CRANFIELD UNIVERSITY

Tim Forsyth

The Boundaries of Flow: when the balance between a person's challenges and capabilities becomes imbalanced, an empirical investigation of the relationship between subjective experience, capabilities and challenge.

Defence and Security
PhD by Research

PhD
Academic Year: 2015- 2021

Supervisor: Jeremy Hilton
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ABSTRACT

The problematic situation this doctoral research project investigates concerns how the quality of a person's lived subjective experience is affected by differing degrees of challenge: a product of pressures and demands that overwhelm a person's knowledge, skills and experience (capability). The cost of stress and the ways stress make people vulnerable to illness is well documented. Therefore, the purpose of this doctoral research project is – to identify the thresholds (points) where the balance between challenges and capability moves to imbalance.

This study uses Flow Theory and Complex Systems Theory as the foundation for this research. A literature review of flow theory pertaining to the research problem identified deficiencies in the models, methods and practices. As a result, the project is divided into two sections. The first section developed a new synthesised model of experience using an innovative suite of methods. The insights gained from this model were used to inform the second phase of the research project. The second phase utilises a novel multi-paradigmatic design strategy grounded in a realist philosophy of science. This approach facilitated the development of a quasi-experimental protocol and construct elicitation method to investigate the individual participant's subjective experience of varying degrees of challenge in the sensory and affective domains, respectively.

This project contributes to the knowledge gap in two distinct yet complementary ways. Firstly, the research identified a relational link between challenge and subjective experience. Secondly, as experienced by the individual, challenge is incremental and cumulative. Moreover, this doctoral research project realises the overarching research objective by developing a codebook and a new synthesised model of experience. When the model and codebook are combined, they can identify when a person's challenges and capabilities are aligned and misaligned through the various instances and absences of experiential states. This contribution represents a proof of concept. Future work is required to develop the method's applicability in organisational environments to support and enhance people's lived experience of work.

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To the two critics who took the time and went to the trouble of reviewing and scrutinising the play for its rigour and trustworthiness who challenged my thinking and encouraged me to reflect – Professor Corrina Peifer and Professor Richard Kwiatkowski.

Thank you all.

In Memory

Mum and Dad

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF EQUATIONS

LIST OF ABBREVIATIONS

FCM	Flow Channel Model
EFM	Experience Fluctuation Model
nLDMF	Non-Linear Discontinuity Model of Flow
Flow-q	Flow Questionnaire
FSS	Flow State Scale
DFS	Dispositional Flow Scale
WoLF	Work-Related Flow Inventory
FES	Flow Experience Scale
AFSS	Activity Flow State Scale
FPQ	Flow Presence Questionnaire
FMQ	Flow Metacognition Questionnaire
RFSS	Reading Flow Short Scale
CFA	Confirmatory Factor Analysis
EFA	Explanatory Factor Analysis
ESM	Experience Fluctuation Method

Chapter One

Introduction: Flow and Being with Challenge

From one till five seemed a very long time to most of the hands, but to Owen and his mate, who was doing something in which they were able to feel some interest and pleasure, the time passed so rapidly that they both regretted the approach of evening. `Other days,' remarked Bert, `I always keeps on wishin' it was time to go 'ome, but today seems to 'ave gorn like lightnin'!'

Robert Tressell 'The Ragged Trousered Philanthropist' (1914)

1 Introduction

The problematic situation this doctoral research project investigates concerns how the quality of a person's lived subjective experience is affected by differing degrees of challenge: a product of pressures and demands that overwhelm a person's knowledge, experience and skills (capability). The cost of stress (pressures and demands) and the ways stress make people vulnerable to illness is well documented (Sapolsky 2004). When challenges exceed capabilities, human costs rise; when capabilities exceed challenges, people's knowledge, experience and skills are wasted (Stamp 1989).

Therefore, the purpose of this doctoral research project is – to identify the thresholds (points) where the balance between challenges and capability move to imbalance. This study will quasi-experimentally (see Chapter 6) investigate the quality of people's lived subjective experience as they engage in challenges in a challenging environment. By adopting this approach and developing an appreciation of the nature of the relationship between varying degrees of challenge and an individual's subjective experience of that challenge as regulated by capability, this study seeks to identify where the challenge-capability balance threshold transitions to imbalance.

This research project essentially focuses on a triad of connected and interdependent themes – subjective experience, challenge and capability. Due to the complex coupling that connects these themes, this research project will adopt a theoretical foundation comprised of flow theory and complex systems theory.

Having outlined the purpose of this doctoral research project, its theoretical foundations and the associated problem that it addresses, the rest of this chapter is divided into two distinct sections. *Figure 1-1* depicts the structure of the first section, which clarifies and analyses the research problem. To this end, this part will discuss indicators of the research problem, the multifaceted amalgamation of elements and inter-relationships that characterise contemporary social structures, and the limitation of methods and practices with which to identify and analyse people's lived experiences. Following this is a summary and rationale for

flow theory providing the theoretical foundations for this study. The rationale supporting this choice are:

1. "whenever the quality of human experience is at issue flow becomes important" (Csikszentmihalyi 1988:14).

2. Flow theory is predicated on balancing challenges and capabilities.

3. Flow theory systemically models the person-environment interaction in terms of challenges and capabilities (complex systems).

4. Extensive flow research has been conducted investigating a person's lived experience at the individual level, between people (group level) and between groups.

Figure 1-1: The Research Problem, Purpose, Consequences and Objectives
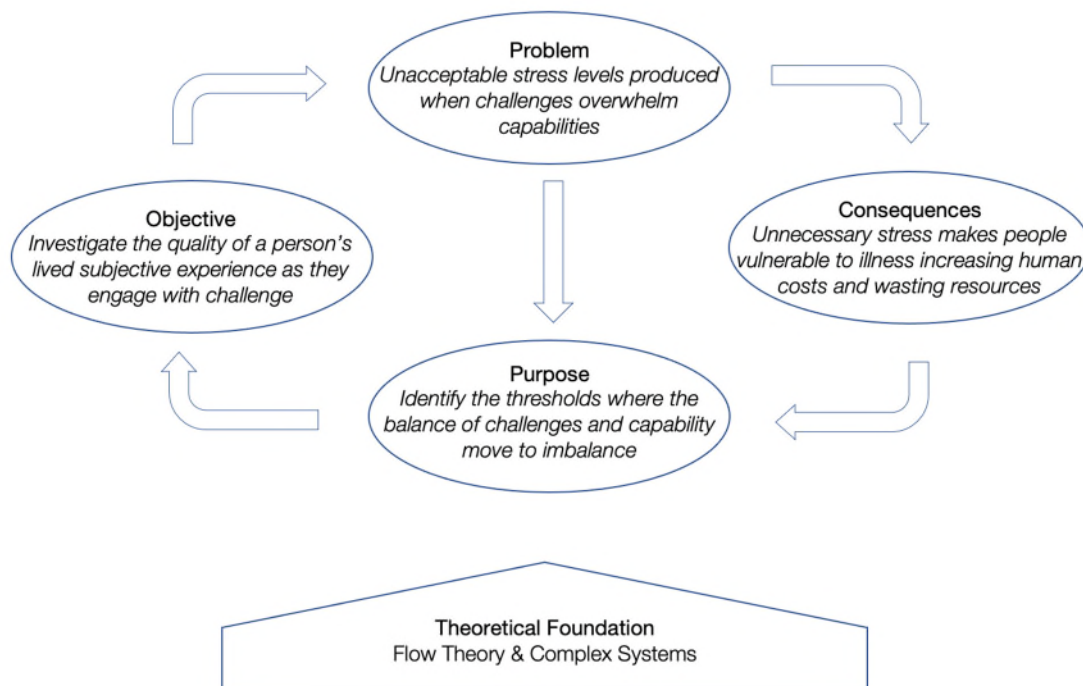
Furthermore, because the research problem is a real-world problem, and flow theory uses systems methods, the research problem is framed using systems theory methods to capture and express its complexities regarding the interactions that occur in complex human environments (Meadows and Wright 2008).

