automating benefits require tracking technologies and the IT department's ability to maintain the data flow smoothly between systems without bugs or system failure, planning and innovating benefits require the business knowledge of the IT department and an advanced reporting system. This is because it is assumed that automating benefits are recouped because the system is working well and employees accept it in use because it simplifies their work.

| **Benefits Level** | Automation Benefits (AB) | Planning Benefits (PB) | Innovating Benefits (IB) |
|---|---|---|---|
| **ERP Technologies** | Tracking Technologies | Flexible Reporting | Statistical Enabling Reports (Data Analytics) |
| **IT Human Resources** | IT Technical Competences | Understanding Business Planning Process | Understanding business value creation process |

Figure 8-10: ERP Resources required for ERP Benefits

#### 8.5.2.1 ERP Technologies

##### 8.5.2.1.1 ERP Technologies: Definition, Validity and Reliability

ERP Technologies are classified into data entry technologies (such as tracking to capture data in a fast and convenient way) and output technologies (such as an advanced data analytics system to enable users get the best of the data captured by ERP).

Tracking technologies are the hardware and software applications for tracing the movement of the material across storage locations. ERP as a software programme has this feature, but the question is about whether the organisation has purchased the complementary hardware (e.g. bar code scanners or RFID scanners). As found in Chapter 6, the existence of such technology presents the data on time with a high level of accuracy and minimum effort. Therefore, two questions are asked about the existence of such technology within the organisation (between its storage locations) or externally (having tracking technologies for tracking moving inventory items between organisations) and one question about having a unified coding system across the supply chain so as to exchange data about the flow of material between stores and organisations. This construct is found to be valid, since all factor loads are more than 0.6, and reliable because Cronbach’s alpha is more than 0.6.

According to Chapter 7, data are useless without having the proper technologies to process them. Reports are the mechanisms by which to process these data. Reporting power is based on two dimensions: statistical power and flexibility power. The planning technology (PT) is operationalized by item to determine the level of flexibility and customizability available which lets users create their own plans freely. These items are the customizability of the layout of the report, the customizability of the report contents, and having a unified dictionary to enable users to customize without problems from conflicting meanings being used by different departments for the same terms. The validity of the construct is assured because all factor loads are more than 0.6, and the reliability is guaranteed because the Cronbach’s alpha is 0.856

When the reporting features of ERP enable the user to construct quantitative models (e.g. forecasting models, inventory models), the user can discover new patterns in the data which help to create an innovative organisation. Therefore, the four factors in indexing the reporting statistics power of the data analytics are:

a. whether the current reporting system enables the user to do calculations; b. aggregating figures into meaningful graphs; c. doing statistical analysis such as regression models (i.e. for forecasting, estimating inventory usage); and d. Analysis of Variance (ANOVA) (i.e. for finding out the differences between different group of customers, vendors or stock items). This construct is validated and the reliability of it is assured because all factor loads are more than 0.6 and Cronbach's alpha is 0.837, as illustrated in Table 8-14.

Table 8-14: ERP IT validity and reliability tests

**Rotated Component Matrix[a]**

| | Component | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Cronbach's Alpha | .837 | .856 | .833 |
| Enables users to make some basic calculations (such as calculating Average, Standard Deviation, Median) | .828 | | |
| Enables the users to customize their reports freely | .756 | | |
| Enables users to aggregate figures in meaningful graphs. | .780 | | |
| Enables the users to do analysis using advanced statistics (Regression, ANOVA, Correlational Analysis) | .762 | | |
| Change layouts of the reports | | .798 | |
| Change the contents of reports with taking into consideration the unified definition of terms | | .801 | |
| Customize their report layout | | .852 | |
| Is there are any technology that enables your organisation to track the flow of material across storage locations such as RFID, Bar code? | | | .895 |
| Your organisation has a unified coding system with its supply chain to track the flow of materials between organisations | | | .761 |
| Your organisation uses scanners to read Barcodes to track the movement of the material between storage locations in different organisations in the supply chain | | | .851 |

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

#### 8.5.2.1.2 The impacts of ERP technologies on ERP benefits

The demand for more sophisticated technologies to recoup higher levels of ERP benefits is increasing. Whereas tracking technologies are not a serious issue for achieving automating benefits, the statistical power of the reporting system is vital for enabling organisations to innovate using the ERP system. As illustrated in Figure 8-11 , the explanatory ratio increases from just 10.7% for automating benefits to 27.5% for innovating benefits. Likewise, the impact is increasing to almost double from 0.27 to 0.49. This can imply that ERP is already automating technology by default and thus attaching a new tracking technology will lead to little incremental impact on automating benefits. However, few organisations are able to understand the power of statistics for realizing innovating benefits. Thus, those organisations which have deployed business analytics systems increase significantly their ability to innovate as a result.

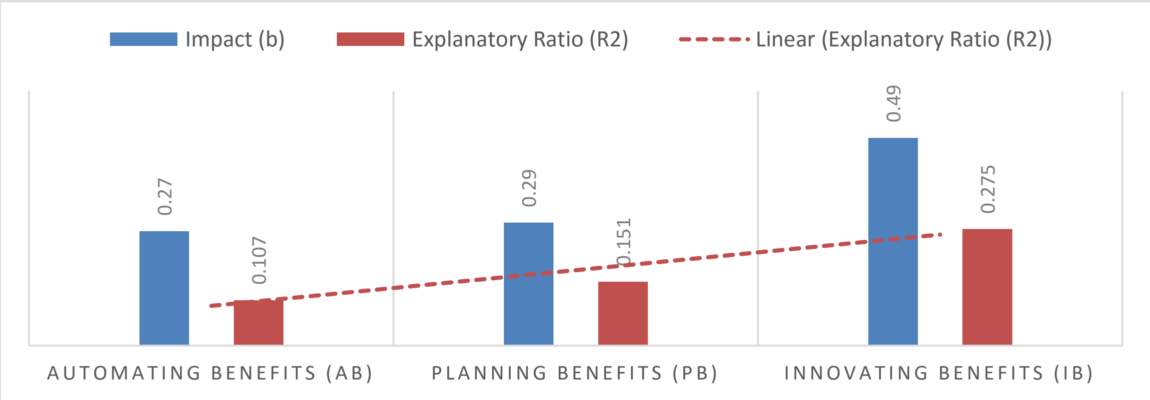



Figure 8-11: The impacts of ERP technologies on ERP Benefits

### 8.5.2.2 ERP Human Resources

#### 8.5.2.2.1 ERP Human Resources: Definition, Validity and Reliability

IT department skills are necessary for maturing an organisation in the use of ERP. The skills range from technical competences to understanding business processes. Competences are classified as either technical competences or business competences. Technical competences are mainly required for automating benefits but planning and innovating benefits need the IT department to be more involved in the business in a way that promotes the planning features of ERP with business users and aligns the IT department strategy with business strategy to leverage the organisational strategy.

The IT Department competence required for planning (PIT) is operationalized by 3 items: namely, the IT department’s ability to understand the planning requirements of the planners so that permission is given efficiently for data access, its ability to advise business users how to use ERP for planning their activities, tasks and jobs, and the holding of seminars and workshops for users to promote good planning practices using ERP.

The IT department’s competence in recouping ERP innovating benefits (IIT) is operationalized into the ability of the IT department to understand and add value to business operations by its recommendations to users, its development of strategies aligned with the organisation’s strategy, its identifying of new technologies in the market and ways to use them to improve the business, and its close relationship with business users. Actually, all constructs are valid and reliable because all factor loads are more than 0.6 as illustrated in Table 8-15.

Table 8-15: IT Resources validity and reliability tests

**Rotated Component Matrix[a]**

| | Component | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| | | | .889 |
| Synchronise the ERP system with all its modules effectively | | | .567 |
| Synchronise the ERP system with other non-ERP systems, such as CRM and SCM, effectively | | | .910 |
| Identify which technologies can be integrated into the current integrated platform | | | .688 |
| Integrate and maintain the integration of the current ERP system with an advanced Data Repository System | | | .727 |
| Understand the planning requirements for each decision maker to give them timely permission for data access. | .824 | | |
| Give advice about the way in which advanced reporting technology could enhance their business planning process | .682 | | |
| Promote good planning practices through organizing seminars or workshops (on ERP or any planning technologies) | .809 | | |
| Understand business practices and add value to it (by recommendations) | .617 | .545 | |
| Develop strategy aligned with the organisation’s changing strategy | | .633 | |
| Identify new technologies in the market and how to use them | | .816 | |
| IT staff have a very strong relationship with business functions managers | | .861 | |

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

#### 8.5.2.2.2 The impacts of ERP HR resources on ERP Benefits

In contrast to the impact of other factors on ERP benefits, ERP HR has no clear pattern of impacts on different levels of ERP benefits. IT technical competences have the strongest impact (0.35) on ERP benefits of all ERP HR competences, as contrasted in Figure 8-12. However, ERP HR competence in understanding and helping business users to understand business-planning processes through ERP has the highest explanatory power (15.6%) of all ERP HR competences to explain the variations in ERP benefits. Indeed, it has been found the lowest impact (b=0.3) and lowest explanatory power ($r^2$=9.9%) of all ERP HR competences on ERP benefits are the ability to understand business value creation processes and the ability to integrate business strategies with IT strategies.

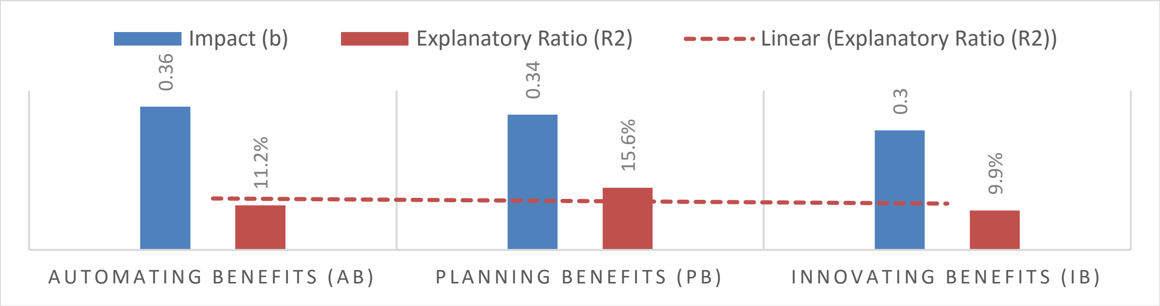



Figure 8-12: The impact of ERP HR on ERP Benefits

These results make sense, since planning is the focal point of the Enterprise Resource Planning system. Automating benefits needs IT technical competences to give an impression of the reliability of ERP in the eyes of users. This perception of reliability is important but not sufficient. For this reason, the impact is high but the explanatory ratio is not as high as it is for ERP planning competences (PIT). However, planning needs change depending on the way in which the users look at the data and how they can be synchronised across departments so as to make enterprise planning possible. The role of IT is critical for changing users' behaviour and their perspectives on the data. This is a very difficult task if the IT human resources cannot absorb and understand the planning process in ERP and its application to real life scenarios. This is why ERP consultants are positioned and named according to their area of experience in business and their technical competences (e.g. SAP Materials Management, SAP Sales and Distribution).

## 8.6 Examining the factors affecting different levels of ERP benefits

### 8.6.1 Regression Analysis on automating Benefits (AB)

In order to verify that the factors presented in Chapter 6 have an impact on recouping automating benefits, correlational and regression analyses were conducted.

#### 8.6.1.1 Impacts of proposed automating blueprint's factors on Automating Benefits

From studying the direct impacts through regression analysis, it appears that the only significant impact with P<0.00 is attitude. All other factors have a significance power of 95% confidence, except skills, which have no significance for attitude. This gives an indication that being skilful in using ERP does not necessarily lead the organisation to do well in automating benefits. However, having a disciplined organisation with well-defined positions and job descriptions is found to have a significant impact on recouping automating benefits (P<0.05) with an explanatory ratio of 13.3%.

As correlational analysis shows in Table 8-17, the perception of recouping automating benefits (AB) is highly correlated with the attitude toward the system (r =42% , P<0.00). In other words, attitude alone can explain about ($42\%^2 = 17.6\%$) of the change in attitude. Nevertheless, the correlational analysis shows that other factors are less significant and low in value with AB. However, all of them, except for Automating Technologies (AT), are highly correlated with attitude. This suggests that the impacts of other factors on AB are mediated by attitude.

Indeed, although skills are insignificantly correlated with the automating benefits, they are highly and significantly correlated with attitude (39.2%, P<0,00). This indicates that skills can have an impact only when they are accompanied with a positive attitude. The mediating analysis was conducted using Structure Equation Modelling (AMOS) software. The mode is insignificant because the sample size is too small to be used for such analysis; three parameters would need 90 responses because each parameter needs 30 (Hayes, 2013; Field, 2013). Thus, it can be proposed that attitudes mediate the relationship between skills and automating benefits. Nevertheless, according to the current sample size, it cannot be argued that skills have a direct impact on automating benefits (i.e. Accepting H0).

It is important to spotlight that the attitude toward ERP and organisation characteristics is significantly correlated by 64%, as illustrated in Table 8-17. This indicates that the organisations that are fitted with ERP can induce a positive attitude toward ERP. This consistency in the organisation motivates the users to accept the ERP, unlike those in which there are conflicts between the ERP functions and their own current functions.

The ability of the IT department to integrate and synchronise the ERP sub systems and work with other external systems such as CRM and SCM was noted in previous chapters to be important for stabilizing the ERP and making it work with few noticeable bugs or problems. This argument was found to be valid in this research, as illustrated in Table 8-17; these competences are highly correlated with users' skills and attitudes (60.5% and 37.5% respectively). Thus, in Table 8-16, these competences are found to have a significant impact on automating benefits (b=0.36 with P<0.05). Indeed, they are less significant and have less impact than attitude. Since they correlate with attitude, it can be proposed that the impact of IT competences on automating benefits is partially mediated by attitude. However, this could not be tested, because the sample size with valid answer is far less than 90.

Table 8-16: Analysis of the impacts of each factor on automating benefits

| Factor | Average | StDev | B | Rsquare |
|---|---|---|---|---|
| **Benefits** | 3.61 | 0.90 | | |
| **Attitude** | 3.4 | 0.86 | 0.42** | 17.7% |
| **Skills** | 3.7 | 0.73 | 0.28 | 5.8% |
| **Organisation** | 3.5 | 0.35 | 0.36* | 13.3% |
| **IT Competences** | 3.6 | 0.85 | 036* | 9.2% |
| **Assets (Tracking)** | 3.0 | 1.13 | 0.27* | 10.7% |

ERP in itself always tends to be illustrated as automating software, as underlined in the literature and by the interviewees. However, the automating technologies in this section are meant to be tracking technologies, such as the bar code or

RFID as detailed elsewhere in this chapter. Indeed, as illustrated in Table 8-16, the existence of such technologies is found to explain 10.7% of the change in realizing ERP benefits (P<0.05) without needing to be mediated or affected by other factors, because there are no significant correlations with other factors. Thus,10.7% is a relatively significant percentage. However, the impact is not as high as some others (b=0.27) with a confidence of 95%.

Table 8-17: Correlational analysis for factors affecting automating benefits

**Correlations**

Pearson Correlation

| | AB | AS | AA | AO | AT | A_IT |
|---|---|---|---|---|---|---|
| AB | 1 | .241 | .420** | .364* | .327* | .335* |
| AS | .241 | 1 | .392** | .285 | .123 | .605** |
| AA | .420** | .392** | 1 | .645** | -.031 | .374** |
| AO | .364* | .285 | .645** | 1 | .092 | .323* |
| AT | .327* | .123 | -.031 | .092 | 1 | .202 |
| A_IT | .335* | .605** | .374** | .323* | .202 | 1 |

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

#### 8.6.1.2 Synergetic analysis

Conducting a mediating or moderating analysis would be difficult in view of the constraints of the sample size. Therefore, all factors together in a single construct using multiplications (to measure when all the factors are in play at the same time) were combined to investigate the interaction between these factors by having a single parameter. All the factors were multiplied and then standardized to give meaningful results. The synergetic impact explains 38.9% of the change in automating benefits from the ERP systems.

The impact of attitude is 0.42 but none of the remaining factors exceeds 0.36. The results support the argument that all the factors together at the same time have a synergetic impact. The synergetic effect is significantly higher than the attitude impact, as spotlighted in Figure 8-13. This proves that the existence of the proposed automating blueprint does lead to automating benefits.