The second section of this chapter presents an executive summary of the dissertation. This section outlines the ontological and epistemological position and describes how it facilitates movement from abstract principles to a coherent research protocol (methodology). The section then provides a brief account of the contributions to knowledge made by this research and its importance in addressing the research problem.

1.1 The Research Problem

This doctoral research project focuses on how the quality of a person's lived subjective experience is affected by differing degrees of challenge: stress (challenge) in the form of pressures and demands overwhelming that person's capabilities (knowledge, experience and skills – see Chapter 5, *Section 5.4*). Research has shown how unacceptable levels of stress contribute to the decline of people's mental health and well-being (World Health Organisation 2020). A critical analysis of this problem indicates three themes:

1. Subjective experience — the state or quality of an individual's subjective experience as they engage in their daily lives.

2. Challenges — that manifest as a product of situational and systemic demands, pressures, responsibilities, and resource limitations.

3. Capabilities — describe the individual's personal resources, knowledge, experience and skills.

By identifying these themes, the research problem can be rearticulated – when situational and systemic challenges overwhelm a person's capabilities, the individual experiences unacceptable stress levels. In other words, an imbalance between challenges and capabilities produces unacceptable stress levels.

By arranging these themes within a systems diagram, the clarity of the research problem is enhanced. *Figure 1-2* depicts the elements of the research problem and the relationships associated with person-environment interaction. The diagram depicts the induvial as a product of the relationship between subjective

experience moderated by capability in relation to challenges in a challenging environment.

Figure 1-2: Subjective Experience, Capability and Challenge Triad
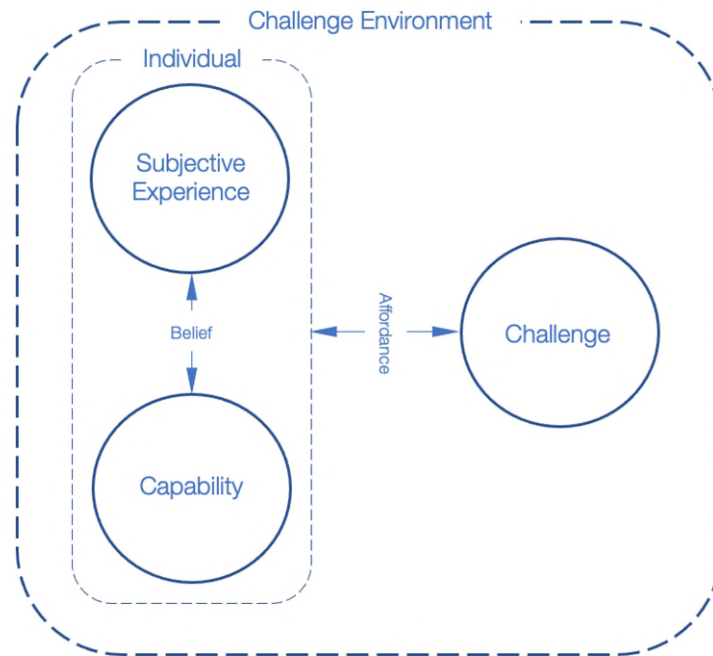
Viewing the research problem and its associated themes through a lens of flow theory, when challenge either exceeds or lags an individual's belief in their capability at a given moment, that individual will begin to experience negative emotional psychological states (see Chapter 2). As depicted in *Figure 1-2*, when the individual engages with challenges in a challenging environment, capability mitigates and moderates the individual's subjective experience of those challenges. To the extent that a person's lived subjective experiences are directly linked to and contingent on the challenges they experience. However, the relationship between subjective experience and challenge is regulated by the individual's belief in their capability in relation to challenge (Csikszenthmihalyi 1990). That is to say, how people idiosyncratically interpret and experience the world provides critical feedback about that individual's changing relationship with their environment, such that fluctuations in a person's subjective experience are highly informative about that person's changing relationship with their environment.

Therefore, the problematic situation that this doctoral research project investigates is the dynamic nature of the relationship between the fluctuations in a person's subjective experience of challenge in relation to changes in the relationship between challenges and capabilities (as a function of meta-cognitive skill, see Chapter 4, *Sections 4.2 to 4.2.3*) as depicted in the various models of flow (see Chapter 2).

1.1.1 The Twofold Consequences of the Research Problem

This research problem is best understood through negative consequences that occur when either challenge exceeds capability or capability exceeds challenge causing stress (World Health Organisation 2020). These consequences are exemplified in a report from the Health and Safety Executive (2019) investigating the decline of employee health and well-being. In summary, the report directly attributes the excessive demands placed on employees by organisations for the decline in employee health and well-being. In other words, the employee experiences an imbalance between challenges and capabilities, where excessive demands in the form of challenges overwhelm the employee's capabilities to respond to those challenges — the consequences of this imbalance manifest at two inextricable yet distinct levels the individual and the organisation.

At the level of the individual, research has shown that subjective experience fluctuates through a wide range of psychological states as a product of the relative and positional nature of the relationship between challenge and capability (Massimini, Csikszentmihalyi, and Carli 1987). It is only when challenges and capabilities are in balance that "enjoyment appears at the boundary between boredom and anxiety, when challenges are just balanced with the person's capacity to act" (Csikszenthmihalyi 1990:126). However, when challenges and capabilities are imbalanced, the individual experiences problems, where stress, depression, and anxiety become the daily norm, directly affecting the individual's health and well-being (World Health Organisation 2020).

For leaders at the organisation level, the consequences of an imbalance between employees' capability and employees' challenges result in either waste or high costs. Waste occurs when the organisation does not fully realise an employee's

potential in terms of their capability. Alternatively, high costs are incurred by the organisation when individual employees are overwhelmed by challenges causing them to make mistakes in the form of poor decisions (Stamp 1989). This analysis shows how an imbalance between challenges and capabilities directly affects the organisation's ability to operate effectively and efficiently. Therefore, if organisations wish to meet the novel demands of new and emerging markets in a volatile, complex and ambiguous operational environment, organisations need to match and balance the needs and demands of operation with the individual employee's knowledge, experience and skills (OECD 2016), where knowledge, experience and skills represent the three domains of meta-cognition (Flavell 1979), and define the thresholds of optimal experience (see Chapter 4, *Sections 4.2 to 4.2.3*).

1.2 Knowledge Gap

As indicated in the current body of literature, methods and the formal approaches applied to capturing and expressing the relationship between challenge and capability and their effect on a person's subjective experience as they engage in a challenging environment are inadequate. This knowledge gap (lacuna) is multifaceted and interdependent:

1. While flow is measured as both an experiential state and psychological trait, none of the current flow models can capture this apparent incongruity (Moneta 2012, 2021).

2. There is a mismatch between the models used to depict the broad range of individual subjective experience and the methods and practices specifically tuned to capture and measure the state and trait of flow (see Chapters 2 and 4).

3. There is an overreliance on correlational self-reporting methods to evaluate people's subjective experience of challenges in relation to their capability (Šimleša et al. 2018).

a. Formal approaches rely on study participants' self-reports through the standardised questions found in questionnaires (see Chapter 4).

b. Questionnaires can only evaluate the phenomena that they are designed to capture. Subjective experience spans a broader range of experience than flow questionnaires can capture (see Chapter 4).

4. There is an overreliance on quantitative studies to capture a qualitative experience. There is a need for more qualitative studies to capture the array of fluctuations of subjective experience depicted in the models of flow (Fullagar et al., 2017).

This section has outlined the negative consequences of the research problem and the limitations of theory, methods and practices that perpetuate these consequences. The following section will succinctly delineate this doctoral research project's purpose in terms of the project's research objectives, theoretical perspective and methodological approach and directly relate research objectives to the knowledge gap.

1.3 The Purpose and Objectives of the Study as a Response to the Research Problem

The overarching purpose of this PhD research project is to identify the thresholds (points) where the balance between challenges and capability move to imbalance. Consequently, this project will empirically investigate and explore the quality of a person's lived subjective experience as they engage in challenges in a challenging environment: to develop an appreciation of the nature of the relationship between varying degrees of challenge and an individual's subjective experience of that challenge regulated by capability. As this research project is deeply entwined with the concepts of subjective lived experience and the quality of that lived experience, the project will, by necessity, be qualitative.

To this end, the objectives of the research project and the associated knowledge gaps are subdivided below and summarised in *Table 1-1*:

1. Study the various philosophical perspectives, methodologies, methods and formal approaches discussed in the literature pertaining to the research problem (see Chapters 2, 4 and 5).

    a. Review the literature theoretically regarding how flow is modelled (see Chapter 2).

    b. Review the literature regarding the formal approaches and methods used to capture and measure flow (see Chapter 4).

2. Address part 1 of the knowledge gap above and develop an explicit theoretical foundation in the form of a new model of experience to explore the research problem (Chapter 3). This new model should address some of the limitations of current flow models and models of experience.

3. To investigate the research problem, establish a clear set of principles (methodology) from an appropriate and coherent philosophical perspective (see Chapter 5).

4. As set out in part 2 of the knowledge gap, empirically (experimentally) test the relationship between an individual's subjective experience of challenge in a challenging environment in such a way that a person should experience the broadest possible range of experiential states relative to challenge (see Chapter 6). Importantly, this approach should not rely on correlational methods, as outlined in section 3 of the knowledge gap.

5. Craft a specific method from the philosophical position developed in Chapter 5 to analyse a person's lived subjective experience of challenge (codebook). The method should capture and communicate the broad range of subjective experiences depicted in the new synthesised model of experience (knowledge gaps 2 and 3. See Chapter 7).

Table 1-1 depicts how the research objectives listed above directly link to the knowledge gap to be addressed by this doctoral research project.

Table 1-1: Knowledge Gap and Research Objectives

Research Objectives	Knowledge Gap
1a. Review the literature on modelling flow. 2. Synthesise all of the elements depicted in flow models into a single coherent model of flow.	1. No single model of flow can depict all of the theoretical elements of flow theory.

1b. Review literature on the methods of measuring flow.
 	
3. Develop a clear theoretical perspective to investigate the research questions.
 	
4. Empirically test (quasi-experimentally) the relationship between:
 	
subjective experience – challenge – capability
	3. Formal approaches used to investigate flow tend to be correlational and rely on:
	
	   a. Focus on a single state or trait of experience.
	
	   b. Rely on self-reports of study participants.

5. Develop a method to identify, capture and express the broadest range of subjective experience relative to challenge.	2. The various questionnaires utilised in flow theory are precisely calibrated to measure flow as either state or trait. These questionnaires cannot capture the broad range of states and traits depicted in the models of flow.

Due to the research problem and a preliminary syntopical literature survey, a theoretically rigorous framework was developed comprised of flow theory and drawing on complex systems dynamics. This framework provides a theoretically significant foundation for grounding the research problem providing structure, functionality, and utility to this doctoral research project and addressing the knowledge gap and research objectives.

1.4 Themes of the First-Person Subjective Experience of Challenges as it Pertains to a Challenging Environment

When the issues described above are viewed from the subjective perspective of people, four distinct themes emerge (World Health Organisation 2020):

i. Stress ensues when the challenges and responsibilities that people experience are not harmonised with their knowledge, experience and skills. Namely, there is a mismatch between an individual's capabilities and the challenges they experience.

ii. People experience stress when they feel they have little control over their lives and related processes.

iii. The distinctions between challenge, stress and pressure are subjective and highly personal. Therefore, judging the distinction between them from an individual perspective is difficult – in terms of the subjective lived perspective of the individual.

iv. Stress occurs in a wide range of circumstances. However, it is often made worse when people (subjectively) feel little support from family, friends, managers, transitory colleagues, social groups, or society.

These four themes of a person's lived subjective experience of challenge in a challenging environment demonstrate that challenge in a challenging environment is a highly idiosyncratic interpretive process that fluctuates in direct relation to vicissitudes in the challenging environment. This universal yet highly idiosyncratic, interpretive way of experiencing the world is captured in the analysis: what is it like to be *that* person engaged in *that* activity in *that* situation at *that* time. To address this problem, Wright and McCarthy adopt what they describe as a pragmatist perspective in appreciating another person's experience and say, "in short, it involves empathy" (2008:638). This approach aligns with what Rogers (1961) describes as coming to terms with another person's thoughts and feelings (see Chapter 5, *Section 5.2*).

1.5 The First Person Lived Experience

Several problems are associated with identifying and capturing the individual first-person subjective experience. Many of these problems are attached to the elusive nature of individual subjective experience itself. Subjective experience is inherently internal to the individual and is only known to that individual, making it hard to capture. As Nagel (1974:444) writes:

> *"if the subjective character of experience is fully comprehensible only from one point of view, then any shift to greater objectivity […] does not take us nearer to the real nature of the phenomenon: it takes us farther away from it".*

In other words, to deeply appreciate another person's experiences, people must develop the ability to see the world through the eyes of another – to walk as it were in the shoes of another. This ability to see the world through the eyes of another should extend beyond normative (value-laden) ideas of empathy. The problem of the first-person experience and coming to terms with the first-person experience is fully explored in Chapter 5, *Section 5.2*.

An additional impediment to the problem is that an individual's lived subjective experience interacts with free will, rendering it non-deterministic (Guastello 2014). Furthermore, subjective experience involves the simultaneous interaction of systemic pressures and situational forces, making it inherently complex (Swanson 2013). Moreover, a person's capability is not a straightforward function, "It is not the skills we actually have that determine how we feel", Csikszentmihalyi (1990:173) writes, "but the ones we think we have".

How can we approach these four connected and interdependent problems (described above) from a first-person perspective to support people equally and in a timely fashion? Mihaly Csikszentmihalyi has lucidly argued, "whenever the quality of human experience is at issue flow becomes important" (1988:14). Flow occurs when an individual's knowledge, experience, skills and interests align with the difficulties manifest in the challenges they experience (point i on the list above). This distinctive feature of flow theory and practice, the alignment of

individual capabilities to challenges, makes flow theory the ideal lens to view, approach, and mitigate the issues that expose people to the damaging effects of stress, depression, and anxiety.

1.6 What is Flow?

There is a long tradition of academic study investigating the intrinsically motivated behaviours of people. In contrast to focusing on behaviours resulting from extrinsic rewards, this research domain explores people's behaviours and experiences resulting from engaging in intrinsically rewarding activities. That is to say, people freely choosing to engage in an activity because the activity is itself rewarding for its own sake. The research agenda adopted by scientists investigating intrinsic motivation is essentially threefold 1) investigation of the mechanisms that produce intrinsically motivated behaviour; 2) the consequences of intrinsically motivated behaviour; and 3) the quality of an individual's subjective experience while intrinsically motivated: what it means for a person to be intrinsically motivated and what is it like for a person to be intrinsically motivated (see Chapter 4). It is this third research agenda, and the theory developed by this research agenda variously and colloquially referred to by people as 'being in the zone' or 'no mind' and labelled by positive psychologists as Flow (Csikszentmihalyi 1975) that will provide the theoretical framework adopted by this doctoral research project.