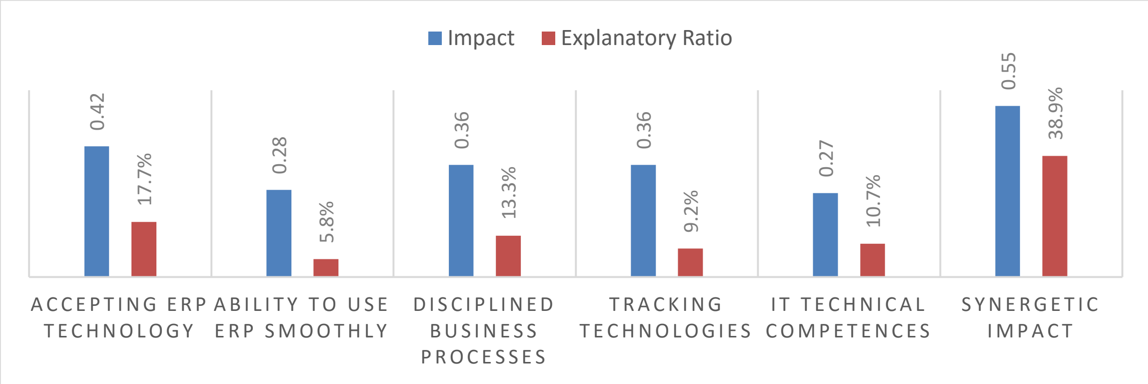



Figure 8-13: Factors affecting ERP Automating Benefits (AB)

### 8.6.2 Regression analysis of planning benefits

#### 8.6.2.1 Impacts of the proposed planning blueprint's factors on Planning Benefits (PB)

Planning benefits is associated significantly with all the proposed factors. Indeed, its organisational characteristics are the highest, with a score of 43.9% (P<0.00). This reflects that the organisation's characteristics are more important for planning than merely the users' attitudes. This makes sense because planning is an organisational activity and needs the involvement of several different departments. If there is no clear planning system, even with a very high attitude factor and strong belief in the power of planning and its technologies, the planners or decision makers will not get the best use of ERP for planning their activities. Although the attitude toward planning is correlated with planning benefits with only 37.7%, it is correlated with the organisational characteristics by 70.2% (P<0.00). This confirms the view that the organisation's characteristics are the key player in securing ERP planning benefits. In other words, having a good planning system integrated in the organisation's daily activities is more critical than simply believing in the importance of the system.

The lowest correlation among the factors, but still significant at p<0.05 is with the users' skills. Again, the players' skills in themselves are not a key factor without an enabling environment. Thus, there is a correlation between users' skills and the organisational characteristics (59% with P<0.00). This proposes that the existence of planning organisation characteristics may partially mediate the relationship between skills and planning benefits.

The technical features of reporting, its being customisable and flexible, are also associated with planning benefits. This is also associated with the users' planning skills (59%, P<0.00). This makes sense because, without planning skills, there is no need to use the customisation features of the ERP reports. Having such options in the ERP is in fact significantly correlated with users' positive attitude toward the system (48.5%, P<0.00) because of their freedom to customize their report as they wish without needing to go back to the IT department to create or change a new report.

Designing their own reports is more closely associated with the planning benefits than IT department competences. IT department competences can lead to planning benefits (r= 36.7%, P<0.05) and giving the users a positive attitude toward the ERP system (r=28.5%, P<0.05), as illustrated in Table 8-18. However, it is not correlated with the organisational characteristics or the customizability of ERP reports. In other words, the customizability of ERP reports depends more on ERP vendor based features than on the IT department's ability to create a customizable reporting system. For instance, SAP and Oracle have their own reporting design system (sometimes called a business intelligence system or Crystal report). In other words, the role of the IT department is to give the users access to reporting designing tools, instead of being used to create their reports for them.

Table 8-18: Correlational analysis for factors affecting planning benefits

**Correlations**

Pearson Correlation

| | PB | PS | PA | PO | PFT | IIT |
|---|---|---|---|---|---|---|
| PB | 1 | .330* | .377** | .439** | .388** | .367* |
| PS | .330* | 1 | .389** | .581** | .590** | .315* |
| PA | .377** | .389** | 1 | .702** | .485** | .285* |
| PO | .439** | .581** | .702** | 1 | .596** | .087 |
| PFT | .388** | .590** | .485** | .596** | 1 | .187 |
| IIT | .367* | .315* | .285* | .087 | .187 | 1 |

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

In this sample, all organisations are scoring above the middle point of 3 in all factors, as illustrated in Table 8-19. In other words, it could not be claimed that any of these factors is unique or difficult to obtain. Furthermore, all of the factors have a positive significant impact on planning, the highest being the organisational characteristics. Indeed, PO is the main factor in terms of explanatory power ($r^2$) and impact (b) with the highest significance level. This can be understood in terms of the vitality of PO. Nevertheless, on average, all factors have more or less the same b of around 0.3. Furthermore, all the explanatory powers of all the factors are roughly the same (15%) except for skills (PS) with 10% and OC with 11%. This gives an indication that all the factors are important and could be complementing each other.

Table 8-19: Analysis the impacts of each factor on planning benefits

| Factor | Average | StDev | B | Rsquare | Sig (P) |
|---|---|---|---|---|---|
| **Attitude** | 3.7050 | .80129 | 0.33 | 14.2% | 0.008 |
| **Skills** | 3.3571 | .77145 | 0.29 | 10.9% | 0.016 |
| **Organisation** | 3.5109 | .81642 | 0.38 | 19.2% | 0.003 |
| **IT Competences** | 3.5490 | .82684 | 0.34 | 15.6% | 0.007 |
| **Planning technologies** | 3.3889 | .91057 | 0.29 | 15.1% | 0.006 |

#### 8.6.2.2 Synergetic Analysis

When all the factors are multiplied (to get the commonality in the interaction) (Alkein, 1991) and standardized for the regression analysis (Preacher et al., 2007; Hayes, 2013), the explanatory ratio, as illustrated in Figure 8-14, increases to 23.8%, which is higher than any other factor alone. In other words, the interaction between factors explains 23.8% of the variation in an organisation's perception of the planning benefits from ERP. However, the impact is limited to 0.34, which is very close to that of any other factor alone (except the impact of skills). The limited sample size precludes an easy understanding of the interaction between factors, but it is not the aim of this chapter to measure the impacts and analyse the interactions; rather it aims to validate whether or not the factors affect the verifying of the tool.

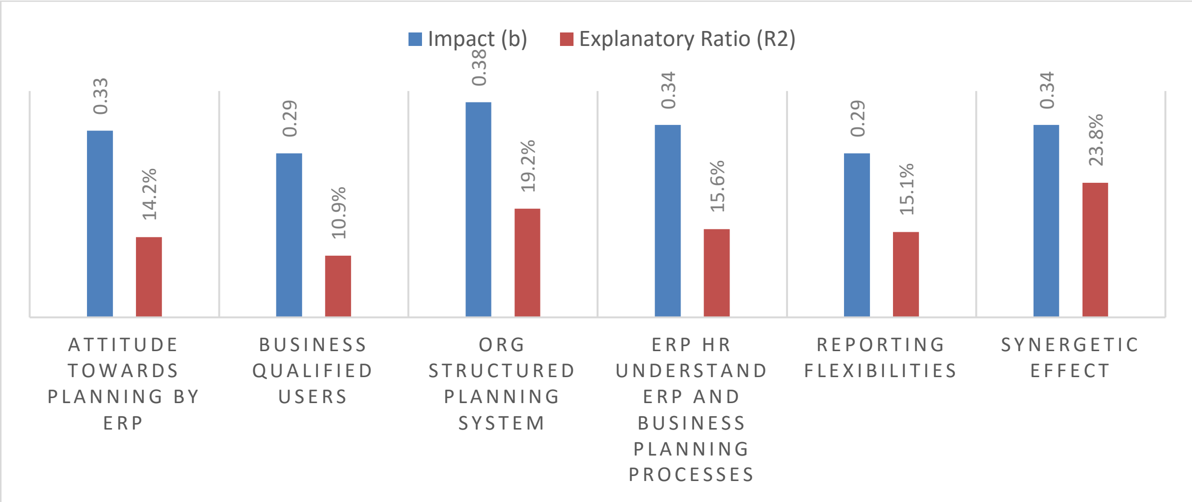



Figure 8-14: Factors affecting ERP Planning Benefits (PB)

### 8.6.3 Regression analysis on innovating benefits

#### 8.6.3.1 Impacts of the proposed planning blueprint's factors on Planning Benefits (PB)

Unlike other benefits, which are dominated by attitude (automating benefits) and organisational characteristics (planning benefits), innovating benefits are correlated mainly by the statistical abilities of the reporting system (IST) available to users (52.4%). As visualized in Table 8-20, the second most important factor is the organisation characteristics (IO) with r = 44.2%. However, the highest impact is made by organisational characteristics and not technological factors, as reported in Table 8-21 and visualised in Figure 8-15. The third significant factor (P<0.00) is the Innovating Skills (IS) with a correlational ratio of 38.7%, whereas attitude (IA) and IT department competences (IIT) are less correlated and less significant (P<0.00). Indeed, IA has the lowest correlation with innovating benefits. In other words, attitude is not as important for high-level benefits (planning and innovating benefits) as it is for low-level benefits (Automating).

Table 8-20: Correlational analysis for factors affecting innovating benefits

**Correlations**

Pearson Correlation

| | IB | IS | IA | IO | IIT | IST |
|---|---|---|---|---|---|---|
| IB | 1 | .387** | .303* | .442** | .315* | .524** |
| IS | .387** | 1 | .263 | .519** | .450** | .478** |
| IA | .303* | .263 | 1 | .330* | -.010 | .371** |
| IO | .442** | .519** | .330* | 1 | .165 | .242 |
| IIT | .315* | .450** | -.010 | .165 | 1 | .394** |
| IST | .524** | .478** | .371** | .242 | .394** | 1 |

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Planning benefits need more organisational characteristics (PO) to perceive the value from planning benefits. Likewise, the main enabler is the IT (such as big data and business analytics) that is available to users in terms of statistical abilities (IST). IST is significantly correlated with all factors (skills by 47.8%, attitude by 37.1 and IT department competences by 39.4%) except for organisational characteristics (IO). However, IO in itself is highly correlated with the perception of innovation from ERP systems. This implies that innovation has two mechanisms: one in the form of centralised innovation that comes because of IO, and the other in the form of decentralised innovation that comes from users' skills.

Furthermore, as always noted in technological diffusion theories (Venkatesh and Bala, 2008), skills and attitudes are highly correlated by 51.9%. In other words, the more employees feel capable of using the technology, the more their attitudes toward it improve. What is interesting is the correlation between the attitude (IA), and the fact that organisational characteristics (IO), and IT department competences are not correlated at all. This may indicate that IT department competences do not affect attitude but do affect skills (r=45%) which boils down to attitude in the end. In other words, without translating the IT department competences in transferring ERP business knowledge, they can affect attitude only if it affects the attitude. This cannot be claimed by the present research; it is more in the nature of a proposition because mediating analysis could not be conducted with such a small sample. However, it is clear that IT department competences are correlated with the perception of ERP as a source of innovation.

The average score of IA for this sample is 3.7 (see Table 8-21). The average is high which means that belief in innovation is not a critical resource, at least, for perceiving the innovating benefits from the ERP system. The average IO score for the sample is 3.2, which indicates that having IO is not as easy as having attitude. The PS is 2.8, less than the middle point. This reflects that not all organisational processes require these skills, which can be considered a relatively scarce and valuable resource for innovation.

Table 8-21: Analysis the impacts of each factor on innovating benefits

| Factor | Average | StDev | B | Rsquare | P Value |
|---|---|---|---|---|---|
| **Attitude (IA)** | 3.7850 | .76267 | 0.31 | 9.2% | 0.036 |
| **Skills (IS)** | 2.8810 | .85912 | 0.35 | 15% | 0.004 |
| **Organisation (IO)** | 3.2087 | .80769 | 0.43 | 19.5% | 0.003 |
| **IT Competences (IIT)** | 3.5637 | .86724 | 0.3 | 10% | 0.033 |
| **Assets (IST)** | 3.2361 | .85149 | 0.49 | 27.5% | 0.000 |

### 8.6.3.2 Synergetic Analysis

When all the factors are multiplied, the impact of the synergetic parameter is tested on the innovating benefits. The impact, as shown in Figure 8-15, is the second after the organisational characteristics. Nevertheless, its explanatory power is the highest. Indeed, the synergetic impact alone explains 23.8% of the variation in an organisation's ERP innovating benefits. This indicates that the proposed innovating blueprint designed in this research is valid.

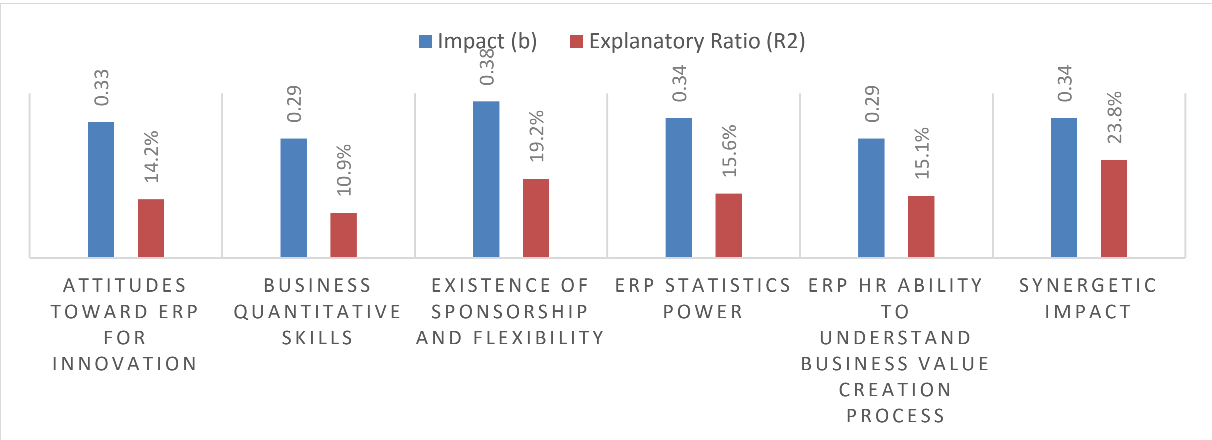



Figure 8-15: Factors affecting ERP Innovating Benefit

## 8.7 Summary

The tool validation went through two phases: a questionnaire (in the previous chapter) and case studies. Thus, the tool was validated from two different epistemological stances: the positivist stance using numbers and correlational analysis from an interpretivist stance using the case study approach.

Of course, no one can predict future performance with 100% absolute accuracy. This is why regression analysis is used. It was claimed in the previous section that, apart from the leading factors for each blueprint, roughly all the factors that were found in Chapter 6 and some which were conceptually tested in Chapter 7 affect performance with more or less the same values, as indicated in Figure 8-16. For instance, users' attitude is the main critical factor affecting automating benefits. However, for PB, organisational characteristics have the highest influence, whereas technology and organisational characteristics are foremost for IB.

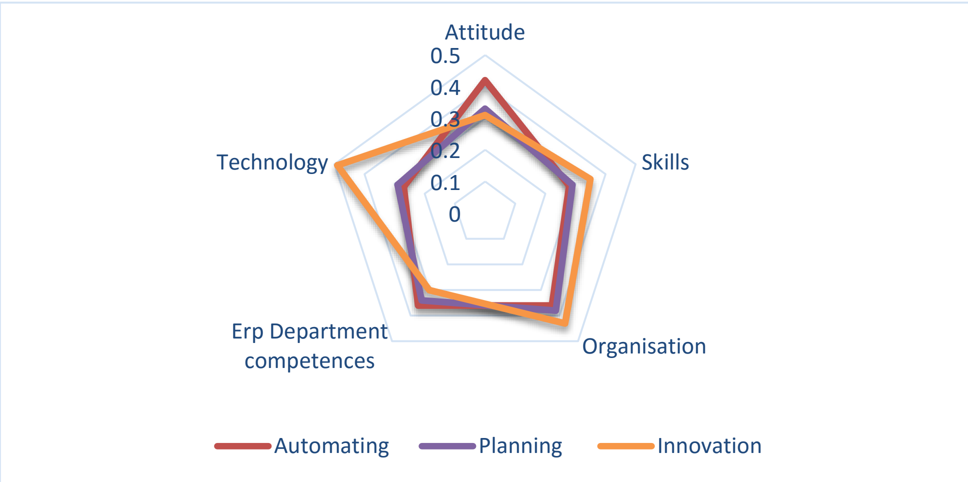



Figure 8-16: The relative importance of each factor in ERP Benefits

The final roadmap for realizing different levels of ERP benefits is conveyed in Figure 8-17. The radar shows the average scores for each factor in relation to each level of benefits. These average scores are considered benchmarks (cut-off points) for recouping different levels of ERP benefits. The figures here shows that the average score of automating skills for the sample is the highest whereas the ERP related innovating skills are the lowest. This indicates that it is not that difficult for organisations to acquire ERP related automating skills. However, ERP related innovating skills are rare and difficult to obtain. This can indicate these skills can be a source of competitive advantage at least in organisations working in innovative environments. Likewise, the organisation characteristics required for recouping innovating benefits from ERP can be a source of competitive advantage because it is average score is significantly lower than others' required for planning or automating benefits. In contrast to skills and organisation characteristics, the technological resources in terms of automating, planning, and innovating technologies have the same average score among the sample. This indicates that the IT in itself could not be a source of competitive advantage as the average is roughly the same.