The theory of flow describes the positive, persistent and ubiquitous cognitive, emotional and motivational features that people report when experiencing flow (Csikszentmihalyi 1975, 1988). Research has shown flow to be a robust emergent psychological phenomenon that ensues when people are intrinsically motivated and optimally challenged, producing feelings of enjoyment and satisfaction. People in flow report that their concentration deepens, the present is what matters (being in the moment), their sense of time becomes altered, control is no longer a problem, they lose their sense of self, and they experience a deep sense of enjoyment. These components of flow can be subdivided into three categories, as depicted in *Table 1-2*:

Table 1-2: Characteristics of Flow

Antecedents (Preconditions)	1. Goals are clear
	2. Feedback is immediate
	3. A balance between challenges and capability
Indicators (signs and symptoms)	4. Concentration deepens
	5. The present in what matters
	6. Control is not a problem
	7. The sense of time is altered
	8. The loss of ego
Consequences (emergent feeling state)	9. Enjoyment – intrinsic reward

Adapted from (Csikszentmihalyi 1988, 2003; Delle Fave, Massimini, and Bassi 2011; Nakamura and Csikszentmihalyi 2009)

These components describe the qualities of the associated activity (antecedents), signs and symptoms that an individual might experience when engaging in certain activities (indicators), and the resultant positive cognitive and emotional features of the psychological phenomenon (consequences). The components have formed the foundation upon which many methods have been developed to identify and capture people's flow experience (see Chapter 4). Flow theory focuses on this experiential state and psychological trait (see Chapter 4, *Section 4.2*) of being in flow. To this end, models of flow have been developed depicting the person-environment (capability-challenge) interaction and the emergent phenomenology (subjective experience) of the person-environment interaction (see Chapter 2, *Section 2.3*). Moreover, a suite of complementary methods and practices have been developed utilising flow theory that focuses on formally capturing and measuring the state and trait of flow using the person-environment models (see chapter 4, *Section 4.5.3*).

1.6.1 The Occurrence of Flow in Classical Literature

People's utilisation of flow is nothing new. Indeed, flow has been a common theme throughout human history. Its emergence can be identified in classic literature by utilising the components of flow to detect latent themes. The existence of flow in classic literature acts as a gauge demonstrating the utility and ubiquity of flow as a robust psychological phenomenon that people have been not only experiencing but deliberately and knowingly utilising to aid performance and survival throughout history.

Flow's utility to directly aid individual performance and improve a person's ability to survive is deeply embedded in Japanese culture. Takuan Soho (1573 – 1645) specifically wrote about the benefits of flow in his classic text 'The Unfettered Mind'. Often referred to as 'mu-shin' or no-mind; the mind free from attachment, or as Takuan writes, "the right mind is the mind that does not remain in one place. It is the mind that stretches throughout the entire body and self" (Soho 2012:12). In this description, Takuan explains how the flowing mind produces a sense of deep embodiment when a person is entirely focused. Csikszentmihalyi (2003:47) mirrors Takuan with his explanation, "We no longer have to think about what to do, but act spontaneously, almost automatically, even when some aspect of the task at hand is very difficult or dangerous […] action and awareness merge into a seamless wave of energy".

The efficacy of rightmindedness (flow) was so embedded within the intrinsic Japanese art forms and Zen that the 'Unfettered Mind' goes beyond the championing of flow. The 'Unfettered Mind' is a textbook that teaches people how to experience flow and avoid the pitfalls and mistakes people make when developing flow as a beneficial skill to aid performance and survival in highly challenging and complex environments.

Additionally, the components of flow can be identified in 'Tom Sawyer'. Mark Twain (1835 – 1910) described the emergence of flow when Tom got the boys to whitewash the fence (Twain 1876). All the boys expressed enjoyment and satisfaction in the task (element 9 of *Table 1-2*). The task had a clear and specific goal (element 1 of *Table 1-2*). The boys reported an altered perception of time

(element 7 of *Table 1-2*) and a deep sense of enjoyment (element 9 of *Table 1-2*).

This same absorption feature, losing oneself painting while engaging in work, is exemplified by Robert Tressell (1870 – 1911). At the beginning of this chapter, Tressell's quote identifies the importance and benefits of work-related flow for both employees and employers. The characteristic of flow that 'Bert' expresses is how time becomes distorted when an activity (work) is interesting and fulfilling, enabling enjoyment and pleasure to ensue from the activity for the workers (element 7 of *Table 1-2*).

These historical examples demonstrate that flow is so robust, valuable and efficacious in human experience that people have been utilising it for centuries to enhance their ability to survive, thrive and flourish in the world.

Contemporary research has revealed three main reasons that people experience flow (Csikszentmihalyi 1975, 1993, 2003):

1. The environment is endlessly rich and stimulating.

2. People were in positions of deep embodiment, meaning all aspects of the person were fully absorbed in the activity and the environment – enabling them to experience positive forms of stress, commonly known as eustress (Selye 1974).

3. The activity was important to the individual, drawing attention into the immediate now (intrinsically motivating).

The ubiquity of these characteristics across a multitude of contexts has rendered flow as a psychological phenomenon that occurs in a wide array of different situations and environments. Therefore, the efficacy of flow produces an ideal state of experience to strengthen and lift individual self-worth and well-being, improve personal performance and enhance a person's experience of challenging, complex and often ambiguous environments (Csikszentmihalyi 2000).

1.6.2 The Benefits of Flow in Society

From the first-person perspective, Csikszentmihalyi (2003:3) asks the question: "is what you do for a living making you ill"? From this perspective, flow plays a pivotal role in fostering optimal experience. Specifically, the absorption and enjoyment aspects of flow that have motivated researchers to study the features and benefits of this emergent psychological phenomenon in an array of environments. For example, the benefits of flow have been investigated in working environments (Csikszentmihalyi 2003; Happell and Gaskin 2015), education (Asakawa 2004; Bassi and Delle 2012), adventure sports (Delle Fave, Bassi, and Massimini 2003) and music (Custodero 1998, 2005) to name a few. These investigations have enabled researchers to appreciate the impact of flow on individual well-being and flourishing and identify effective strategies that increase people's opportunities to realise the phenomena of flow across an array of activities and contexts (Csikszentmihalyi 1988; Fullagar and Fave 2017; Isham, Gatersleben, and Jackson 2019).

1.6.3 Research on Flow

Research has shown that when an activity is well structured and aligned with the knowledge, experience and skills of the individual positive states of experience ensue (Csikszentmihalyi 1988). Moreover, flow would appear to mitigate against the damaging effects of chronic stress. In a study by Lavigne et al. (2012), flow has been shown to protect workers from the damaging effects of chronic work-related stress, depression and anxiety. Therefore, it would appear that an essential process must be assessing an individual's experience of flow by observing and identifying when a person is being moved out of flow as a product of the excessive demands and the limitations of meta-cognitive skills (Xanthopoulou 2017).

Flow theory focuses on the experiential state and psychological trait (see Chapter 4, *Section 4.2*) of flow. To this end, models of flow have been developed depicting the person-environment (capability-challenge) interaction and the emergent phenomenology (subjective experience) of the person-environment interaction (see Chapter 2, *Section 2.3*). Moreover, a suite of complementary methods and

practices have been developed in flow theory that focuses on formally capturing and measuring the state and trait of flow using the person-environment models (see Chapter 4, *Section 4.5.3*). Analysis of the literature has shown incoherence between the models used to systemically depict people's experience of challenge and the methods and practices used to measure people's experience of challenge. This incoherence occurs because the methods and practices are calibrated to focus on capturing and explicitly measuring flow (whether state or trait).

In contrast, the models depict a far broader range of experiential states that are not captured by the methods and practices that measure flow. Moreover, Fullagar et al. (2017:18) write, "at the methodological level, further efforts are needed to understand the phenomenology of flow in real-time". This analysis of Fullagar et al. refers to the correlational retrospective methodologies used to investigate flow. Retrospective methodologies are limited by sampling and the participant's memory (this is an acute issue when investigating flow, see indicator 8 in *Table 1-2*). These inconsistencies and limitations of methodology form the knowledge gap described above and generate the research objectives.

This section has discussed the theoretical foundation upon which this doctoral research project is based. The phenomenon of flow has been discussed from the perspective of its characteristics, features and benefits. Additionally, some examples of the occurrence of flow in classical literature were presented to demonstrate that flow is a feature of the human condition. This historical perspective of flow shows how people have deliberately used flow to deal with highly complex, dynamic and often ambiguous environments. Takuan Soho (2012) exemplifies this in his description of the application of flow to combat. The section then discussed the benefits of flow and the array of research investigating flow across multiple activities and contexts. Finally, this section briefly identified inconsistencies in the models, methods, and practices used to investigate flow and the corresponding knowledge gap they generate.

The following sections of this chapter will outline the structure of this dissertation. The theoretical foundations in terms of the research questions developed from

the literature review and the identification of the study's ontological and epistemological position. The section will then briefly discuss the methodology and conclude with a discussion of the studies contribution to knowledge and the project's main findings.

1.7 Structure of the Dissertation

This doctoral research project is divided into six distinct sections (*Figure 1-3* below) introduction, theoretical foundations, design of the quasi-experimental protocol, method of analysis and study findings, contributions to knowledge, and finally, addressing the research problem and knowledge gap. The following sections will adhere to this same structure.

Figure 1-3: Dissertation Structure
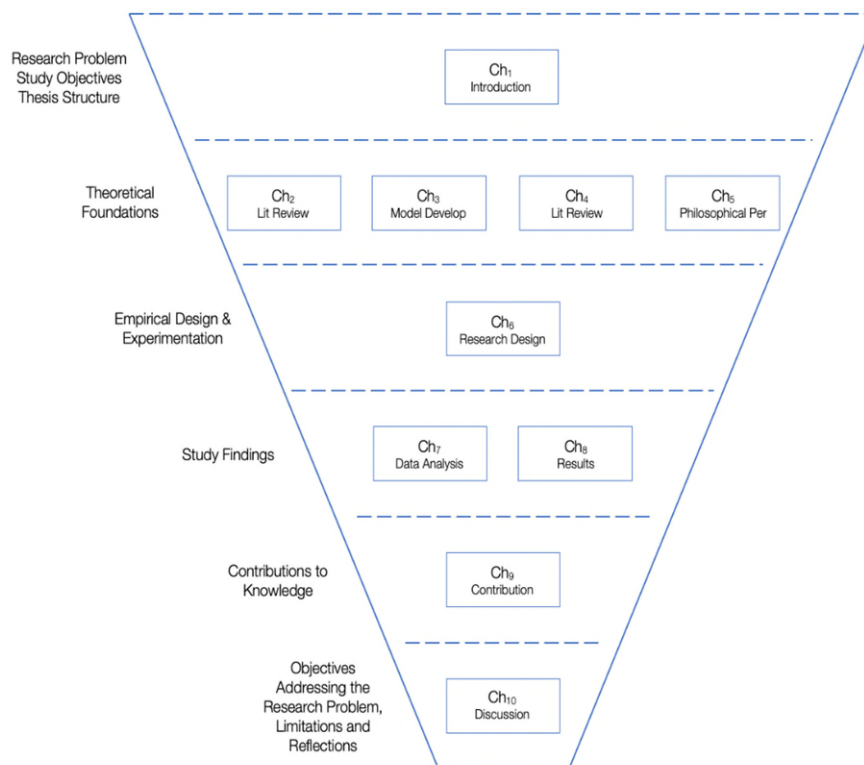
1.7.1 Theoretical Foundations

The section above (what is flow?) is essentially a preliminary literature review of the research problem when viewed through the lens of flow theory. This review revealed a knowledge gap that resulted in the development of an array of research objectives (see *Table 1-1*). Firstly, the preliminary review revealed an inconsistency between the models that depict flow (flow as experiential state and flow at psychological trait); and secondly, a gap between the methods that measure flow and the models that depict flow. Therefore, the decision was made to conduct two distinct but interrelated literature reviews. The first review would analyse the literature on flow from the perspective of modelling flow objective 1a (Chapter 2). The second review would analyse the literature on flow from the perspective of methodologies and methods of measuring flow objective 1b (Chapter 4).

Chapter 2 presents an extensive review of the literature pertaining to the modelling of flow. The chapter begins by identifying the two main approaches to modelling flow: componential and operational. The review identifies the central researchers, themes, and the development of flow models within these two approaches since flow research began in the 1960s. This review of models depicting flow revealed deficiencies. Leading to the development of the research question:

- *Is it possible to synthesise a new model of experience that captures all of the various elements of flow theory?*

This question directly aligns with objective 2 (*Table 1-1*) and generates the focus of chapter three.

Chapter 3 details the first phase of the research project as a function of the research question developed in Chapter 2 – the design, methods and structure of developing a New Synthesised Model of Experience. The novel generative approach utilised in this part of the study in terms of its multi-method design comprised of three explicit and complementary methods:

1. A thematic analysis method (Boyatzis 1998) was used to identify latent themes that resided between the three spaces of the Flow Channel Model (FCM) and the descriptions of the affective feeling states of the Experience Fluctuation Model (EFM) (see Chapter 2, *Section 3.2*).

2. The thematic analysis results were then synthesised into a truth table (Gibson and Isaac 1978). By synthesising the FCM and the EFM in this way, a coherent qualitative systemic model was generated that maps the positional and conditional elements of a person's lived subjective experience of challenge as they engage in a challenging environment.

3. The truth table was then encoded using a binary grey code (Lucal 1959). In this way, encoding the truth table facilitated a mapping process known as Karnaugh maps (Karnaugh 1953) enabled the development of a system of three simultaneous Boolean equations. These equations provided new insights into the ways people experience challenges.

The thematic analysis and truth table synthesis (*Sections 3.3 & 3.4*) enabled the production of generalised symptomatic effects to be extrapolated from the new model and the complimentary development of a system of simultaneous Boolean equations. The result is a new model that depicts a landscape of human experience in the form of interrelated spaces (labelled Disuse, Misuse and Optimal Experience) thematically and logically populated by experiential states. These spaces are delineated by complex and interactive thresholds as a consequence of an individual's metacognitive skills. The development of the new synthesised model represents the realisation of objective 2.

Chapter 4, as described above, provides an adapted systematic review of the theories, methodologies and methods for identifying, capturing and measuring flow. An extensive review is also conducted on the theory of flow as an experiential state and psychological trait.

In summary, the chapter review identified a paucity of qualitative studies. The trend in methodology is to investigate flow in a naturalistic setting using correlative approaches. The measurement methods are tuned to measure flow

quantitatively, either as state or trait and cannot identify any other experiential state depicted in the flow models. The methodologies and methods are limited in their sampling frequency when measuring states. All these methods rely on the study participants' testimony and memories and their ability to accurately evaluate the level of challenge they are experiencing. From these findings, two complementary research questions were developed:

- *RQ-1: Is it possible to encode a person's signs and symptoms of being in flow and moved out of flow state through the various instances and absences of states?*

- *RQ-2: What affect does challenge have on a person's subjective character of experience?*

These research questions were then used in conjunction with the new synthesised model to locate this research project's philosophical perspective and direct the study's empirical portion.

Chapter 5 discusses the novel and innovative philosophical perspective adopted by this PhD research project and the implementation of its multi-paradigmatic investigation. One paradigm is placed in parallel with another paradigm because each paradigm provides a differentiated perspective to view the research problem. The paradigms frame each of the different aspects of the research problem and then synthesise the results into a coherent set of findings that directly pertain to the research objectives. The rationale supporting this choice resides in the fact that Critical Realism and Interpretivism (Transcendental Idealism) are grounded in philosophical realism and share some critical assumptions of the nature of ontology (Blaikie and Priest 2017). These shared assumptions facilitate a multi paradigmatic research strategy that transcends superficial choice of qualitative or quantitative research to a precise framing of the research problem with explicit principles and practices as to how the research problems are investigated.