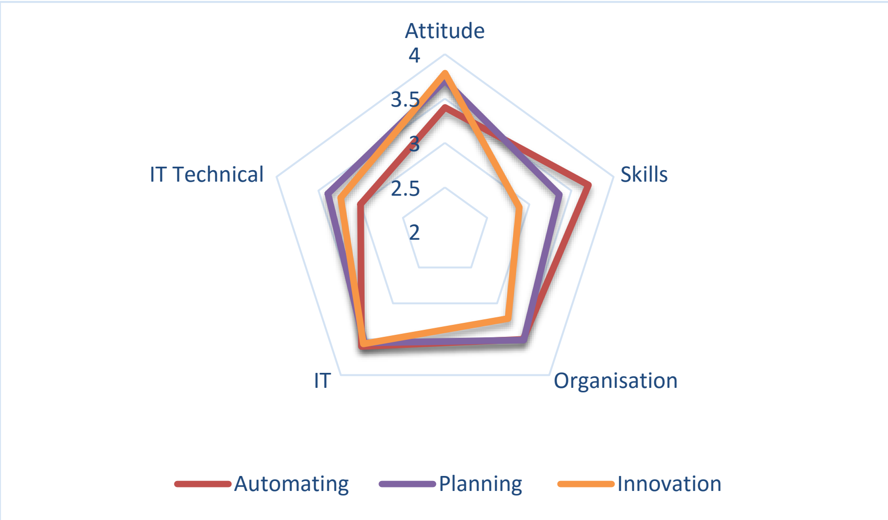
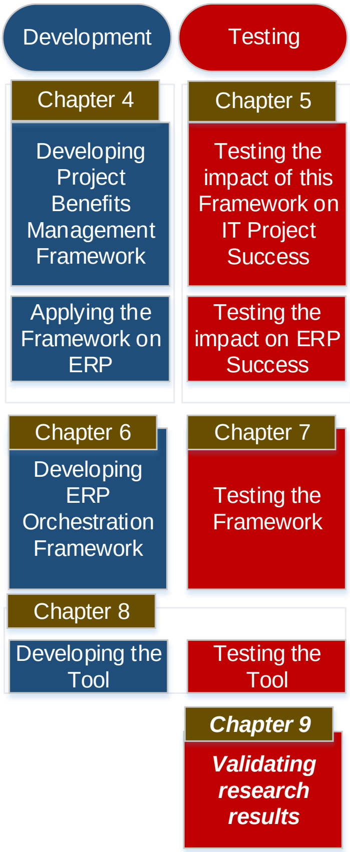



Figure 8-17: The benchmark radar for different blueprints for recouping different levels of ERP benefits

# 9 Chapter Nine: Tool and Project Benefits Framework Validation




## 9.1 Introduction

The aim of this chapter is to validate the research results. In the first phase of the research, the aim was to develop a project benefits governance framework in IT projects for the sake of increasing the probability of IT success. It has been found that the organisations that institutionalize project benefits logics in its routine IT projects are capable of realizing more ERP benefits than those are not. There are various rationales for recommending project benefits governance for ERP success. First, the advantage of having a business case is that it details the plans for benefits and the cost of realizing them. Second, assigning benefits ownership makes users, or super users (i.e. primary users), responsible and accountable for recouping the predetermined benefits.Third, the purpose of authoring a project charter document is to detail the scope for technical staff (the IT department) to identify the space of work and the required technology for achieving the desired benefits. Last, but not least, a detailed service level agreement, if needed, ensures the stability and quality of IT services provided to users.

The key connecting point between the IT department and the benefits owners is the blueprint that details what the business should look like in order to realize the benefits. Consequently, the second phase of this research involved the design of various blueprints for recouping various ERP benefits. Based on these designs, a tool was developed to assess how far an organisation resembled the designed blueprints. The blueprints were tested on 63 organisations and it was found that the elements detailed in these blueprints are imperative for realizing the benefits at every level.

This chapter aims first to assess two cases using the tool designed in the previous chapter. Then it identifies the weaknesses of the cases. Using a project benefits governance framework, remedies are proposed to the decision makers in these cases. In the event, both cases were satisfied with the results and the reports. They have both started to implement the prescriptions provided by the research outcomes.

## 9.2 Research Methods

Two cases were conducted to validate and verify the research findings. These cases were selected on the basis of their voluntary responses to a call on LinkedIn which elicited 4 volunteers altogether. All four were analysed, but only two of them are now reported, the two whose findings are more rigorous and rich. The chapter does not aim to discover new things or to create new theories; rather it is aimed at applying the tool and proposing strategies for remedying weaknesses by means of a project benefits governance framework approach. Thus, selecting comparable cases was not the main intention. However, both work in the Fast Moving Consumer Goods (FMCG) area, but the diversity of the cases enriches and increases the feasibility of generalizing the results in different contexts.

The study of the two cases involved the documents related to them, which were scanned, and meetings were conducted with different ERP experts. However, the experts listed in Table 9-1 were asked only to validate the results. The questionnaire was answered by the ERP application manager (the post he held at the time was that of basis manager, since the post of ERP application manager did not exist) and financial controller (because her firm has no IT department, and she was the one responsible for developing business plans and taking key IT investment decisions).

Table 9-1: Experts used for validation

| Organisation | Expert position | Experience |
|---|---|---|
| **Case F (Food retailing)** | IT Infrastructure Manager | 5 years |
| | ERP application manager | 8 years |
| | Material and Ma SAP specialist (consultant) | 3 years |
| | Sales & Distribution (SD) SAP specialist consultant | 3 years |
| | Production Planning (PP) SAP specialist consultant | 2 years |
| | CEO | - |
| | CIO | 20 years |
| **Case M (Pharmaceuticals)** | CEO | - |
| | Financial Controller | 15 years |

## 9.3 Egypt – Case F

This case is one of the biggest producers of snacks and foodstuffs. It was established in 1999 as a limited liability family-owned company. It started with a small production capacity and progressively augmented this over time, and it has managed to establish itself as a market leader in Egypt. It is responsible for 14 products in the market, bringing out a successful new product roughly every year. However, it faces a big challenge because it is located in a rural area remote from a well-educated workforce. Thus, its main mission, as claimed on the website, is to invest in human resources:

> *"We are committed to providing healthy and safe food products to meet our customers' satisfaction. We are committed to investing in our assets of human resources, because they are among the key factors in our success formula."*

This case implemented an in-house ERP system (developed internally and based on the user's needs) more than 10 years ago. However, this system was not regulated according to proper auditing or control rules and procedures. In other words, users can still delete, update, or change any document at any time without the possibility of tracking these changes. Inevitably, the assets were misused. Consequently, the top management decided to buy an ERP system from a local external vendor. After it did so, the employees perceived that their freedom had been eroded. Thus, they psychologically reacted against the new system and blamed it for anything that went amiss until after 2 years of fighting to implement it the top management decided to stop using it and revert to the old system that had been developed in-house. The main weak point of this local ERPP system, as perceived by the management was the absence of a production system integrated with the ERP. Therefore, the top management decided to implement a new system with an integrated production system.

From 2012 to 2014, it made many attempts to implement SAP. As perceived by the IT director and other IT employees, the ERP vendor was not professional at all and failed to manage change successfully. Thus, this case is still struggling to implement its ERP system. After four unsuccessful attempts to go live, it finally managed to do so early in 2015. Since then it has integrated all the SAP modules except Production Planning (PP) system. The Sales and Distribution (SD) system is functioning well with the Materials Management (MM) system (dealing with the warehouse and internal movement of materials). All the modules are integrated with the Finance and Controller (FICO) system. The next phase is to implement Production Planning (PP) at the beginning of 2016.

Clearly, this case shows no sign of a benefits management methodology. However, after appointing a new general manager who has long experience of ERP and change management, many benefits management logics have been integrated in the business. After his appointment, new concepts reflecting a new culture, such as benefits ownership, a blueprint, and business qualified users, appeared in the organisation which .

When this case study was being compiled, a new general manager had just been appointed. His strategies for managing change were closely aligned with findings of the present research. Thus, his strategies are cited in the “proposed strategy” section.

### 9.3.1 ERP Benefits at F

At the time of this case study, the ERP was in difficulties. All the benefits were still below the middle point (3) and below the average. The benefits radar in Figure 9-1 shows that the automating benefits from ERP stood at 2.67 which is rather lower than the sample average of 3.6. Likewise, the planning and innovating scored 2, very low in relation to the sample averages of 3.7 and 3.3 respectively.

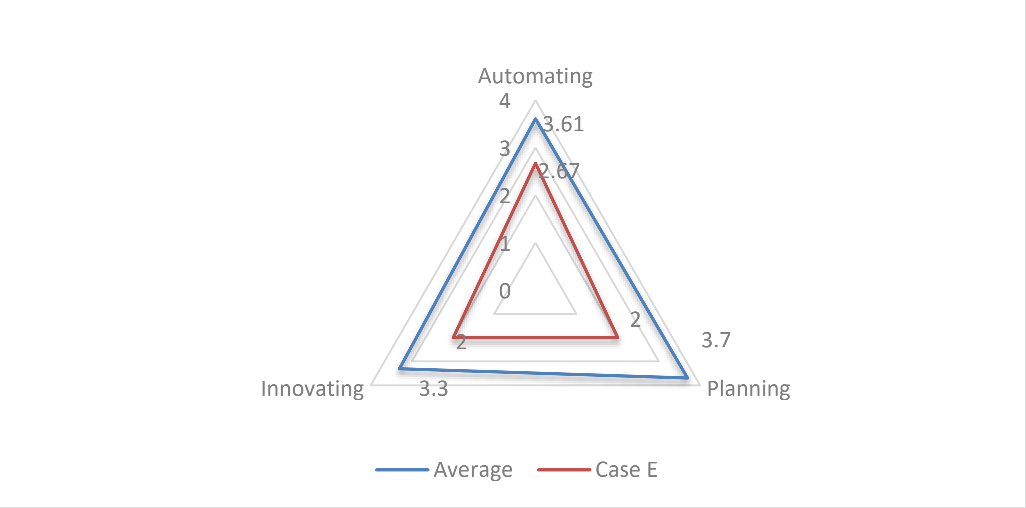



Figure 9-1: ERP Benefits in Case F

### 9.3.2 Automation Benefits

This case is implementing a new ERP system because the former ERP was excessively flexible, enabling the employees to manipulate the data at will. Introducing a new technology to them affected them in two ways. First, SAP is a very restrictive system, which does not allow the user to change anything without its being recorded in the log. Second, SAP is a new technology which requires new steps for recording data, implying a new reporting system with new interfaces. Furthermore, according to the IT infrastructure manager, when the vendor first introduced the ERP in a workshop for employees, he said,

> *"ERP has amazing benefits. It reduces the need for labour and thus it decreases cost significantly"*

Unsurprisingly, according to this manager, this workshop gave the employees a very negative attitude toward the system. According to him, one of the managers said to his employees,

> *"Do not worry, either I or this system [will remain] in the company. Nothing will be changed"*

The negative attitude toward the system was communicated in a kind of death spiral as reported in a paper (Badewi et al, 2013). This death spiral among the users led the system to go down 4 times after going live, which made a huge loss for the company. Furthermore, the negative attitude arose because the vendor could not communicate with the employees.

Another reason for the negative attitude was the fact that the movement of materials could not be tracked through the system. It is still manual and needs much effort to record such data. No automated mechanisms are in place to track the movement of inventory between company stores. The ERP automating IT score is only 2 which is very low in relation to the sample size and the middle point.

The characteristics of the organisation are among the main reasons for the negative attitude. As illustrated in Figure 9-2, it scored only 2, which puts it in a disagree area with regard to the proposed organisation characteristics for automating benefits. Employees are lost when they try to implement the system. Although it was assumed that the blueprint for implementing an ERP was a mandatory part of SAP implementation methodology if the vendor is an SAP ERP, when the IT infrastructure manager was asked about a blueprint, he told the researcher that this was not practical at all. He reported that the vendor had handed the package over without a proper analysis, but anyone looking at it could tell that it was far from reality. Indeed, it has been communicated to no one except the CIO and the IT infrastructure manager. Unless the employees are acquainted with the new blueprint of the ERP and its related business benefits, they will not easily accept the changes which ERP brings.

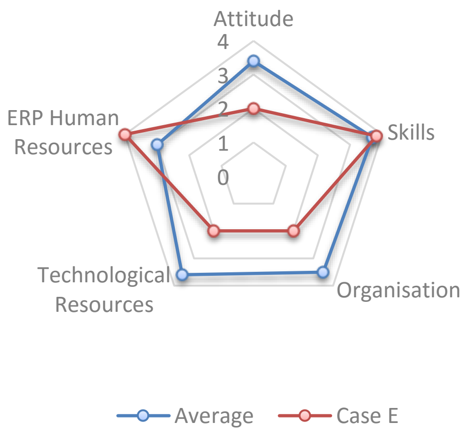
It could not be claimed in this case that the problem can be attributed to the skills of the employees, because they had an ERP in the past, and the company spent 2 years on implementing the system. The staff know very well how to use interfaces and they know about basic reports. In the radar, the skills are reported as a positive point in this case, which scored 3.82, higher than the middle point of the scale (3) and higher than the sample average.

What is most interesting in this case is that the top management failed so many times to go live into ERP, when they had spent so much money on the IT department and IT resources (now seen to be irrelevant). Immense amounts were invested in servers without any need or reason. Some of the servers had passed their guarantee period without being used once. Furthermore, the organisation's huge investment in IT department competences – technical and business abilities – was made without need and improved people's skills needlessly. According to PP, who is a member of the company owner's family (who is believed to wield much power for this very reason):

> "I have been employed by this company for two years. The company spent lots of money on me to qualify me in SAP PP, programming, networking, six sigma and other things. Until now, I have not done any real job because Production Planning (PP) has not gone live yet. Furthermore, production managers are not happy to talk to me as they see me as an IT man and remote from what they actually do."

To tell the truth, the salary of the lower ranking staff in the IT department equals the salary of a senior manager. This creates many negative attitudes toward ERP SAP consultants among the employees. As the MM consultant said,

> *"a senior manager told me, look MM, I spent 20 years working as a planner in this company. Not you, who have just graduated – you cannot teach me what I should do! I do not know why they give you the same salary as me. All of my experience is critical, not you and your SAP"*




| | |
|---|---|
| ***Attitude***: Little/no resistance ERP | *Very Weak* |
| ***Skills:*** Users are able to deal with data entry and basic reports | *Very Strong* |
| ***Org. Char.:*** Well-disciplined organisation | *Very Weak* |
| ***ERP Tech Res***: tracking technologies | *Very Weak* |
| ***ERP HR***: ability to maintain a reliable system | Very Strong |

Figure 9-2: Factors affect automating benefits - Case F

### 9.3.3 Planning Benefits

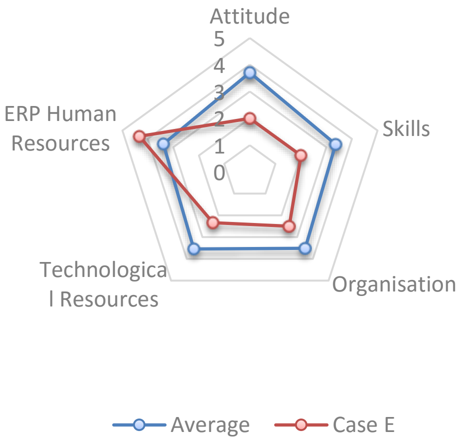
Since the attitude toward ERP is negative, it will be negative also toward planning technologies. This applies to the present case as illustrated in the radar in Figure 9-3, below. Attitude scores 2 out of 5 which is far below the sample average of 3.7. ERP planning skills score very low also (only 2). Investigating this problem showed that users were not at all motivated to customize their reports. All reports were changed by the IT department alone. The management does not have enough belief in the people to allow them to plan. Furthermore, the decision makers were not interested in this issue. The previous system had accustomed them to seeing a particular kind of report and they wanted to see the same kind from the current ERP. From the employees' perspective, ERP seemed to have come to complicate their work instead of simplifying it, according to view of the sales and distribution (SD) SAP consultant.

Thus, the management asked the consultants to customize all the SAP reports until they were identical with the reports of the previous system. Furthermore, in the production department, the management told the production planning SAP consultant (PP SAP):

> "*the best reports we want from ERP are the excel sheets that we have and use now <before SAP>. We are not interested in more than that*"

This quotation reflects a very negative attitude toward exploring new reporting systems. Indeed, in itself it rules out the idea that an ERP system could give them more benefits, in terms of planning. The same reports would be expected to deliver the same information to the decision makers to achieve the same planning performance. The ERP planning benefits which come from the data would be virtually zero unless someone were interested in discovering them.