So, on the one hand, the new synthesised model of experience implies a stratified world where underlying mechanisms produce effects in the empirical world (RQ-

2). This perspective is consistent with a Critical Realist view of reality (Bhaskar 2008). On the other hand, research question RQ-1 presents a problem of the first-person perspective or intra-subjectivity – what is it like to be *that* person engaged in *that* activity in *that* situation at *that* time (Wright and McCarthy 2008). The first research question (RQ-1) essentially asks: is it possible to link the first-person (intra-subjective) experience through self-reports, actions and behaviours (signs and symptoms) with the descriptions of states manifest in the new model of experience? This linking of signs and symptoms to descriptions of states is consistent with Interpretivism (Blaikie 2010). Hence, locating and framing the research problems with two complementary parallel research paradigms means that the latter's results can be used to identify signs of intra-subjective (first-person) experience and facilitate the development of a method to link a person's actions and behaviours to experiential states. These findings can also be utilised to argue the former's existence and efficacy (the new synthesised model of experience), producing two distinct yet complementary contributions to knowledge.

1.7.2 Empirical Design and Experimentation

Chapter 6 details the second phase of this doctoral research project: the strategic approach, design and choice of methods. This chapter discusses the novel design and development of the quasi-experimental protocol and the construct elicitation method applied in this doctoral research project's empirical phase. The chapter explicitly utilises the philosophical principles derived in Chapter 5 as an overarching framework to guide the PhD research project's design and development.

This chapter begins with a clear statement of the research objectives in terms of the quasi-experimental protocol. Next, the chapter identifies and selects an appropriate activity and context to conduct the study, including selecting the most suitable participants to engage in the research project. The chapter then moves on to the design and methods selection.

As a product of the overarching principles developed in Chapter 5, the selection of an activity, a context and study participants, a quasi-experimental approach

was identified as the most suitable way of realising the research objectives. The rationale supporting a quasi-experimental design is twofold: 1) individual experience is subjective by nature (see Chapter 5) and a control group cannot be used as a probabilistic baseline for subjective experience, and 2) in a naturalistic setting, study participants cannot be assigned to control groups. Within the quasi-experimental protocol's description, there is a detailed account of the dependent variable in direct accordance with the unit of analysis in Chapter 5. The independent variable is discussed in detail, leading to a discussion of the quasi-experimental protocol, its format, the type of data generated, and the qualitative way the data is analysed (Edmonds and Kennedy 2017). The data is treated qualitatively and analysed using 'framework analysis' (Boyatzis 1998) to identify links between the study participants actions, behaviours and self-reports (typifications) with descriptions of experiential states (typologies) identified in the literature (see Chapter 7).

The chapter then concludes by selecting the triangulation method – construct elicitation. The methods theoretical foundations are discussed and aligned with the philosophical perspective of this doctoral research project. Then the section moves on to describe the transformation of a general method 'Role Construct Repertory Test' (Burr, King, and Butt 2014) to the crafted application of the method used in this doctoral research project.

1.7.3 Study Findings

Chapter 7 identifies and describes the method of data analysis utilised in this PhD research project. The chapter begins by situating qualitative research methods into a broader historical perspective of social scientific enquiry. The chapter then discusses the utilisation of Kidder and Fine's (1987) framework to aid in the appropriate selection of an analysis method. Following this, the elected method of framework analysis in the form of a codebook is described in detail. The chapter then proceeds to align the general framework analysis method to the philosophical perspective that this study applies to the research problem (people's subjective experience of being with challenge). The alignment of the

analysis method with philosophical perspectives is then used as a vehicle to facilitate the movement from a general method to a crafted application.

A complete group of typologies of feeling states are collated with appropriate labels, compact descriptions, and examples orientating them to the context under investigation to aid the movement from a general method to a crafted application. The chapter then describes in detail the process of data analysis that generated the codebook linking feeling states (typologies) to the observable actions and behaviours (typifications) of the study participants. This section concludes with a detailed description of the data analysis and the multifaceted approach for identifying and corroborating the codable moments linking typifications to typologies.

Finally, consistent with findings in the literature review (Chapter 4) and the qualitative nature of this doctoral research project, an additional independent layer of structure is applied to the overall research project. The intention is to ensure the quality, credibility and rigour utilised in this project (Tracy 2010).

Chapter 8 builds on the analytical foundations developed in Chapter 7 and presents the experimental protocol results in terms of the two research questions. Therefore, this chapter is divided into two parts. Part one shows the integrated (all three study participants) codebook and identifies the participants' actions and behaviours (unit of observation) and links them to experiential states. Part two then shows the fluctuation of the participants' experiential states (unit of analysis – dependent variable) relative to the fluctuations of the challenge activity (independent variable).

In part one, the relationship between the participant's observable actions and behaviours (typifications) and an individual's subjective experience of being with various levels of challenge is presented in the form of the codebook, as discussed in Chapter 7. The participants' actions and behaviours are linked through the logic of abduction and induction to the descriptions of experiential states.

Figure 1-4: Structure of Data Analysis
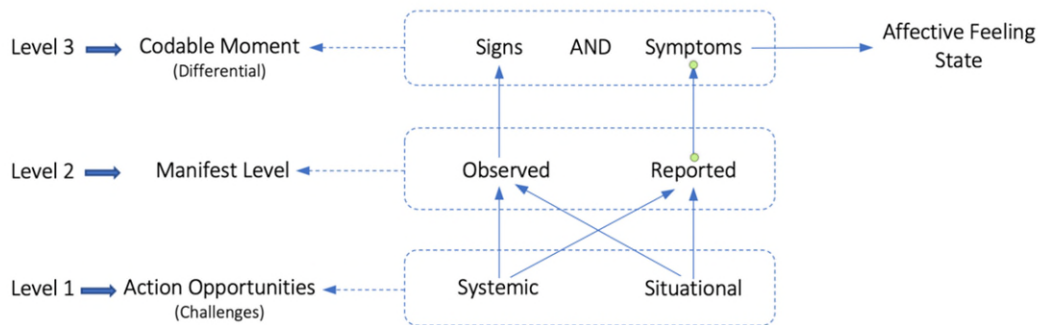
Figure 1-4 depicts the way the analysis of this section is structured. This structure produces a narrative of systemic pressures, situational forces, the observed actions and behaviours, which are codable and translatable into affective experiential states (thick description – *Appendix E*). The codebook spans seven experiential states: worry, anxiety, arousal, flow, control, relaxation and boredom. Each of the experiential states has a description and corresponding signs and symptoms.

Part two of this chapter utilises the codebook developed in part one to answer research question two. The codebook identifies the participants' actions and behaviours to their experiential state. The identification of the experiential state is then plotted in relation to the level of challenge (Y-axis) across time (X-axis). The resulting graphs show how the participant's subjective experience dynamically fluctuates in relation to varying levels of challenge.

Each of the graphs shows how the participant's subjective experience fluctuated relative to the level of challenge. The fluctuation of subjective experience in relation to challenge demonstrates a correlational link and that this relationship is relative. Additionally, the graphs show that even when a challenge is set at a particular level, the challenge can spike, causing the individual's subjective experience to spike. This spike in subjective experience alerts the individual of their need to respond to the acute, proximal and potentially harmful spike in a

challenge. In this way, experiential states inform the individual how to act and respond.

Multiple safeguards were applied to ensure the quality and rigour of this study and its credibility to inform future research. These safeguards are seen in the framework for the 'quality of qualitative research' at the end of Chapter 7, *Section 7.3*. Firstly, the participants' self-reports were used to corroborate the identification of experiential states while each participant was engaged in the challenge activity. Identifying subjective experience with self-reports were then triangulated with the participants construct elicitation grids developed from the interviews. Finally, once the analysis was complete, the participants were asked to review the analysis of their experience. These member checks by the participants confirmed the analysis.