It must be admitted that this case, at the time of writing, has not made use of the power of ERP as an integrated system. In the organisation characteristics area (e.g. having a structured planning system across departments), it scored only 2.5, as illustrated in Figure 9-3, which seems very low when it is juxtaposed with the sample average of 3.5. The organisation continued to plan by means of a pushing inventory system, under which every department makes its own plan separately. The difference between supply and demand is stored in a huge warehouse. In the absence of ERP, there was no clear new planning methodology, and hence there were no initiatives to integrate planning across departments in ERP conditions. This in turn, led to bringing the value of ERP in terms of planning benefits to more or less zero because the organisation planning structure did not use the power of ERP integrative competence.




| | |
|---|---|
| ***Attitude***: Positive attitude toward planning and ERP planning technologies | *Very Weak* |
| ***Skills:*** Users have business planning skills and are skilful in using ERP in planning | *Very Weak* |
| ***Org. Char.:*** Organisational structured planning system | *Weak* |
| ***ERP Tech Res:*** Reports are customizable | *Very Weak* |
| ***ERP HR:*** able to help and support users to plan through ERP data | *Very Strong* |

Figure 9-3: Factors affecting planning benefits - Case F

### 9.3.4 Innovation Benefits

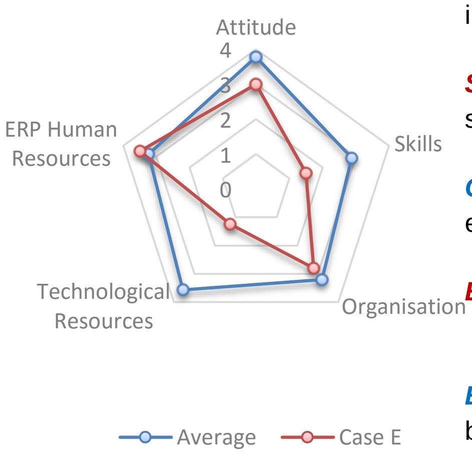
This company is very keen to innovate in its products and tries to deliver new products and new flavors from time to time. According to its website, its approach in quality management is as follows:

> *"The Company is further committed to improving the quality of its existing products, as well as introducing new products in response to changing tastes and market needs."*

This suggests a positive attitude toward innovation and the criticality of innovation to organisational success. Thus, this case scored three in attitude toward innovation. Three is not very low score; it is close to the sample average score (3.8) of attitude toward innovation and attitude toward the ability of ERP technologies to make innovations. Thus, three can be recognized as a low for the attitude toward innovation. However, the organisation does not invest in employees' skills (scoring 1.5) in encouraging innovation nor does it have the proper organisational characteristics (e.g. sponsoring new ideas) to boost innovation (scoring 2.8). Innovations are bought up from outside by the marketing department. This is the result of not believing in the power of its own employees. As the CIO manager says

> *"the problem is that we are located in a remote area. Our human resources lack lots of skills. We are not able to recruit professionals because our location is so remote from any developed areas. Most of our employees … can hardly read and write"*

This is reflected in the employees' ERP innovative skills (e.g. statistical competences) which, as reported in Figure 9-4, score very low (only 1.5), significantly lower than the sample average of 2.88. Furthermore, the ERP technological resources required for innovation do not existed (i.e. is not activated) because, as with the planning benefits, management cannot trust the employees to create new concepts in the database to be used for analysis. Thus, the customization of reports for new methods of statistical analysis are locked away, as it were, discouraging users from exploring these data. The only motivational aspect is that the competence of the IT department is very high. This was investigated before when automating benefits since the board of directors always invests in IT, in the belief that the problem lies there and not in the OCRs. However, this over- investment in the ERP Human Resources without orchestrating other resources (OCRs) with ERP resources has created tensions and weakened the relationship between the IT staff and its users.




| | |
|---|---|
| ***Attitude***: Positive attitude toward innovation and ERP as an enabler for it | *Weak* |
| ***Skills:*** Users have quantitative and statistical competences using ERP | *Very Weak* |
| ***Org. Char.:*** Organisational flexibility and existence of innovation sponsorship | *Normal* |
| ***ERP Tech Res:*** statistical features | *Very Weak* |
| ***ERP HR:*** strong relationships with business users and ability to understand the business innovation process | *Normal* |

Figure 9-4: Factors affecting innovating benefits - Case F

### 9.3.5 The proposed strategy

The main problems for this case are mainly the inability to orchestrate between investment in ERP resources (i.e. ERP technological and human resources) and Organisational Complementary Resources (OCRs). This mismatch created a negative attitude toward ERP, its technologies and what it could do for the organisation. The problem was exaggerated because of the organisation's inability to trust in the ability of its employees to plan and innovate.

Benefits management can resolve part of the problem by engaging the users in ERP benefits and planning realistically for benefits over a time horizon on the basis of the employees' ability to comprehend and deploy ERP. Without reviewing the plans and progress in realizing benefits, benefits management would make no sense in terms of benefits ownership. Furthermore, these plans should be integrated with the required technological resources and the required new organisational design in one document called a blueprint should be communicated widely across the organisation.

For this reason, the researcher conducted a workshop for all SAP consultants to train them in using the Benefits Network Diagram (BND) and benefits management principles so that they could train key users to identify benefits and persuade them to believe in the system from a positive perspective (ERP brings benefits). By having a benefits map, they can the attach the ERP benefits to the income for the user (the benefits owner). SAP consultants welcomed this idea and started to implement it. This workshop was video-recorded and the IT department of the company kept the video to replay every time ERP technological resource was implemented in future.

The General Manager (GM) engaged stakeholders by mapping them to identify key blockers and facilitators. Afterwards, he organized many informal meetings with key blockers, building strong relationships between the IT department and the other employees which grew into friendships and informal relationships. He also spread the concept of "benefits ownership" for ERP benefits by allocating responsibilities and rewards that were based on ERP benefits. The sign of his success was his turning of key blockers into key facilitators.

As the Sales and Distribution consultant reported,

> *"The marketing director was not a believer in ERP at all. He was the main reason for the failing ERP each time. After our new General Manager's ability to manage change, now I see this manager is a key defender of the system. In the last seminar about his power to implementing successfully, he always pointed to his own efforts.. Anyway, regardless of who account for the success, we are happy that marketing department is 100% implementing ERP within only 4 months"*

The General Manager (GM), as a change management agent, managed the attitude toward ERP not by talking about ERP but by talking about the performance and productivity that were needed to make improve business. He conveyed a sense of urgency to implement the system. The success stemmed from his giving lectures in planning methodologies and approaches which made the users hungry to implement ERP so as to use these planning methods. As a matter of fact, according to the Materials and Management (MM) consultant, introducing Activity Based Costing (ABC) as a costing model to compete with the company's traditional budgeting model (which fitted and was more convenient to use with its previous system), made the decision-makers more interested in ERP because it would give them access to ABC reports which would let them cost their batches more accurately. Furthermore, after he had been shown the solution, the production planning (PP) consultant was interested in attending a workshop with all the planners in production, the supply chain, and sales, to talk about the integrated planning system of ERP and how the organisation could get the best use out of it.

A sample of decision makers responded to the proposed solutions by the following positive comments:

> *"Having a benefits management strategy is a really vital idea. Having a systematic review of benefits and buying new ERP feature based on it to leverage the performance could be a key to success."* CIO

> *"Yes, I agree with you. It is a new idea to have a "benefits audit". I see it as very critical for realizing ERP success" CEO*

## 9.4 Ireland – Case M

Case M is a family business producing pharmaceutical and vitamin goods in the west of Ireland. It has five pharmacies to sell and to distribute its products to the Irish market and also exports to Europe and America. Its operations and sales extend over several cities in Ireland. This organisation is very much interested in innovation and leading the market, which itself is a market of innovation. Thus, this case has the mission

> *"to be the primary leader in all aspects of lifestyle and healthcare"*

It has four levels of management. The work of the first one, the board of directors, is strategic long-term decision-making and planning. The board consists of the managing director, financial director and a non-executive director. The second level prepares operational plans and takes operational decisions. It consists of managers in purchasing, human resources, operations, human resources and marketing.

Its ERP system is not well integrated. Each department has its own information systems. Although it has an ERP system, its systems are still working in silos. There is no direct integration of information systems. Thus, reports are handled manually or electronically on a periodical basis (e.g. monthly reports, quarterly reports). Nevertheless, databases are accessible via the financial controller and department heads; they are not on the same platform (i.e. they deal in different systems from different vendors) except that the purchasing and operations management have the same IT vendor (i.e. they can communicate and share data).

The third level is the stores operations in which point of sales systems (POS) constitute the main information system. This POS system is integrated, through ERP, with the decision makers' level to allow the decision makers to read online what is going on in the stores.

Progress in IT infrastructure, as summarised in Table 9-2, has moved from a manually based system to an ERP cloud system. This case has adopted the

Opus ERP cloud system. To accommodate this, all the stores are interconnected with Wi-Fi and broadband, which allows for the seamless communication and transferability of data. Since 2013, ERP has been working but is not well integrated across various functions.

Table 9-2: Progress in IT infrastructure in Case M

| Year | ICT system | Function |
|---|---|---|
| **1998** | Manual till | Sales |
| **2001** | Electronic till | Sales VAT receipts end of day |
| **2005** | EPOS system | Sales purchasing recording suggests orders |
| **2013** | Opus-integrated system. | Sales purchase suggests ordering best sellers, sales promotions, and minimum orders with a seasonal variation link to an accounting package of sales variations on a yearly basis |

### 9.4.1 ERP Benefits at Case M

Case M scored just below the average in all benefits but higher than, or equalling the middle point of the scale (3). This means that it lags behind other organisations but these benefits are to some extent accepted by its decision makers. Automating benefits do better in this company than planning and innovating benefits, as illustrated in Figure 9-5. The average score for automating benefits is 3.5 which is higher than the middle point of 3 but lower than the sample average of 3.61. However, the difference between the sample average and this case score in automating benefits is not significant. This implies that the organisation is doing averagely well in automating benefits. However, the difference between the average sample and this case is higher and more significant when it comes to planning benefits (the difference is 0.3 or 10%) and rather higher for innovating benefits (the difference is 0.5 or 15%). However, both planning and innovating benefits just equal the middle point of the scale (3).

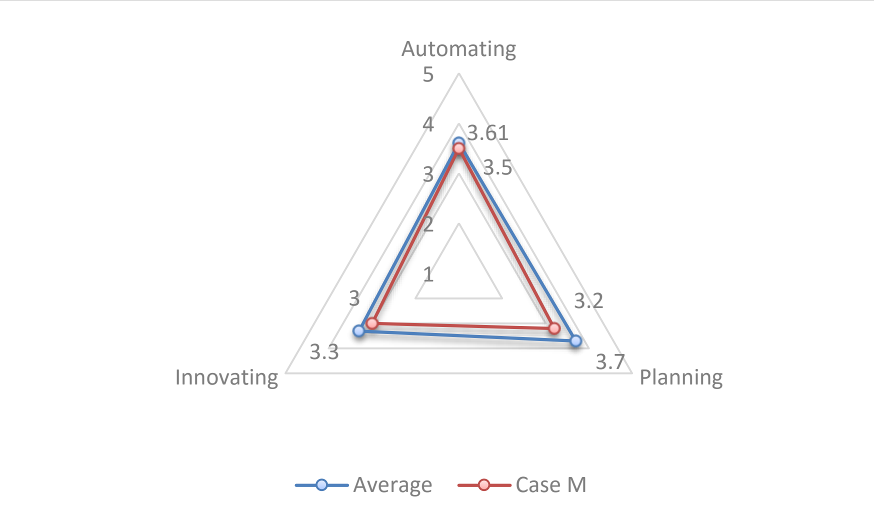



Figure 9-5: Benchmarking Case M with the sample benefits

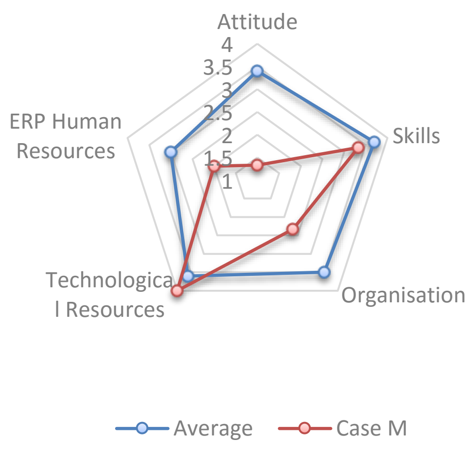
### 9.4.2 Automating Benefits

As illustrated in Figure 9-6, this case does very well in IT. It does so because it has a cloud system, a bar code system and integration of all its stores. Its only integration problem lies with its non-material systems such as Human Resources. On the operational level, all its points of sale on retail counters are integrated with a central head office sales system, not an accounting system.  Thus, the sales department can monitor all the sales in stores as they are completed.

This case faces a big challenge because the attitude toward ERP is negative (1.33) scoring below the middle point of the scale (3) (i.e. it is in the disagree area). Indeed, attitude is the main critical factor affecting the automating benefits, as shown in the previous chapter. This problem of negative attitude toward ERP could be attributed to two factors: IT department competences and organisation characteristics. But the users' skills should not be blamed for the negative attitude because the users' automating skills (i.e. basic skills in using ERP) are not very low; they score higher than the middle point of the scale (3) yet lower than the sample average (3.7).

The IT department is not available to employees and its work is outsourced, which leads to innumerable problems when the system breaks down. It takes some time to restore it. Furthermore, the IT department is not able to integrate systems effectively because they company relies on several different vendors). In other words, the system has the potential to be well integrated but the management of the IT department is not good (it is under contract with the IT vendors). The problem has escalated because the company has no proper project management methodology for implementing and contracting new IT projects and this may entail delay or cost ineffectiveness. All of these factors affect the attitude of the staff toward the system. The interviews did not reveal any benefits management methodology or change management approach for managing change. These factors have all contributed to the negative attitude.

The organisational characteristics required for achieving automating benefits are lacking. The scored only 2 out of 5, which means they are not available. As discussed in Chapters 5 and 6, the role of benefits management role is to design the blueprint for the new IT on behalf of the organisation. In this case, because no benefits management mentality has been encouraged, the organisational characteristics do not support the earning of automating benefits. In other words, because there is no clear blueprint for the future state of the organisation, the job descriptions become vague to employees and users do not properly understand their functions. All of these factors affect the attitude negatively.




| | |
|---|---|
| ***Attitude***: Little/ no resistance to ERP | *Very Weak* |
| ***Skills:*** Users are able to deal with data entry and basic reports | *Normal* |
| ***Org. Char.:*** Well-disciplined organisation | *Very Weak* |
| ***ERP Tech Res***: tracking technologies | *Very Strong* |
| ***ERP HR***: ability to maintain a reliable system | *Very Weak* |

Figure 9-6: Factors affecting automating benefits at Case M

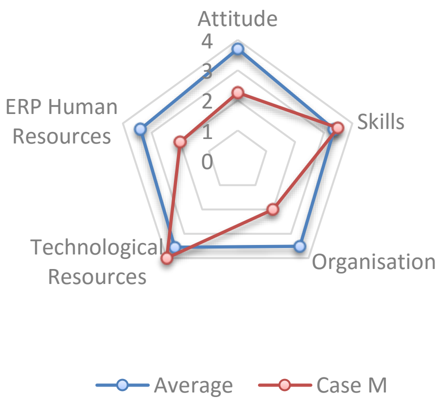
### 9.4.3 Planning Benefits

If a negative attitude prevails toward the system for achieving automating benefits, the same negative attitude is expected toward planning technologies.

This case exemplifies this, as illustrated in Figure 9-7, since attitude scores only 2.25. Furthermore, the organisation characteristics share the same problems as are found for automating benefits. Usually, when the organisation does not change itself to absorb the new technology, it is difficult for it to recoup its benefits. The organisation characteristics' score for planning is far below the average (it is 2 when the sample average is 3.5). This can be blamed on the lack of a benefits manager who would responsible for changing the current organisation (As-is) into a (to-be) organisation to earn the expected benefits from ERP.

From the technical perspective, the value from investing in excellent planning technologies (IT scores 4, higher than the average of 3.5) diminishes because of the inability of the IT department (IT facilities are under contract with the IT vendors) to manage such technologies. The lack of an IT director who can share the planning practices of ERP and promote them (both benefits management functions) prevents  the users from learning about by many of the IT planning assets in the organisation. Indeed, many employees in this case are not aware that there is an ERP system at all.