1.7.4 Contributions to Knowledge

Chapter 9 extends the discussion of the results presented in Chapter 8 and reviews those findings in light of their theoretical significance in direct relation to the literature on flow theory discussed in Chapters 2 and 4. In making this comparison, this section will explicitly specify the significant contributions to knowledge made by this doctoral thesis regarding:

1. The methodologies and formal approaches for accurately capturing and expressing how a person subjectively feels about the challenges they experience (research question 1).

2. How differing degrees of challenge can be seen to affect different people's experience of that challenge and how that challenge may also influence how they subjectively feel (research question 2).

3. The New synthesised Model of Experience and its associated system simultaneous Boolean equations.

Moreover, this chapter will discuss the other contributions to knowledge made by this doctoral thesis regarding the novelty of the approach, the application of a

multi-paradigm research strategy and an empirical approach to determine if a person is being ethically challenged.

1.7.5 Objectives – Addressing the Research Problem

Chapter 10 provides the concluding sections of this doctoral dissertation. The chapter will begin as the dissertation begins by reiterating the research problem, the consequences, and the knowledge gap that this PhD addresses. The research objectives are restated and reviewed in terms of the research problem. Subsequently, the section will conclude with how this research addresses the research problem and the knowledge gap:

1. This PhD identified that challenge is cumulative and iterative and that cumulative and iterative challenges affect people's subjective experience.

2. This PhD identified a correlational link between challenge, subjective experience and capability.

3. Combining the link between challenge and subjective experience, the codebook and new synthesised model facilitates a new formal way to identify when people are experiencing unacceptable levels of challenge.

Additionally, the chapter will discuss the efficacy of the new knowledge produced by this doctoral dissertation, how the knowledge fits into the landscape of flow theory, the limitations of the research and the novel and innovative research directions that should follow from this research project.

Finally, the chapter concludes with a reflection of the author and their personal learning journey while conducting this research project.

1.8 Chapter Summary

This chapter is divided into two sections. The first section describes the research problem, its consequences and the associated knowledge gap. This PhD's purpose is then set out in terms of the research objectives and the theoretical foundation upon which the study is grounded.

The section concluded with a preliminary review of flow theory pertaining to this doctoral research project's purpose and research objectives. The review identified limitations in the models, methodologies, and methods of measuring flow affecting this project's research problem and objectives. Therefore, two focused literature reviews were conducted, the first reviewing the literature on flow from the perspective of modelling (Chapter 2) and the second review of flow literature from the perspective of methodologies and methods of measuring flow.

The second section presented the dissertation's overall structure, Chapters 2 through 10 (*Figure 1-3*). By presenting the section in this way, the dissertation can be subdivided into:

1. *Theoretical Foundations* – the research questions, a new synthesised model of experience and the ontological and epistemological assumptions in relation to the studies unit of analysis (individual subjective experience).

2. *Empirical Design* – Crafting general methods (quasi-experimental and construct elicitation) into a coherent research protocol, identifying challenge activity, selecting appropriate participants, and identifying the independent and dependent variables.

3. *Study Findings* – the development of an explicit approach from a general method for analysing the quasi-experimental data analysis. Presentation of the results.

4. *Contributions to Knowledge* – specifying the direct contributions to knowledge made by this doctoral research project directly compared to the limitations identified in the literature reviews.

5. *Objectives Addressing the Research Problem* – how this doctoral research project achieved its objectives thereby addressing the research problem. This final chapter also discusses the limitations of the research and concludes with an account of potential future work resulting from this PhD.

Therefore, having clearly and explicitly summarised this doctoral research project. The following section (Theoretical Foundations) begins with a literature review on flow theory – modelling flow.

Chapter Two

Literature Review: Modelling Flow

The word model is used as a noun, adjective, and verb, and in each instance it has a slightly different connotation. As a noun "model" is a representation in the sense in which an architect constructs a small-scale model of a building or a physicist a large-scale model of an atom. As an adjective "model" implies a degree or perfection or idealization, as in reference to a model home, a model student, or a model husband. As a verb "to model" means to demonstrate, to reveal, to show what a thing is like.

Russell L. Ackoff 'Scientific method: optimizing applied research decisions'
(1962, p. 108)

2 Introduction – Modelling Flow Literature Review

This chapter directly follows the introduction of this doctoral dissertation. It is the first of four theoretical chapters locating this PhD within the broader framework of flow theory and research. This literature review addresses objective 1a and focuses exclusively on the modelling of flow (*Table 1-1*). The chapter begins with a background to modelling flow – its purpose and utility. This section then divides flow models into two distinct types, componential and operational and describes the structure of each kind of model in turn.

Following this, a comprehensive review is conducted of componential models of flow, followed by a review of the operational models of flow. All the models are reviewed explicitly from the perspective of this doctoral research projects overarching purpose:

- To investigate the balance between challenges and capabilities to identify the thresholds (points) at which imbalance occurs.

Subsequently, the models are evaluated in relation to each other. The results of this evaluation are presented in the form of a research question. This question represents the central theme of Chapter 3.

2.1 Background to Modelling Flow

Modelling and measuring are complementary interdependent activities of the research process. This chapter exclusively focuses on and reviews the methods, and ways researchers have modelled the flow phenomenon. The methods of measuring flow will be reviewed in Chapter 4.

Flow is a distinct and complex psychological phenomenon that occurs when a person is intrinsically motivated and optimally challenged. Research has demonstrated that flow occurs when a complex set of variables coalesce and align, producing a channel through which the phenomenon of flow can ensue. The correlated variables of flow have been catalogued, described and codified. Their relationships have then been systematically investigated to predict and

explain flow and the myriad of theoretically related outcomes associated with flow, such as performance, well-being, flourishing and self-worth.

Models are used as a way of representing theory, and as Deming (1994:103) writes:

> *"Without theory, experience has no meaning. Without theory, one has no questions to ask. Hence without theory, there is no learning."*

Theory presented in the form of models can be regarded as the product and process of research. As Lewin (1951:169) writes, "… there is nothing so practical as a good theory". As a product of research, models allow researchers to depict and explain phenomena, and as a process of research models enable researchers to identify 'lacunae' – what is not yet known. Therefore, on the one hand, as a product, models can be used to depict a particular theory and the relationship between variables that generate the phenomenon. On the other hand, as a process, models can drive research and test theory through prediction by investigating the relationships between variables to develop new knowledge.

From a research perspective as either product or process, modelling is a generative scientific activity that develops through iterative research cycles. In either of these roles, models can take many forms. However, there is no explicit taxonomy or ideal way of modelling in either qualitative or quantitative terms. The form a model takes will depend on the researcher and the nature of the theory to be modelled. To this end, models can be thought of as existing on a spectrum from qualitative to quantitative. In a purely qualitative form, models can be entirely descriptive using only prose (as seen in *Table 2.1*) or more structured forms, as in the case of path diagrams, concept maps, and systems diagrams. At the other end of the spectrum, models can be quantitative using mathematical operators to precisely define the relationship between variables. However, this distinction is not clear-cut – as seen in *Section 2.3.3*, equations using mathematical operators can be entirely descriptive.

Whatever the purpose or form models take, modelling is important because it provides researchers with a tool to present the latent theories and relationships they identify within quantitative or qualitative data sets. However, crucially, models are inevitably simplifications of a real-world phenomenon and can originate from differing research perspectives and practices. Researchers have used a broad range of modelling methods to develop different models in their particular research paradigm. Unfortunately, these differing perspectives and research practices and the models they create have produced disagreement and confusion between researchers regarding the utility and efficacy of specific flow models and disparity over the ways flow should be investigated.

Generally, flow models can be divided into two categories: componential and operational. The componential approach models flow as a multidimensional phenomenon comprised of various characteristics. The absence, presence or intensity of these characteristics indicates a person's flow experience (Engeser and Rheinberg, 2008; Jackson and Eklund, 2002, 2008; Moneta, 2012). The operational approach models flow systemically. The emergent phenomenon is a product of the "person and environment and the emergent phenomenology of the person-environment interaction" (Nakamura and Csikszentmihalyi 2009:90). Each of these approaches aims to accurately model and depict the subjective experience of individuals as they engage in the activities of their everyday lives.