> "*Our ERP is very basic currently and more in line with an EPOS system with added BI.  We are currently working on integrating this with the finance system*."
> Financial Controller




| | |
|---|---|
| ***Attitude***: Positive attitude toward planning and ERP planning technologies | *Very Weak* |
| ***Skills:*** Users have business planning skills and are skilful at using ERP in planning | *Normal* |
| ***Org. Char.:*** Organisational structured planning system | *Very Weak* |
| ***ERP Tech Res:*** Reports are customizable | Strong |
| ***ERP HR:*** able to help and support users to plan using ERP data | *Very Weak* |

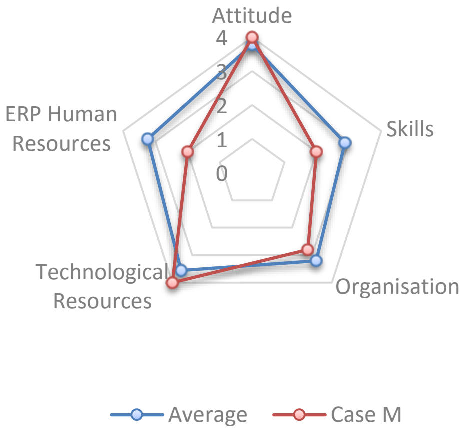
Figure 9-7: Factors affecting planning benefits at Case M

### 9.4.4 Innovating benefits

The attitude toward innovation, with a score of 4, is better than average for the sample, 3.78. This is reflected in the CEO's keenness to innovate and supply new products. However, as the findings suggested in the previous chapter, attitude alone without having an innovative environment cannot make much difference. The organisational characteristics do not enable the company to innovate as easily as some others, according to the scores. A score of 2.8, as illustrated in Figure 9-8, shows that this case does not have the flexibility to make innovations nor have the sponsors for discovering, validating and implementing new ideas. This may be the result of the heavy investment in IT for automating, which restricts the organisation's capacity to change overall (as suggested from the correlational analysis in Chapter 7 which finds that automation affects flexibility negatively).

From the technological perspective, the organisation does very well in terms of innovative technical resources. A customers' loyalty card system for tracking customer behaviour and purchases is in operation. The central server correlates the customers' buying trends and this influences product purchasing. A messaging system exists at the point of sale, which reminds staff to promote a particular product or recommend a product on the basis of seasonality, or current offers. However, the employees' skills score very low (2 compared to a market average of 2.88) because the Business Intelligence system produces all the statistics required and there is no clear need for other users to be very skilled in using them (as supported from the results in Chapter 7, the need for statistics as a skill does down as data analytics become more advanced).

In fact, the main restraint on innovating comes from the ERP human resources. According to the findings in the previous chapter, IT department competences are critical for innovation because of their important role in absorbing and introducing new market technologies in an organisation after translating their technical importance into business importance for business users. The problem in this case is that it does not have its own IT department. It is believed that this is the main stumbling block when organisations want to innovate using ERP technologies.




| | |
|---|---|
| ***Attitude***: Positive attitude toward innovation and ERP as an enabler for it | *Weak* |
| ***Skills:*** Users have quantitative and statistical competences for using ERP | *Very Weak* |
| ***Org. Char.:*** Organisational flexibility and existence of innovation sponsorship | *Normal* |
| ***ERP Tech Res:*** statistical features | *Strong* |
| ***ERP HR:*** close relationships with business users and an ability to understand business innovation processes | *Very Week* |

Figure 9-8: Factors affecting innovating benefits in Case M

### 9.4.5 The proposed strategy

Strategies based on the analysis conducted using the ERP benefits maturity framework are proposed for this case and summarized in Table 9-3. For the users' negative attitude toward the ERP system, the proposed solution is to adopt the project benefits management governance framework developed in Chapter 6 so that its blueprint is  well designed before the new system is implementing (or else to design a blueprint for the current system).  Projects could then be launched on the basis of this blueprint. Furthermore, service level agreements should be written (as one of the tasks of benefits management) to ensure connectivity and prevent technical issues. In this way the system would be well enough integrated and harmonized to be perceived as reliable by its users.

Planning benefits need a stronger sense of benefits ownership among users than planning benefits do. But according to the CEO, neither exists in this organisation, for it has no mechanism for making employees to be accountable and responsible for the benefits.  This may be one reason for their psychological detachment from the system. They are conscious only of punishment when they do not use the system or use it wrongly, but there is no sense of accountability for earning predefined benefits instilled before implementing the system. According to the

CEO, he accepts this idea and he is developing a Key Performance Indicators (KIP) system to integrate benefits with current performance evaluation.

After holding a workshop with the CEO and the financial controller, it was agreed that in this case suitable strategy and the role of IT manager were critical for supporting technology-led innovations. The current way of implementing new technologies which were not based on any systematic approach (e.g. benefits management and project management) have led the organisation to invest haphazardly without a clear overall direction. This limitation on implementing new technologies was the main solution for investing too much in technologies, which diminished the ability of users to accept, absorb, and get best use from them. Indeed, because of the haphazard IT strategy, there was no integration between the ERP systems and no unified interface for the data. In other words, the points of sale were integrated but there was no integration with the finance and HR systems. This in turn led to an inability to develop new innovative ideas easily. The financial data were not integrated with the operational data and thus strategic decisions were difficult to make.

Before implementing new technologies, a business case should be developed based on clear benefits, a benefits plan (a plan for realizing benefits from ERP) and the assigning of benefits owners. For innovation benefits, the story is to some extent different. The main benefit owner of the innovation should be a sponsor (non-existent in the present case), or the board of directors, who were struggling at the time to have a single system on which to tracking what was going on. The CEO agreed with these proposals, but when he asked whether the new ideas were shared in the organisation, some employees replied "*Who will listen to us?*" This came as a clear sign to him of the lack of sponsors for nurturing the new ideas resulting from ERP.

Table 9-3: problems and proposed solutions

| Problem | Proposed solution |
|---|---|
| **Weak attitude toward ERP technologies and disbelieve in the ERP** | Benefits Ownership: each benefits owner should propose his/her own ERP benefits. Afterwards, accountabilities for realizing benefits should be assigned and their realization should be tied in with income |
| **Weak innovative skills** | Training in data analytics. Workshops for training users should be conducted. |
| **Weak automation and planning organisation structure** | Business Change Managers should be appointed to design blueprints that would reflect the necessary business changes for realizing automating and innovating benefits. |
| **Technological Resources: too much to absorb technologies** | Business cases should be developed to rationalize investments in IT |
| **Lack of ERP human resources** | One IT manager, at least, who has a business background and understands business processes, understands IT business needs and can work with business users to improve the realization of the benefits of ERP |

## 9.5 Summary

Two different cases in two different countries revealed different obstacles to realizing ERP benefits. Nonetheless, after introducing an ERP benefits management framework (principles, values, and tools) as developed in Chapters 5 and 6, it was found that the cases under study could improve their benefits from ERP. But first they would need to become aware of these benefits and work to realize them. ERP can be a source of innovation if it is planned to be so. Benefits realization is not a passive process but an active process which needs active management to recoup them.

Indeed, although the two cases were conducted in two different countries with two different cultures, it has not been noted any differences that may affect the results. Both organizations face similar problems. Both of them invest in technology not in the organization characteristics, skills or attitudes. Both cases perceive attitude is something not important to be managed.

Even the recommended solutions are far similar in many aspects such as the need for having benefits owner, reviewing benefits and attaching benefits to employees income. Indeed, the Case F is more professional in IT human resources whereas case M is not. It is not because of the culture or country context, it is because how each organization manage its IT investments.

Indeed, the aim of this research is not for building new conceptual frameworks by understanding the differences in context; rather, the aim is to validate the research results by introducing the tool and proposing solutions based on Project benefits governance framework.

# 10 Chapter Ten: Discussion and Conclusion

## 10.1 Introduction

Although IT success has been investigated and studied for more than 30 years, between 40% and 66% of a set of 460 organisations perceived that they were gaining less than 50% of the predefined benefits (Panorama, 2015). Success means not only delivering the IT artefact on time and within budget but also recouping the pre-defined benefits from it. This research spotlights this paradox by asking the question “How organizations can achieve the maximum benefits from ERP systems?

It could not of course be claimed that one research study is enough to answer this question. However, the present research developed, tested and validated several integrated approaches for improving the success rate of ERP in terms of harvesting its benefits. This research is only a step toward answering one of the most debated questions in the literature “Why do IT projects fail?” (Carr, 2003; Chae et al., 2014). It was found in the present research that neither benefits management practices nor ERP technological resources alone can account for it. Furthermore, a road map (i.e. a set of complementary blueprints) is designed and elaborated into assessment tool to help organisations address the weaknesses and strengths in their capabilities to realise benefits

## 10.2 Research Methodology and Its limitations

This research used a critical paradigm in different ways. Its main axiology is continuous scepticism and a critical approach to the emergent results. The literature is used to build, support, develop, and validate results in light of abductive logic (mixing deductive and inductive logics). This research differentiates between the framework, the model, and the validated framework to reflect its sceptical research philosophy. The frameworks are developed from the literature but extended and enriched by qualitative research. However, what people know comes usually from what they have learnt from books, but what they believe and what is written in the literature is not necessarily correct. Therefore, the positivist paradigm is used to translate the qualitative results into propositions which are tested under the presumption that the respondents do not know. In other words, instead of probing questions ("do you think benefits management is necessary for ERP success"), one question asks whether or not the respondents' organisation is using benefits management and another question asks about the ERP success in this organisation. This approach is believed to clarify the demarcation between the truth and belief. It threw up many interesting criticisms of what many believed to be facts to show their fallacies. After testing, the framework was called a "model" because it was verified by numbers.

For instance, most of the experts interviewed believed that benefits management was critical for ERP success. However, it was found that this claim could not be validated and that PM is more important and more critical for success. Indeed, evidence from 200 organisations suggests that BM without PM will not lead to ERP success. Another example found in this research is that ERP is an enabler of innovation. One of the experts exclaimed, "Are you serious! ERP will never be a source of innovation." However, the qualitative data used to enrich the literature based framework and the quantitative data used to test this framework underlined that under certain conditions ERP can indeed be a source of innovation. When this expert saw the results, she agreed. The researcher had given significant attention to differentiating between the "power of the book" in the minds of experts and the strength of the evidence. It must be admitted that numbers alone can be misleading in testing frameworks, but the aim of validation is to ensure that the tested model makes sense in the minds of experts. All the models in the present research were thus validated and finally all results were validated on two case studies (presented in the previous chapter).

The main drawback of this sceptical approach was that it needed unusual amount of effort and time. For instance, this research collected questionnaires from more than 500 respondents. Furthermore, it was a daunting process to analyse all these questionnaires and use various statistical models. This research used simple descriptive statistics, inferential analysis and advanced inferential analysis. It used both structured analytic models and unstructured analytic models.

## 10.3 Research Questions

### 10.3.1 Research Aim

The research aim is ***"to investigate the benefit realization process of ERP systems to develop a benefit realization road map for organisations to realize the maximum potentials of ERP systems."*** It is believed that this thesis has successfully accomplished this aim. As illustrated in table 10-1, this research produced two main frameworks: project benefits governance framework and ERP orchestration framework. Whereas the first framework is to improve the project success in terms of delivering business benefits from investment in ERP by having a coherent and integrated implementation governance mechanism, the second framework is to clarify the road map for delivering different set of benefits.

#### 10.3.1.1 Project Benefits Governance Framework

The benefits realization process is investigated and understood by developing and testing a project benefits governance framework which, when institutionalized in an organisation, explains 55.1% of the reason for variation in achieving ERP project success. ERP project success includes perceived benefits from the system, stakeholders' satisfaction from the results and senior managers are happy with the return on investment on it. This framework consists of four conceptual models and one measurement model. The first model is to understand the actors' abilities to realise ERP benefits. Based on this model, the second is to understand and to propose the areas of responsibilities and accountabilities so that the third model can be developed to present the relationship between different actors in ERP implementation based.

The fourth model, ERP benefits management governance model, is, based on the previous models, for mapping the actors' responsibilities and accountabilities and related documents on ERP benefits management cycle (i.e. identify, plan, implement, review, and exploit ERP benefits). Finally, the last model is a measurement model to test the viability of this new framework after taking into consideration the institutionalisation of project management and benefits management logics in an organisation.

Table 10-1: Summary of research frameworks, tools, measurements, taxonomies and tools

| | Models, process, measurements, taxonomies and tools | Description |
|---|---|---|
| A governance based framework to integrate PM and BM | Abilities of actors to realize benefits model | It is to show out what each actor can do and what he/she cannot do. |
| | Relationships between benefits management actors model | Based on the abilities of each actor, a proposed model to show how actors shall interact to improve project success |
| | the circles of accountabilities between project managers and benefits managers model | Based on the abilities and relationships, the circles of accountabilities are drawn to assure a proper governance of actors' behaviors to improve project success |
| | ERP benefits management governance model | Mapping the responsibilities and accountabilities of each actor on each step of ERP benefits management (i.e. identify, plan, review, and exploit benefits) |
| | Institutionalizing project benefits governance model | To test all the previous results after considering institutionalizing these logics. The model shows 55% of ERP project success due to institutionalizing and implementing this framework. |
| ERP Orchestration Framework | ERP Benefits Taxonomy | To classify ERP benefits into IT, automating, planning and innovating benefits. |
| | ERP Benefits Pyramids | To propose that automating benefits are easy to obtain, planning benefits are difficult to obtain and innovating benefits is the most difficult to be realized. |
| | ERP cone of innovation model | To propose that to realise innovating benefits, automating and planning benefits shall be realized and matured first. |
| | ERP automating Benefits Blueprint | To develop a detailed design of the blueprint required to realise automating benefits |
| | ERP planning Benefits Blueprint | To develop a detailed design of the blueprint required to realise planning benefits |
| | ERP innovating Benefits Blueprint | To develop a detailed design of the blueprint required to realise innovating benefits |
| | ERP innovation model | To test the ability of the defined blueprint required for innovation to enable organizations to innovate in its products. |
| | ERP Benefits road map | To summarize all blueprints for all three benefits types into a single map |
| | ERP Benefits Maturity Tool | To utilize the previous results in an assessment tool for measuring the organisations' weaknesses and strengths to realise different kinds of ERP benefits |

#### 10.3.1.2 ERP Orchestration Framework

The second framework, ERP Orchestration Framework, consists of a benefits taxonomy, 2 models (ERP cone of innovation and ERP innovation model), 3 blueprints, a road map and a tool to enable organisations to identify the weaknesses in their current As-Is so that different to-be (i.e. blueprints) can be targeted to realise different levels of benefits. As tabulated in table 10-1, one taxonomy is to classify ERP benefits into four main categories: IT infrastructure benefits, automating benefits, planning benefits, and innovating benefits. The maximum level of benefits can be realised is the innovation benefits which are not bounded by a certain predefined score.

The benefits pyramid comes to show the benefits are not all easy to recoup. Whereas automating benefits are easy to recoup, innovating benefits are challenging to be realised. Therefore, ERP innovation cone model shows that innovating benefits are not easy to be realised without realising the automating and planning benefits first. Furthermore, three blueprints are designed to achieve different ERP categories of ERP system. The innovating blueprint is tested in a measurement model to show the effectiveness (the validity, reliability, fitness, and accuracy of the blueprint). All of these blueprints, after validating, refining, and testing, are summarised into a single road map called ERP benefits road map. Finally, this road map is quantified and used as a benchmark to assess organisations' weakness and strengths, in ERP benefits maturity assessment tool, in their ability, through different blueprints, to realise different ERP benefits.

### 10.3.2 Research Question, Sub questions and Objectives

The main research question of this thesis is "How organisations can realise ERP benefits?" the answer is by institutionalising project management and benefits management logics in an organisation before implementing ERP and then implementing it using traditional project management approach combined by benefits management approach. For realising the benefits, organisation has to move from its As-Is status to three interdependent blueprints (i.e. automating, planning and innovating blueprints).

### 10.3.3 What is a suitable implementation mechanism for implementing ERP?

This research commenced by interviewing experts to find how they implemented IT projects in such a way as to deliver the predefined benefits. It was found that project management and benefits management are the main mechanisms for delivering IT projects and recouping their benefits. Furthermore, the interviewers' ideas and views were heavily influenced by their accreditations in a project (e.g. PMP and PRINCE 2) and programme management (e.g. PgMP and MSP). However, some of them integrated the two approaches, in what was perceived to be a fruitful way of delivering the benefits of IT projects.

This research went on, after testing it on 200 organisations, to underline the view that the project management approach (i.e. assigning and detailing responsibilities to IT project managers, planning and updating cost and time plans and stakeholders' management) is vital for delivering IT projects on time and within budget. Furthermore, this approach leads to project investment success (i.e. to recouping the expected benefits and a satisfactory return on investment). The reasons for this are many. First, because the project is delivered on time and within budget, users perceive that a professional agent (the IT department) has delivered the system. Second, because of the existence of the project charter, which details the scope of work required from IT, the IT department is able to address the users' needs in an efficient and effective way. Finally, by managing the stakeholders' perceptions using proper communication methods with effective messages, the project lowers resistance to the new IT artefact and improves attitudes.

Nevertheless, the benefits management approach (i.e. assigning and detailing responsibilities to the benefits owner, defining benefits, planning benefits and auditing benefits) is found to have a weak but significant impact on project investment success. In other words, without having an effective project management approach to deliver IT projects, the users will not be psychologically able to accept the IT artefact because of the delay, bugs or perception of unprofessionalism in the work. However, it has been found that when PM and BM approaches are made at the same time, the project investment success is increased more significantly than merely adopting a PM approach without BM. This integration between PM and BM is named the Project Benefits Governance Framework (PBGF)

When this framework was applied to ERP, the results were disappointing. However, when an organisation institutionalizes, i.e. becomes more mature about, the PBGF in its daily practices, it is able to achieve far more success than other organisations which are not institutionalized, i.e. less mature about, the PBGF in its practices. Institutionalizing PM practices alone affects ERP success but combining the two approaches leads to significantly more success.

#### 10.3.3.1 Research Objective 1: To identify the reasons for the inability of the project management approach to realize ERP benefits

In normal IT projects, the Project Management Framework (which consists of a project charter for detailing the authority and responsibilities of the project manager, the reviewing time and cost plans, and the stakeholder management plans) are necessary for delivering IT project success in terms of delivering the IT artefact on time and within budget (project management success) and users' satisfaction and return on investment (project investment success). Furthermore, the benefits management framework (which consists of the identification of benefits, planning for benefits, and reviewing and auditing the benefits recouped from the IT project) are found to have a weak but significant impact on project investment success.

However, for ERP projects the case is different. They need more effort in change management than a mere delivery of the IT artefacts (they involve, e.g., purchasing technologies, configuring them and customizing them). Furthermore, the conflict between the business unit managers (i.e. the benefits owners) and the IT project teams is one which hinders the effective transition and buy-in process (of believing in the ERP). Without a centralized and matured (i.e. institutionalized) relationship between the IT department and its project managers and business departments' users, the ERP projects would face difficulty, preventing them from recouping the expected benefits.

#### 10.3.3.2 Research Objective 2: To identify how authorities/responsibilities and accountabilities are allocated in such a way as to manage the interaction between actors and increase the probability of success

A project manager and a business change manager have roles, positions, and backgrounds which are of course different. On the one hand, the project manager always has a technical background (IT manager, Programmer, with a computer science background) because he is leading a technical project which demands technical experience. On the other hand, the Business Change Manager (BCM) should not have a different role from that of the benefits owners. Benefits owners are the business managers and business people who define the benefits, plan for their realization and implement these plans (i.e. the benefits realization management process). The BCM role can be consultative for business users or managers, helping them to manage the benefits realization. All BCMs or benefits owners have a business background and they understand business discourse, not technical words. The differences between the BCM and the project management roles demand connecting governance documents to enable them to work as a consistent couple. The documents are a benefits profile, project charter, business case, and blueprint.

#### 10.3.3.3 Research Objective 3: To develop a Project Benefits Framework for improving the probability of ERP success

Bearing in mind the previously stated problems, the solution is proposed of having a governance framework to control the behavior of the project team and business department team and also to ensure the buy-in process into the ERP. To this end, four documents should be used to keep the relationship between the departments consistent.

First, a benefits profile document is needed, which is created by the benefits owner (the head of the business department) and contains the expected benefits, benefits behaviors (how the benefits will be realized on the timeline), benefits planning (how the benefits will be realized after implementing the system; for example,  how the inventory will be reduced when ERP is implemented) and benefits ownership statement (how the compensation system of the company integrates the benefits of the system with the income of the benefits owners).

The second document is the project charter, which is created by the Senior Responsible Owner (SRO) (one of the board of directors who believe in the ERP; in many cases it is the ERP committee) to detail and define the scope of the work for the ERP project team, the time required to deliver the outputs (ERP resources), the budget limit for the technical work, the organisational risks that may face the team and the main stakeholders who may accept or reject the project. The project manager should refine all of these items in the project charter before the statements defining the scope. The project team cannot make any changes in the scope, budget or scheduling without asking permission from the SRO and benefits owners.

The third document is the business case which is created by the Senior Responsible Owner to detail the costs, benefits, risks and scenarios of the whole project for realizing its ERP benefits. The business case is different from the traditional capital budgeting techniques (i.e. a benefits cost analysis). It should include different options in implementation, different scenarios in implementation (for implementation risk purposes) and different scenarios for the plans of benefits realization (for benefits realization risk purposes).

The fourth document is the blueprint which forms the basis for creating the business case, the benefits profiles and project charter created by the SRO, the business change manager, benefits owners and agents from the IT departments. This is the integrating document for defining the capabilities (the technological resources plus the organisational resources required to assimilate these technological resources) required for achieving ERP benefits. It contains the future picture of the organisation in realizing the ERP benefits. It defines what the organisation should look like from different perspectives: process (how the business will run), users' attitudes, users' skills, organisational characteristics, ERP technological resources and ERP IT human resources (as defined in Chapter 7 and summarized in research objective 4).

### 10.3.4 What is the road map for realizing maximum benefits from ERP?

For each level of benefits, a particular blueprint is required. In a single road map presented in figure 8-2, three blueprints were developed for realizing three different levels of benefit. The automating blueprint, planning, and innovating blueprints were designed to enable organisations to recoup their automating, planning and innovating benefits.

Based on works by Malvelle et al (2004) on the resources required to realize business value (benefits) from IT investments, each blueprint has two dimensions: an ERP resources dimension and Organisational Complementary Resources (OCRs). Too many resources were detailed in Chapter 6 to be comprehended in an assessment tool. Thus, seven experts were interviewed to reduce the items for the tools. Furthermore, factor analysis and reliability analysis were used in Chapter 8 to reduce the items to a reasonable number, namely, 82. The validity, reliability and verification of the relations are conducted for the 63 organisations that used the tool.

#### 10.3.4.1 Research Objective 4: To identify the required ERP resources as well as the organisational complementary resources to achieve each class of ERP benefits.

This research fulfilled the third research objective, having identified the required resources in Chapter 6. Furthermore, in Chapter 7, the business innovation framework**Error! Reference source not found.** was tested. It is worth noting that there were too many of these items to let them be used in the tool. Therefore, in Chapter 8, the items were filtered with experts and then filtered further on the lines of the dimension reduction statistical model using the Viramax approach. Finally, it should be noted that the bold items in this table are used only in the final version of the tool. After examining them in relation to the sample of 63 people who used the tool, it was found that they all led to the expected benefits.

An ERP resources dimension comprises the technical requirements of ERP and the IT department skills and competences. The technical requirements are the tracking technologies for automating benefits, reporting flexibility (the convenience of customized reports) for planning benefits, and the statistical adequacy of the analytic system for innovating benefits. The IT department competences are three in number. First, technical competences are for maintaining and integrating the system to recoup the automating benefits. Second, management and technical competences, to understand business planning and ERP planning processes to help, encourage, and guide users in convenient ways for the recouping of ERP benefits. Finally, business competences, to understand the value creation process of the current business model and the integration of business strategy with ERP strategy.

OCRs have two dimensions: users and organisational dimensions. Users' attitudes and skills have three different measures for achieving different levels of benefits. The attitude towards ERP is critical for automating benefits, towards the planning process using ERP is important, and towards innovating by means of ERP is relevant. Attitudes and skills are always interwoven, since the more skilful one becomes in one thing, the more one's attitude towards it becomes positive and these positive attitudes help one to learn and improve one's skills still further (Badewi et al, 2013). Thus, skills also are on three levels: users' technical skills in using the system for recouping automating benefits smoothly. Business qualifications are required to enable users to get the best out of ERP for recouping planning benefits (e.g. suppose the ERP has an Activity Based Costing (ABC) model but the planner does not know it;, the user will be using the traditional budgeting regardless of the ERPs power in creating reports for ABC). Finally, quantitative skills are required to enable users to get the best use from data analytics in revealing new patterns in the data and so new opportunities in the market and new internal processes.

There are three main organisational characteristics in delivering three levels of ERP benefits. A disciplined organisation is required for automating benefits (it is necessary for ERP automating benefits but could lead to reducing the innovating benefits later if it is not supported by the "innovating organisational characteristics", as explained in Chapter 8). Having a structured planning system across the organisation is a critical factor in enabling the users to recoup ERP planning benefits. Finally, having a sponsor for finding and funding new ideas, flexibility in the decision-making process and benefits accountability for new ideas are characteristics of innovative organisations through ERP. To be sure, there are sometimes mutual impacts between users and their organisations. This is why it has been found that the synergetic impact of letting all the blueprint factors (resources) coexist at the same time has more impact and/or a bigger, more explanatory ratio for different levels of benefits.

However, ERP as an innovation enabler is an odd concept in the literature because ERP, according to structuration theory, structures the organisational processes leaving it too rigid to innovate. It was not enough to argue this on the basis of a small sample size of 63 organisations. Thus, another parallel and more focused study on the relationship between ERP and innovation has commenced; it tests the ERP Business Innovation Framework, which was developed on the basis of these results. Considering a sample of 126 organisations, it has been found that ERP leads to organisational inflexibility, which reduces innovation. However, it has another mediating impact on innovation: when a knowledge share system is present in the organisation and when using the data analytics attached to ERP system, it has a moderating impact, i.e. one which becomes a significant impact when it is combined with the existence of sponsorship.

#### 10.3.4.2 Research Objective 4: To develop a theory to orchestrate ERP resources with ERP capabilities to achieve a different ERP business benefits level in an efficient and effective way

This objective is fulfilled by spotlighting the ineffectiveness of deploying new resources without having the required attitudes among users and the required organisational characteristics. It has been found that synchronizing and orchestrating resources is the best strategy for achieving ERP benefits successfully without any frustrating or disappointing results. Maturity in achieving each blueprint (as illustrated in table 10-2) before the targeting higher level benefits would be ineffective strategy.

Table 10-2: Summary of ERP resources and their organisational compelemtary resources

| | Automating Benefits | Planning Benefits | Innovating Benefits |
|---|---|---|---|
| **ERP Capability** The organisation's ability to | Automate its value-engineered processes using the ERP system effectively with few processes breaching it. | use ERP planning resources to understand, and hence to control, the external and internal environment | Absorb and assimilate the surrounding knowledge |
| **ERP Tech. Resources** | ***Tracking****, connecting and integration technologies | Convenient statistical reporting features<br><br>***Flexibility and customizability of reports***<br><br>Data storage technologies (Volume, variety, and velocity) | Agility and flexibility of the ERP system (e.g. Cloud, open source)<br><br>***Advanced statistical features and abilities***<br><br>Knowledge Share system |
| **ERP HR** | ***Ability to synchronize the system effectively with other systems***, system maintenance, ability to purchase the right technology which is consistent with ERP integration | ***Knowing the ERP planning Modules***<br><br>Ability to work smoothly with business users<br><br>Ability to maintain the system with a high level of data transfer<br><br>Ability to integrate the current system with planning systems<br><br>Ability to develop a business case for planning systems | Ability to customize the ERP<br><br>***Understanding the business value creation process***<br><br>Ability to identify new technologies that can leverage the business value creation process<br><br>***Ability to develop an IT strategy aligned with organisational strategy*** |
| **Attitude** | ***Accepting the ERP*** | ***Positive attitudes toward planning using ERP***<br><br>***Positive attitudes toward planning as a vital to organisation success*** | ***Innovation is critical for organisational success***<br><br>***ERP is an enabler for innovation*** |
| **Skills** | ***Using ERP smoothly without problems*** | ***Business knowledge of different planning models***<br><br>***Technical knowledge about different planning models in the ERP*** | Cross-sectional analysis<br><br>***Statistical competences***<br><br>Theory development skills<br><br>Qualitative Abilities |
| **Organisational Characteristics** | ***Disciplined organisation***, Fitness between ERP and organisational functions | Information sharing culture<br><br>Culture of continuous improvement<br><br>***A disciplined integrated organisational planning system*** | ***Organisational flexibility***<br><br>***Existence of an innovation sponsor***<br><br>***Benefits accountability for innovations***<br><br>Strategy led organisation |

*items in bold are validated in the tool. Other items are not used in the tool

#### 10.3.4.3 Research Objective 5: To develop a framework for enabling organisations to realize business innovations from the ERP system with its attached assets

The framework was originally developed from the literature; however, the resources are defined in Chapter 6. The framework is subsequently tested in Chapter 7. It was found that ERP leads to innovation conditioned by having and using a data analytics system. Furthermore, the existence of a sponsor is important for innovation but the role becomes more defined as the organisation becomes more structured and automated by ERP. The existence of the sponsor is the main recovering strategy for overcoming the worst side effects of ERP (i.e. organisational rigidity). Finally, the existence of an effective knowledge share technology mediates the impact of ERP and the benefits of innovation.

#### 10.3.4.4 Research Objective 6: To develop an ERP Benefits maturity model for achieving Business Benefits from ERP.

The framework was developed on the basis of the results from Chapters 6, 7 and 8. The tool was applied in 63 organisations. The regression analysis was used to ensure the correlation and impact between items in the blueprint and the proposed benefits. All the factors are found to have an effect. However, when all the items of a certain blueprint come together at the same time (i.e. with a synergetic impact), the effect is improved significantly, and the explanation ratio is also improved.

## 10.4 Contributions to Knowledge

This research makes several significant contributions to knowledge. The contributions are as follows:

1- This research is the first to test the impact of Benefits Management Practices on IT project success. It finds that BM alone, neglecting project management practices, will not affect this success

2- This research is the first to develop a project benefits governance framework for integrating project and benefits management practices. Furthermore, it tested this framework. The results show that the framework has a more significant probability of incremental success in IT projects  than using PM alone or BM alone would have/

3- Because ERP entails a radical transformation of business processes, PM, in the literature, has been found to have only a vague impact on ERP success. This research is the first to use neo-institutionalisation theory to resolve this paradox. Indeed, it has been found the routinization of project management practices in organisations mediates (i.e. is a condition) for claiming that project management has a secure relationship with ERP success.
4- This research is the first to examine the role of institutionalizing a project benefits governance framework affects the role of PM and BCM in ERP success. Indeed, without institutionalizing this framework, the ERP project manager and ERP benefits manager would suffer in delivering ERP investment success (i.e. return on investments).
5- This research borrowed programme-management governance framework to use in its project benefits governance framework. The four governance documents are listed below.
6- This research is not the first to use the framework of Melville et al (2004) for understanding ERP resources, but it is novel in integrating this framework with the orchestration framework to show different blueprints for different benefits. This contributes to knowledge by showing that the timing of investing in different ERP resources improves the success of ERP without frustrating users by overloading them with more advanced technologies than they can  absorb and assimilate.
7- This research developed the blueprint in such a way as to integrate the soft school (focusing on attitude and use) with the hard school (focusing on benefits management practices, tools and techniques). The new here is to claim that attitude is a resource and the benefits management should invest in it as in any other resource for securing success.
8- Based on the results of identifying the resources required for enabling an organisation to innovate, this research clarifies that ERP could be a source of innovation and could also be a source of restricting innovation. As the literature supports, ERP restricts innovation because it structures the organisation too

much to allow innovation. However, when the identified resources in the research are present, ERP will be a source of innovation. This framework was tested and validated. (The factors are the existence of a knowledge share system, the existence of a sponsor and the existence and use of a data analytic system supporting statistical modelling).

## 10.5 Contributions to Knowledge and Academic Implications

### 10.5.1 Project Benefits Governance Frameworks

The Project Management Body of Knowledge (PMBoK) practices, the PMI handbook for the PMP certificate, has been criticised because it does not consider “the front-end” definition (Pinto and Winch, 2015; Morris, 2015). The front-end paradoxes are mainly about what motivates, and based on this, the predictions about the benefits of potential projects (Samset and Volden, 2015). Factors which can conceptualise the front-end problem are the existence of a benefits owner (Winch and Leiringer, 2015), the process of making sense of it in a cross-cultural context, and understanding the organisational context (Toivonen and Toivonen, 2014; Biesenthal and Wilden, 2014). This research introduces a novel framework to comprehend this issue. Based on the contention that the comprehensiveness and supplementation of project management methodology with relevant frameworks can improve project success (Joslin and Müller, 2015), this research contributes to knowledge by defining a project benefits management framework as one of the missing relevant frameworks. Indeed, by integrating benefits management practices into project management practices, the front-end problem has been recovered because it considers the benefits owner, who identifies the foreseen benefits with a suitable level of assurance that he can recoup them.

Benefits management practices are usually underlined as critical to recouping the benefits from a project or programme (Ward and Daniel, 2006; Bradley, 2010; Melton et al., 2008). Nevertheless, recent research has yielded no clear generalizable evidence for this statement (Badewi and Shehab, 2016; Badewi, 2015; Serra and Kunc, 2015). However, PM practices had a higher impact and higher significance than those of BM. Indeed, unlike the beliefs held by many authors (Thorp, 1998; Axelos, 2011; Project Management Institute, 2013), this SEM result with step-wise analysis suggests that the BM framework alone is not sufficient for realizing benefits and project success. This result supports other authors who believe that PM should be the cornerstone for BM (Bartlett, 2002; Thomas and Mullaly, 2008).

### 10.5.2 Institutionalisation Project Benefits Governance framework for ERP Success

The annual report of the Project Management Institute (PMI) for 2015 starts,

> "When a project and programme management mind-set is embedded into an organisation's DNA, performance improves and competitive advantage accelerates"

However, this assertion has not yet been tested or validated. The present research approves it by using its organisational theories. The use of organisational theories (Greenwood and Miller, 2010) such as institutional and contingency theories and the resource-based-view in understanding the governance of project management practices and their actors' interactions within the organisation has not so far been fully understood. The present research took one step towards understanding how the specific project governance framework of Badewi (2015a) can increase the success of radical projects such as ERP systems. The main underpinning theory is that the institutional process of certain institutional logics creates an institutional project identity. This identity improves performance because the maturity of applying the practices and tools is increased and the actors understand their circles of accountability better because of the harmonised institutional logics of the project.

This research started by asking whether the institutionalization of project management and benefits management as part of an organisation's' institutional logic affects the success of ERP implementation. There is no clear answer in the literature to this question. Yet the role of PM practices in realizing ERP project success is critical. Although other studies have considered the impact of these practices on ERP investment success and found mixed results (some see an impact but others do not) (Ram et al., 2014; Ram et al., 2013; Dezdar and Ainin, 2011a), this study supports both sides by providing a new lens through which to view this relationship. From one side, the use of project management practices in an organisation without the ability to realize success from implementing this framework does not affect the success of ERP projects. This implies that those organisations that are not successful in delivering routine projects on time and within budget will not easily be able to use project management practices to implement big projects such as ERP projects.

As institutional theory suggests, the greater the institutionalization of practices, coordination and control between rules, the higher the expected performance (Gupta et al., 1994). Supporting the institutional theory perspective, Thomas and Mullaly (2008) argue that the more the organisation uses PM practices, the more maturely it develops its PM capabilities and therefore the more proficient it is at delivering project success. This explains the use of project management practices, in this study and others, where the same relationship is found (Badewi, 2015a), to affect both project management and investment success.

The more project management and benefits management are used in an organisation’s routine projects, the more the organisation is helped to avoid the contradictions of institutional logic (Berente and Yoo, 2012) between project managers and business change managers or between business change managers and the potential beneficiaries of the system. Unlike loose coupling, where firms work distinctly and separately from each other but may still be responsive to each other (Orton and Weick, 1990), when project management and benefits management practices work together for a long time they become tightly coupled. Indeed, this research finding may support the view of Lyytinen and Newman (2015) that the relationship networks between the ERP project management team and the benefits owners have astonishing impacts on the speed and success of ERP implementation. Therefore, the other side of understanding the issue of whether project management practices affect ERP project success is that the more organisational project management practices are institutionalized, the more the organisation can realize ERP project success. This finding supports those of Engwall (2003), who investigated how the organisation's history in projects and the availability of a project-management enabling context are critical for the future success of new transitional projects.

### 10.5.3 ERP Business Value Framework

The IT Business Value concept of Melville et al (2004) is extended in ERP implementation, which, besides being an infrastructure for other IT projects, entails the management of radical organisational change. ERP resources are found to be technical and human resources. Organisational Complementary Resources (OCRs) are the organisational characteristics that affect the culture and users' skills. Skills and culture affect the attitude, which is translated into practices.

Combining the Melville framework with the ERP benefits taxonomy of Automation, planning and innovation has helped us to provide the three blueprints required for the three organisational capabilities, which ensure that the three groups of benefits are realized. Therefore, this research argues, the role of the benefits management team is not only to audit ERP benefits (Badewi, 2015a) but also to manage the evolving process of realizing them until they reach "critical mass" (Davenport et al., 2004), a point which is identified in this research as the innovation blueprint.

### 10.5.4 ERP Orchestration Framework

This research contributes to Resource Based Theory (RBT) and Orchestration theory. RBT is based on the idea of identifying the resources that cause rent (abnormal profit beyond that of other competitors) (Seddon, 2014). Unlike previous research which suggests that ERP is a commodity and cannot be a source of competitive advantage (Seddon, 2005), the present research contributes to this argument by suggesting that it can be so if we consider the time factor in orchestrating different ERP resources and OCRs. i.e. when the resources should be purchased, developed or built. Timing depends not only on the IT competence to understand and bring the new technology to the organisation (Piccoli and Ives, 2005) but should also be based on the level of maturity of the organisation to realize lower level benefits from the current IT assets portfolio, for instance, maturity in the attitude to the ERP.

In this research, while the attitude required for automating benefits involves merely an acceptance of technology, this acceptance has to be strong if planning benefits are to recouped and so should the belief in technology as an enabler of transformation by innovation. These findings support Jasperson's argument (2005) for the implementation of ERP in stages so that users can see the positive outcome from the current ERP implementation before deciding to upgrade/invest in more resources. This is why it has been found in the literature that the existence of a formal committee to gauge the need for ERP related technologies and decide which one should be purchased has a role in assimilating ERP (Mu et al., 2015).

Unlike the current Resources Orchestration theory stream, which suggests that competitive advantage requires adaptation to external environmental factors (Teece et al., 1997), this research spotlights the role of mature internal capabilities (built on internal resources combined with OCRs) in determining the timing for upgrading, transforming or extending current capability.

### 10.5.5 ERP and Innovation paradox

Unlike the prevalent notion in the literature that ERP kills innovation in organisations (Trott and Hoecht, 2004a), this research has found evidence that ERP can be a source of innovation. Without the ability to have reliable, timely and valid data from the current IT resources (by matching and integrating ERP functions to organisational functions and processes (Soh et al., 2000)), planning (understanding the data patterns) would be impossible, even new planning, if resources are invested in it. Without understanding the patterns, innovation is difficult.

This supports and extends the propositions of Srivarhana and Pawlowski (2007). Their propositions were based on Absorptive Capacity theory (Zahra and George, 2002) concerning the ability of ERP to be an enabler for sustained business process innovation when an organisation can acquire knowledge (by ERP automation OCRs), assimilate it (by ERP planning OCRs), or transform and exploit it (by ERP Innovation OCRs innovation) through ERP. Thus, as supported by the literature (Gupta and Kohli, 2006), the organisation's ability to integrate ERP in its current processes, so that data are collected from their source and can be used (given the users' and organisation's ability to absorb and to assimilate) in information and knowledge creation, is the key to realizing the potential value of investment in ERP.

## 10.6 Research Professional Implications

### 10.6.1 ERP implementation mechanisms

The role of PM practices in realizing ERP project success is critical. Although other studies have gauged the impact of these practices on ERP investment success and found mixed results (some found an impact while others did not), this study provides a new lens through which to understand this relationship. The use of project management in routinized organisational projects is not sufficient to guarantee ERP investment success. However, when the project management practices are mature enough, in terms of the ability to deliver projects on time and within budget, the management of the project will significantly affect ERP investment success. Nevertheless, the ability to realize the success of the organisation's project investment is found to be not at all critical in mediating the relationship between organisational project management and ERP investment success.

In our understanding of project management theory using institutional theory, the researcher believes that academic efforts to change management theory to include the perspective of change management are useless unless professional bodies include it (Hornstein, 2015; Cicmil, 1999). Furthermore, it is argued that project management should be kept as it is and new roles should be available with their own logics. Contradictions between the logics of the two disciplines are possible, but this does not mean that contradiction must be avoided at all costs. What is believed in this research is that the project and benefits management logics should be studied in depth and then possibilities for aligning them by practices and tools should be sought. These tools and practices should be reflected in the body of knowledge of project management, benefits management and change management.

### 10.6.2 ERP Benefits

Although the "P" in ERP stands for planning, many academics and practitioners still believe that ERP applies to automation only. This research spotlights that the ability to invest in ERP can increase the innovation and planning capabilities of the organisation only if it is extended and grown at the right time and if it is supported by OCRs. It is not cost effective to push an organisation to achieve all the benefits at the same time; rather, it is clear that an organisation will not be able to enjoy a higher level of benefits until it has amassed a significant number of lower-level benefits. Thus, investing in higher-level benefit assets directly after an ERP implementation, when there are no organisational capabilities available to use these assets, could be inefficient. Moreover, it could be stressful to users when they see plenty of new ERP resources without the ability to use them. Although it could be of slight benefit to introduce, for example, business intelligence to employees in the "stabilizing period" (Badewi et al., 2013), from the financial perspective, it is a waste of money since the benefits would not be realized as expected. Therefore, orchestrating ERP assets with the development of organisational capabilities is important for achieving the greatest effectiveness and efficiency from the resources available to the organisation.

### 10.6.3 ERP Benefits Maturity Model

This research proposes to draw a road map of the organisational capabilities required to assimilate IT. Additionally, an assessment tool is developed to enable organisations to benchmark themselves with their peers on the scale to reveal out how far they are behind or ahead of others. Additionally, this tool diagnoses ERP adopters by identifying the weaknesses and strengths of their build-up of organisational capabilities and strategies to accumulate ERP assets. Thus, organisations can develop the causes of the problem and not focus on the symptoms of "shame" strategies in their use of the benefits of ERP systems.

## 10.7 Research Limitations

This research has its methodological strengths and areas of improvement. Among the former is the ability to test the hypotheses over a large number of organisations, whereas the latter are seen in the limited ability to understand project and benefits management practices in ERP systems. Likewise, the institutional logics of project and benefits management can vary from country to country. It is not clear how the logics can be similar or different. This is why, the questions in this research were mainly about the main values and principles of project and benefits management.

It is interesting to note that interviews with people in developing countries enrich the analysis of planning and automating benefits, forming a contrast to interviews with people in developed countries, which focused on the benefits of ERP business innovation. This is one of the main benefits of the critical realist paradigm. Furthermore, diversity in the countries participating in this research allows perhaps a more insightful analysis of new organisations that do not have enough experience with ERP systems to guard against deriving the benefits from automating and planning before seeking to achieve business innovation benefits through buying more ERP resources.

The sample size used to validate the tool is too low to claim any generalizability for the tool. With a sample of below 100, it would be difficult to conduct interaction analysis (i.e. moderating and mediating analysis) and structural equation modelling analysis. This limitation has it is consequences for inability to examine factors in depth. This problem arises because the questionnaire was too long to be able to retain the attention of many respondents. However, the plan for a remedy was to set up another study with fewer questions to admit a big enough sample. This allowed the main conceptual elements to be examined but the operationalized level items were not tested on a sample of sufficient size. The small sample and the inability to attract more respondents had consequences for the possibility of testing other factors such as business innovation (not only product innovation, as this research did, but also process and business model innovations). The latter would need more resources and time than this research fund can afford.

## 10.8 Future Research

### 10.8.1 Benefits Management Practices for ERP Projects

Although this research argues that ERP benefits management practices affect the success of ERP project investment, the conceptualisation of ERP benefits management in terms of the existence and success of the BCM and ERP benefits auditor can limit the ability to define this relationship precisely. It is still unknown which ERP benefits management practices (benefits identification, planning, implementation, reviewing or exploiting) may have an impact on ERP project investment success. To be sure, the relationship between the ERP benefits review in the post-implementation stage has been examined in the literature, but so far, other practices have not. Furthermore, benefits management is based on principles, practices and tools. BM tools, such as the Benefits Dependency Network (results chain) for planning and modelling benefits, have not been studied in relation to the impact of ERP project success, nor have they been integrated with this impact.

### 10.8.2 Cost of Benefits Realization Management

As found and asserted in this research, benefits need deliberate action to be recouped. This action costs money. Thus, another study to develop a costing framework for realizing ERP benefits is proposed. If it were integrated with the ERP costing models, it could give a holistic view of the cost not only of implementing ERP; but also of realizing all ERP's potential benefits (i.e. automating, planning and innovating benefits). Furthermore, if complexity factors are used in simulating the costs of the Project Benefits lifecycle (from initiating the idea to achieving innovating benefits), the picture would be clearer for decision makers.

Perhaps the inability to support the ERP so as to realize all its benefits could have resulted from the vague roadmap issued for completing the total picture.

The complexity of the OCR parameters would represent the number of users who cannot comprehend statistical tools, the interactions between different plans, the current gap between the existence of a planning system and the planning system now proposed for recouping the desired planning benefits. The complexity of ERP resources would give an incentive to management to integrate new IT licenses with current ERP, including the maintainability of the system, the scalability of the system and the customizability of the reporting systems.

### 10.8.3 Integrating Managerial and Technical Blueprints with one another

All these research findings are seen purely from the management perspective, not the technical perspective. Indeed, it is believed that if aspects that are more technical have been considered in designing the blueprint, it would have been more helpful to the ERP vendors. In other words, if the ERP resource side of the blueprints of this research is translated into aspects that are more technical by considering TOGAF methodology, it might leverage the importance of this research.

Moreover, the blueprint is meant to map organisational characteristics, users' skills and abilities and business processes. This research failed to design the processes required to realize each group of benefits. Indeed, it was found that it is too difficult to map all the processes required to realize all the possible benefits. Furthermore, process design is more an organisation-based activity than something can be generalised. Therefore, case studies are proposed for scrutinising each group of benefits and designing the business processes using modelling tools such as system dynamics, agent based modelling and IDEF0 for designing blueprints.

### 10.8.4 ERP as business innovation enabler

ERP is found, under certain conditions, to be an enabler for product innovation. ERP as an enabler for business innovation, through interpretive epistemology, is conditioned by the scalability and flexibility of the ERP resources. However, there is no objective evidence for this. To fill this gap, it is recommended that another positivist objective research be conducted for finding whether ERP can be a source of business innovation. It is an interesting point because this research has shown that ERP reduces organisational flexibility. Without organisation flexibility, business innovation, according to the current literature, would be too difficult to realize. According to the research (see Chapter 6), the situation would be helped if the organisation had technical programmers who could customize the system, in particular if it is open source ERP. However, according to the literature it would be difficult for this organisation to get the use of vendors' upgrades. Maybe there is an optimal point for maximizing the organisation's ability to introduce business innovations while being able to get the best use from vendors' upgrades.

### 10.8.5 **Possible advancements in the ERP Benefits Maturity Models**

The current benefits maturity model is based on simple calculations and estimations using second generation of statistical analysis (correlational and regression analysis). It is recommended to do a further research by considering the third generation statistical models such as Structural Equation Modelling. Indeed, all of the previous inferential analysis can be criticised for it is inability to incorporate artificial intelligent algorithms in such a way to improve forecasting and estimating the probability of realising certain benefits under certain conditions. Therefore, Fuzzy Logic can be one recommendation for having fuzzy situations in which the organisation is not necessary under a certain blueprint. In real life context, organisations can be in between two blueprints at the same time. Also, neural network can be used to advance the expectation, and therefore recommendation, if organisation prioritize their funds between the resources to achieve the highest outcomes with least cost. Constraints algorithms such as goal programming, can help in such efficiency in allocation of resources under certain constraints.

The current research ERP Benefits Maturity model has pros and cons. Although it is useful in assessing the current organizations blueprints for realizing different ERP benefits, it is mainly about the blueprints not about the mechanism to deliver IT projects. Thus, it is worth to note, and potentially being integrated with this research maturity model, Capability Maturity Model Integration (CMMI). CMMI is mainly dedicated to software engineering companies for assuring the quality of delivering IT deliverables on time within budget. This can be discussed in further research as how to integrate the implementation framework with the ERP benefits maturity assessment model.

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# Appendix A Questionnaire 1: The impact of Project Benefits Governance Framework on Project success

***1.*** IT Projects in your organisation are **(*Project Management (1-2) and project Investment success (3-4)*)**

| | SA | A | N | DA | SDA |
|---|---|---|---|---|---|
| Delivered on time | | | | | |
| On Budget | | | | | |
| Satisfying in terms of return on investment on them | | | | | |
| Deliver the business benefits expected from them | | | | | |

**2.** In your organisation, IT Projects **(Project Management: 1-4)**

| | SA | A | N | DA | SDA |
|---|---|---|---|---|---|
| have a project charter before implementing the projects | | | | | |
| Cost plans are reviewed periodically | | | | | |
| Time plans are reviewed periodically | | | | | |
| Communication plans are implemented | | | | | |

3. In the case of implementing a new IT project in your organisation, your organisation **(Benefits Management: 1-3)**

| | Never | Rarely | Sometimes | Often | Very Often |
|---|---|---|---|---|---|
| Develops *a* ***business case*** before starting implementing new IT Projects<br>*A business case* is a formal document that is used to identify benefits of new IT projects, in cash terms, during a number of years after implementation | | | | | |
| Develops a periodic ***benefit audi****t* report after IT project implementation<br>***Benefit audit*** is a process of reviewing the business benefits periodically. For enstance, each 3 months there is a review to see the progress of realizing IT projects benefits | | | | | |
| assigns responsibility and accountability for realizing benefits from IT projects /(before, during, or after IT projects) | | | | | |

4. Where do you do your job?
5. What is your current position?
6. How many full time employees are working for your organisation?

## Appendix B Questionnaire 2: The impact of Project Benefits Governance Framework on Project success

1. IT Projects in your organisation are

| | SA | A | N | DA | SDA |
|---|---|---|---|---|---|
| Delivered on time | | | | | |
| On Budget | | | | | |
| Satisfying in terms of return on investment on them | | | | | |
| Deliver the business benefits expected from them | | | | | |
| Perceived as satisfactory by users of the their outputs (e.g. software, network, security, ) | | | | | |

2. In your organisation, IT Projects

| | SA | A | N | DA | SDA |
|---|---|---|---|---|---|
| have a project charter before implementing the projects | | | | | |
| Cost plans are reviewed periodically | | | | | |
| Time plans are reviewed periodically | | | | | |
| Communication plans are implemented | | | | | |

3. In the case of implementing a new IT project in your organisation, your organisation

| | Never | Rarely | Sometimes | Often | Very Often |
|---|---|---|---|---|---|
| Develops *a* ***business case*** before starting implementing new IT Projects<br>***A business case*** is a formal document that is used to identify benefits of new IT projects, in cash terms, during a number of years after implementation | | | | | |
| Develops a periodic ***benefit audit*** report after IT project implementation<br>***Benefit audit*** is a process of reviewing the business benefits periodically. For instance, each 3 months there is a review to see the progress of realizing IT projects benefits | | | | | |
| Identifies the benefits in a formal way before starting developing/purchasing the new information system | | | | | |
| Assigns responsibility and accountability for realizing benefits from IT projects /(before, during, or after IT projects) | | | | | |

4. Did your organisation have the following roles/responsibilities (before, within, or after) the implementation of ERP?

| | Not Available | Part-time but unsuccessful | Part-time and successful | Full time but unsuccessful | Full time and successful |
|---|---|---|---|---|---|
| ***Business Change Manager*** any person or department works closely with the user department to help it adapt/fit with the new system | | | | | |
| ***Benefits Auditor*****:** any person or department review the benefits of ERP on periodical basis within and after implementation | | | | | |
| ***Project manager:*** any person or department responsible for implementing the ERP on time and on budget with the pre-determined requirements (if the project manager is outsourced or provided by the service provider, it is existed but does he/she full time or part-time/ successful or unsuccessful) | | | | | |

5. How does your organisation perceive the ERP? In other words, how do employees, in general, perceive the ERP?

| | **SDA** | **DS** | **N** | **A** | **SA** |
|---|---|---|---|---|---|
| *It is easy to use it* | | | | | |
| *It is useful* | | | | | |
| *The return on investment on it is satisafactory* | | | | | |
| *ERP is successful in delivering what is expected from it* | | | | | |

6. Did your organisation implement another ERP system before the current one? Yes No
7. Where do you do your job?
8. What is your current position?
9. How many full time employees are working for your organisation?

# Appendix C Questionnaire 3: Testing the ERP Innovation Framework

1. Do you agree or disagree with the following statements? **(Innovation: 1-3)**

| | SDA | DS | N | A | SA |
|---|---|---|---|---|---|
| We often are the first to introduce a new product (service) to the market | | | | | |
| We often create and sell products whose functions are completely new | | | | | |
| We often create and sell products that are new in both style and service | | | | | |

2. From your point of view, the department, group, or person that ***implements/sponsors*** *new ideas* is (If it is department, part time means it is not the key function of it) **(Sponsor 1-3)**

| | Not Available | Part-time but unsuccessful | Part-time and successful | Full time but unsuccessful | Full time and successful |
|---|---|---|---|---|---|
| Bringing new products ideas to market | | | | | |
| Bringing new small products' enhancements idea to market | | | | | |
| Bringing new radical products' improvements ideas to market | | | | | |

3. From your point of view, the department, group, or person who ***searches for new ideas*** is (If it is department, part time means it is not the key function of it) **(Sponsor 4-6)**

| | Not Available | Part-time but unsuccessful | Part-time and successful | Full time but unsuccessful | Full time and successful |
|---|---|---|---|---|---|
| Discovering new products ideas | | | | | |
| Discovering new small product enhancement ideas | | | | | |
| Discovering new radical product improvement ideas | | | | | |

4. How often your organisation uses any evidence based approach, such as interviewing with customers, to ***test the viability of new ideas*** (proposals) before implementing it **(Qualitative 1-3)**

| | Never | Rarely | Sometime | Often | All of the times |
|---|---|---|---|---|---|
| New products ideas | | | | | |
| New small enhancements ideas in the products | | | | | |
| New radical improvements ideas in the products | | | | | |

5. Does your organisation use any systematic/formal interviews with customers, suppliers, or employees for ***discovering new ideas*** related to **(Qualitative 4-6)**

| | Never | Rarely | Sometime | Often | All of the times |
|---|---|---|---|---|---|
| New products ideas | | | | | |
| New small enhancements ideas in the products | | | | | |
| New radical improvements ideas in the products | | | | | |

6. What is the level of statistics used in analysing data in your organisation? **(Statistics: 1-3)**

| | Never | Rarely | Sometime | Often | All of the times |
|---|---|---|---|---|---|
| Second level statistics such as comparing between two means, regression, Factor Analysis, or ANOVA | | | | | |
| Third Level statistics such as Structure Equation Modelling | | | | | |
| Artificial Intelligent Analysis such as Neural Network, Genetic Algorithms | | | | | |

7. How would you describe your organisation analytic software? Notes: Analytic software is defined as any application that helps in data analysis such as data mining and business intelligent systems. **(Analytics: 1-4)**

| | | | | | |
|---|---|---|---|---|---|
| Easiness of the use | Very Difficul | Difficult | Neutral | Easy | Very Easy |
| Usefulness of the system | Very not useul | Not Useful | Neutral | Useful | Very useful |
| Percentage of employees using it | Less than 20% | 21%-40% | 41%-60% | 61%-80% | 81-100% |
| Frequency of Use | Rare | Sometimes | Neutral | Often | All time |

8. How would you describe the routine work (documentation/ paper works)? **(Automation: 1-4)**

| | | | | |
|---|---|---|---|---|
| Full Manual at the same department | | | | Full computerized at the same department |
| ◎ | ◎ | ◎ | ◎ | ◎ |
| Full manual across departments | | | | Full computerized across departments |
| ◎ | ◎ | ◎ | ◎ | ◎ |
| Full manual with your boss at the organization | | | | Full computerized with your boss at the organization |
| ◎ | ◎ | ◎ | ◎ | ◎ |
| Full manual with your peers from different departments | | | | Full computerized with your peers from other departments |
| ◎ | ◎ | ◎ | ◎ | ◎ |

9. How would you describe your organisation sharing system? NB: Sharing system means any application that helps in sharing text, graphics, videos, and voice . **(Knowledge Share: 1-4)**

| | | | | | |
|---|---|---|---|---|---|
| Ease of Use | Very Difficult | Enter Text here | Difficult | Neutral | Easy |
| | ◎ | ◎ | ◎ | ◎ | ◎ |
| Usefulness of the system | Very not useful | No useful | Neutral | Useful | Very Useful |
| | ◎ | ◎ | ◎ | ◎ | ◎ |
| Percentage of employee using it | Less than 20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
| | ◎ | ◎ | ◎ | ◎ | ◎ |
| Frequency of Use | Rare | Sometimes | Neutral | Often | Most of the time |
| | ◎ | ◎ | ◎ | ◎ | ◎ |

10. Evaluate the presence of these characteristics in your enterprise organisational structure (Flexibility 1-5)

| | Very Low | Low | Normal | High | Very High |
|---|---|---|---|---|---|
| Loose, informal control; heavy dependence on informal relations and norm of cooperation for getting work done | | | | | |
| Strong emphasis on getting things done even if this means disregarding formal procedures | | | | | |
| A strong emphasis on adapting freely to changing circumstances without too much concern for past practice | | | | | |
| Manager's operating styles allowed to range freely from the very formal to the very informal | | | | | |
| Strong tendency to let the requirements of the situation and the individual's personality define proper on-job behaviour | | | | | |

# Appendix D Tool Appendix

**Automation Benefits**: the improvement in organisation performance due to its ability to automate its process, i.e. efficiency benefits, such as reduction of time devoted in manual work, decreasing purchasing and selling cycle times.
**Blueprint:** automation of the business processes, system is reliable enough as perceived by users to depend on it, users understand very well their positions in the whole processes and how their data input affect other users, and there is no resistance toward the system itself.

| | Statement | |
|---|---|---|
| **1.1** | **Integration Assets required for realising Automation Benefits** | |
| **1.1.1** | **Automating technologies (Tracking)** | |
| **1.1.1.2** | There are any technology that enables your organisation to track the flow of material across storage locations such as RFID, Bar code | |
| **1.1.1.2** | Your organisation have a unified coding system with its supply chain to track the flow of materials between organisations | |
| **1.1.1.3** | Your organisation uses scanners to read Barcode used to track the movement of the material between storage locations with different organisations in the supply chain | |
| **1.1.2** | **IT Department capabilities** | |
| **1.1.2.1** | **IT staff** are able to synchronise the ERP system with all its modules effectively | |
| **1.1.2.2** | **IT staff** are able to synchronise the ERP system with other non-ERP systems such as CRM, and SCM effectively | |
| **1.1.2.3** | **IT staff** are able to identify which technologies can be integrated to the current integrated platform | |
| **1.2** | **Organisational Complementary Resources** | |
| **1.2.1.** | **Abilities to use the system as input** | |
| **1.2.1.1** | **Users** are able to use the basic features of ERP (data input) | |
| **1.2.1.2** | Few errors in data entry | |
| **1.2.1.3** | **Users** are able to jump between forms and screens easily and smoothly | |
| **1.2.1.4** | **Users** know which reports he/she wants easily | |
| **1.2.1.5** | **Users** are able to reach the desired reports easily and smoothly | |
| **1.2.1.6** | **Users** can use basic reports | |
| **1.2.2** | **Attitude toward ERP (Ease of Use & Usefulness)** | |
| **1.2.2.1** | **Users** believe the system is easy to use | |
| **1.2.2.2** | **Users** believe the system is helpful and useful | |
| **1.2.2.3** | **Users** have positive attitude toward ERP system | |
| **1.2.3** | **Organisational characteristics** | |
| **1.2.3.1** | There is a proper definition of job descriptions and roles | |
| **1.2.3.2** | There are clear flowcharts of business processes after ERP implementation | |
| **1.2.3.3** | **Users** understand their position and their role in their business processes | |

**Planning Benefits:** the improvements in organisation performance due to its ability to plan and control its activities, i.e. effectiveness benefits, such as target more customers, increasing customer loyalty
**Blueprint:** Decision makers forecast the future and plan and control their activities through using corporate relevant timely data in an efficient and effective way

| | Statement | |
|---|---|---|
| **2.1** | **Planning Assets required for realising Automation Benefits** | |
| **2.1.1** | **Planning technologies (Reporting Flexibility)** | |
| **2.1.1.1** | The ERP enables users to change layouts of the reports | |
| **2.1.1.2** | The ERP enables users to change the contents of reports with taking into consideration the unified definition of terms | |
| **2.1.1.3** | Customize their reports' layouts | |
| **2.1.2** | **IT Department capabilities (Business Understanding)** | |
| **2.1.2.1** | **IT staff is able to** understand the planning requirements for each decision makers to give permissions for data access to them. | |
| **2.1.2.2** | **IT staff is able to** give advice about how advanced reporting technology could enhance their business planning process | |
| **2.1.2.3** | **IT staff is able to** Ability of IT department to promote good planning practices through organizing seminars or workshops | |
| **2.2** | **Planning Organisation Competences** | |
| **2.2.1** | **Business Qualified Users** | |
| **2.2.1.1** | **Users** understand the planning process of the ERP system | |
| **2.2.1.2** | **Users** understand the planning reports of the system | |
| **2.2.1.3** | **Users** use the planning reports of the system | |
| **2.2.1.4** | **Users** are able to customize the reports to fulfill different planning needs | |
| **2.2.2** | **Attitude toward Planning and Planning Technologies** | |
| **2.2.2.1** | **Users** believe that planning technologies are useful, helpful and reliable | |
| **2.2.2.2** | there is a positive belief that planning is critical to organisational success | |
| **2.2.2.3** | there is a positive believe that ERP is helpful in planning | |
| **2.2.3** | **Organisation's characteristics** | |
| **2.2.3.1** | There is a clear planning methodology used in the organisation (Such as process, batch, or repetitive production system) | |
| **2.2.3.2** | There is application of planning methodology used in the organisation | |
| **2.2.3.3** | The structured planning system fits the ERP system | |
| **2.2.3.4** | there are standardized definitions of concepts used in the organisation | |

**Planning Benefits:** the improvements in organisation performance due to its ability to innovate in its products and building business innovations
**Blueprint:** Users, through ERP data, are willing to discover new patterns in the environment through the data and sponsors own these ideas to bring them to life

| | Statement | |
|---|---|---|
| **3.1** | **Innovating Assets required for realising Automation Benefits** | |
| **3.1.1** | **Innovation technologies (Reporting Statistics Abilities)** | |
| **3.1.1.1** | Enables users to make some basic calculations Level 1 (Such as Average, Standard Deviation, Median) | |
| **3.1.1.2** | Enables the users to customize their reports freely | |
| **3.1.1.3** | Enables users to aggregate figures in meaningful graphs. | |
| **2.1.1.4** | Enables the users to do analysis using statistics level 2 (Regression and ANOVA) | |
| **3.1.2** | **IT Department capabilities** | |
| **3.1.2.1** | **IT staff** understand business and add value to it (by recommendations) | |
| **3.1.2.2** | **IT staff** is able to develop strategy aligned with organisation changing strategy | |
| **3.1.2.3** | **IT staff** are able to identify new technologies in the market and how to use them | |
| **3.1.2.4** | **IT staff** have a very strong relationship between IT and business functions | |
| **3.2** | **Innovating Organisation Competences** | |
| **3.2.1** | **Users' Quantitative Abilities** | |
| **3.2.1.1** | Users understand how using statistics can enhance their job performance | |
| **3.2.1.2** | Users are able to test new ideas with evidence from the ERP | |
| **3.2.1.3** | Users use advanced statistics level such as correlational analysis and regression | |
| **3.2.1.4** | Users use ERP business warehouse analytic models to use advanced statistics level | |
| **3.2.1.5** | Users use the artificial intelligence capabilities of ERP | |
| **3.2.1.6** | Users are able to develop their reports to do the calculations of advanced statistics level | |
| **3.2.2** | **Attitude toward Innovation and Innovation Technologies** | |
| **3.2.2.1** | **Users** believe there is a need to innovate in products | |
| **3.2.2.2** | **Users** believe that Information Technologies are enabling for innovation | |
| **3.2.2.3** | There is a positive belief that innovation is critical to organisation | |
| **3.2.2.4** | There is a positive believe that planning technologies are necessary for innovation | |
| **3.2.3** | **Organisational characteristics** | |
| **3.2.3.1** | The organisation's ability to change in its process structure easily and efficiently | |
| **3.2.3.2** | The organisation changes easily to reflect foreseen changes in the market | |
| **3.2.3.3** | There is a benefit accountability position to follow up the benefits realisation process from the implementation of new ideas | |
| **3.2.3.4** | There are sponsoring unit to pick new valid ideas from the knowledge sharing system in the organisation | |
| **3.2.3.5** | The sponsoring unit is able to implement/sponsor the new ideas | |

# Appendix E Interview Guide for ERP Orchestration Framework

| Question | Rational for the Question |
|---|---|
| Let me introduce myself, my university, and my research project | To familiarise the interviewee with the interview and to understand the aim and objectives of the research |
| Could you introduce yourself? | To know years of experience, type of experience, which ERP system he/she experienced, and Which module he/she has more experience in. |
| What are benefits of ERP system? | To know all perceived benefits by the respondents without any bias due to researcher intervention. |
| What are benefits of Accounting System, Procurement system, Inventory system, production system? “Question is tailored based on the experience of the respondent” | To get in-depth information about each module benefits because the previous general question may lead the interviewee to talk about “general benefits”. This question motivates the respondent to talk in-depth about the ERP benefits in his/her area of expertise. |
| Based on what you said, could we classify ERP benefits into Automating benefits, planning benefits, and transforming benefits? If yes, could you give me examples of each? | This question comes in a biased way to validate my understanding toward what is said. If interviewee accepts that, he will support my argument with more explanation to reinforce this classification. If not, he will advise me what should be. |
| Do you think these benefits could be come without intervention? Do we need to do something to manage benefits? | The interviewee is expected to remember from his experience how the benefits are realised. Even if his organisation has not done anything to manage benefits, he is expected to say, “although some benefits as X& Y are achieved without much effort, these benefits were needed to be managed to be realised. |
| So what is required to achieve Automating benefits? | To list factors, capabilities or/and environmental factors that affect achieving automating benefits. |
| What about planning benefits? | ……… planning benefits |
| What about transforming benefits? | ……… transforming benefits |
| “I have been told by expert that ERP benefits could be managed as an independent business unit (either teams or department like IT department or Quality Assurance Department), which is responsible for auditing benefits and set recommendations for how to realise more benefits from ERP system” What is your opinion about that? | This argument motivates the interview ways of managing benefits. This argument is constructed by expert experienced 20 years in developing and using ERP systems. These arguments attempt to find out the governance of achieving benefit. In other words, how ERP benefits should be managed, who is responsible for achieving them, and who is responsible for auditing them. |