This review of flow models is the first part of a modified systematic literature review. The second part of the review (methodologies and methods of measuring flow) is covered in Chapter 4. While this chapter is not an exhaustive analysis and evaluation of every flow model developed, it is thorough. For example, this review does not include the linear regression model of flow (Moneta 2012, 2021; Moneta and Csikszentmihalyi 1996, 1999). Chapter 4*, Section 4.1.*, describes the method, search strings and databases used in this modified systematic literature review.

This chapter reviews the flow models from the two main research perspectives, intending to locate each model within the theoretical landscape of flow. The aim is to develop an appreciation of the theoretical implications of each model. To

identify the limitations of the various models and develop an understanding of their theoretical boundaries. Finally, this chapter develops an appreciation of how the various models complement each other to represent the theoretical landscape of flow theory.

2.1.1 Componential and Operational Models of Flow

The chapter begins with the componential models of flow. These are further divided into the following categories:

1. Structural models in which the components of flow depict flow as either an affective experiential state or psychological trait.
2. Sequential models wherein the component elements are sequenced with antecedents, indicators and outcomes.

The chapter then moves to operational models, which depict flow systemically as an emergent psychological phenomenon. These models present flow as linear, dynamic, non-linear and discontinuous. The chapter ends with an evaluation of the various flow models.

2.2 Componential Models of Flow

Research has shown that flow is composed of nine complementary and interdependent components (*Table 2-1*):

Table 2-1: The Components of Flow.

Characteristics	Descriptions
Clear goals	These goals reveal themselves moment by moment – enabling the individual to know what needs to be done for the activity to continue.
Immediate feedback	The activity provides clear and timely information to the participant on how well they are doing. Ideally, feedback will be directly produced by the activity.
Challenge-capability balance	Flow (tends) occurs when people perceive the task to be achievable, where both the opportunities (challenges) and the person's capabilities are high and in balance.
Concentration deepens	The individual does not have to think about what to do. They can act spontaneously, automatically or instinctively. Action and awareness merge, producing coherence and absorption
The present is what matters	The individual is lost to the moment. There is no past and no future, just a seamless stream of consciousness. The individual's attention is wholly focused on the immediate now.
Control is not a problem	The person can control their actions, behaviours and thoughts in response to the immediate acute and proximal variations in the action opportunity (challenge) environment.
Sense of time is altered	Time adapts itself to the activity and becomes subjectively distorted. The distinction between Chronos and Kairos. Chronos: quantitative chronological time. Kairos: qualitative, subjective time for action.
Loss of ego	The sense of personal identity fades and is replaced with experience in the moment. It is not that the person forgets themselves (loss of sense of self), but the experience raises above the self in the order of priority. The person is not aware of being aware.
Enjoyment	In terms of eudemonic happiness and transcending homeostatic pleasure (autotelic enjoyment).

Adapted from (Csikszentmihalyi 1975, 1988, 2003; Delle Fave et al. 2011; Jackson and Marsh 1996; Nakamura and Csikszentmihalyi 2009)

In many ways, from the broad description of 'models' above, *Table 2-1* can be regarded as a qualitative thematic model of flow. The table shows the themes of flow in the form of characteristics with accompanying descriptions. *Table 2-1* is divided into three distinct sections as indicated by the solid and broken lines dividing each row. The first group (clear goals, immediate feedback and challenge-capability balance) represents the antecedents or preconditions of flow. The second group (concentration deepens, the present is what matters, control is not a problem, altered sense of time and loss of ego) captures the indicators of flow in terms of signs and symptoms. The final theme (enjoyment) represents the consequences of flow.

The antecedents of flow facilitate the structuring of an activity that holds the 'potential' of allowing flow to ensue. However, in this case, potential refers to structuring activities from an 'objective' perspective. Structuring activities from this objective perspective will always have limitations due to the subjective nature of experience. The antecedents of flow are moderated by "a (person's) subjective perception during an activity" (Peifer and Engeser 2021:422). One person may subjectively experience clear goals activity, immediate feedback, and a balance between challenges and capabilities in a given, enabling flow to ensue. Another person may not experience the antecedents of the activity in the same way.

For example, the person may find the activity does not balance with their capabilities. In response to this imbalance, Asakawa (2004) identified that autotelic personalities apply metacognitive skills to the challenge, while non-autotelic personalities were unable/unwilling to do so. Jaques and Stamp (1995) similarly identified the exercise of (personal) discretion over more extended periods or shorter periods (feedback). Therefore, a person's ability to experience flow is affected by multiple variables such as an autotelic personality or transient variables such as mood (see Chapter 4 *Section 4.2.3*); that extend beyond the objective structuring of a particular task or activity.

The antecedents of flow provide the structural conditions to which an individual's attention is drawn (Nakamura and Csikszentmihalyi 2009). When a person is in flow, qualitative and quantitative research over a range of leisure and working

activities consistently shows that the phenomenology of flow is comprised of six components (*Table 2-1*). Critically, while the indicators of flow are described individually, they are experienced by a person simultaneously. In other words, holistically, as a product of an individual being absorbed by an intrinsically motivating activity (Fullagar et al. 2017). Incorporating the indicators of flow into the componential models of flow, researchers have developed instruments to measure a person's flow experience by evaluating the absence, presence and intensity of the various indicators (see Chapter 4 *Table 4-5*).

By mapping the phenomenological landscape of flow in terms of its indicators and proximal conditions (antecedents), researchers can place greater confidence in their results when measuring a person's experience of engaging in an activity to identify if an individual is experiencing a state of flow. Applying a multi-factor analysis to identify the phenomenon of flow, researchers can distinguish between other experiential states with similar characteristics. In contrast, if a single item is used to identify a specific experiential state, it becomes possible to confuse what state is being identified. This problem is exemplified by Peifer and Engeser (2021), who highlight the importance of using multiple indicators to identify a person's flow experience compared to using single indicators. For example, both flow and anxiety share a limited stimulus field; however, these two states are very different experientially.

The final characteristic, enjoyment, has been shown to ensue when all the other characteristics have been realised from the individual's subjective perspective (Abuhamdeh 2021; Abuhamdeh and Csikszentmihalyi 2012; Csikszentmihalyi 1975, 2003; Tse et al. 2018). It is essential to note the distinction between enjoyment and pleasure in Table 2-1 (Abuhamdeh 2021; Csikszentmihalyi 2003; Lustig 2017; Sapolsky 2017).

This literature review has identified a critical distinction between the various componential models of flow that significantly impact how flow theory is understood. These distinctions are structural and sequenced. Structural flow models utilise the components of flow in specific structural configurations. These structures depict flow as either trait or feeling state (Jackson and Eklund 2002;

Jackson and Marsh 1996; Jackson et al. 2008; Moneta 2012). Reviewing these models in isolation is problematic because they are inextricably linked to measurement. Alternatively, the ordered/sequential componential models place the various components in a specific order, producing what might be described as a cascade through the various elements (Quinn 2005; Šimleša et al. 2018).

2.2.1 Structural Flow Models

Confirmatory factor analysis (CFM) was used to test each of the structural componential flow models (Jackson et al. 2008). Essentially, CFM is a statistical approach primarily used in social research to test if the measures of a construct (factors) are consistent with the researcher's appreciation of the nature of the construct. The intention is to confirm if the data fits the proposed measurement model. These models are the nine-factor measurement model (*Figure 2-1*) and the single factor model (*Figure 2-2*). The items (questions in the questionnaire) form part of the model's structure in each of these structural models. These models are classic test theory models.

Figure 2-1: Nine Factor Measurement Model

(Moneta 2012:42)
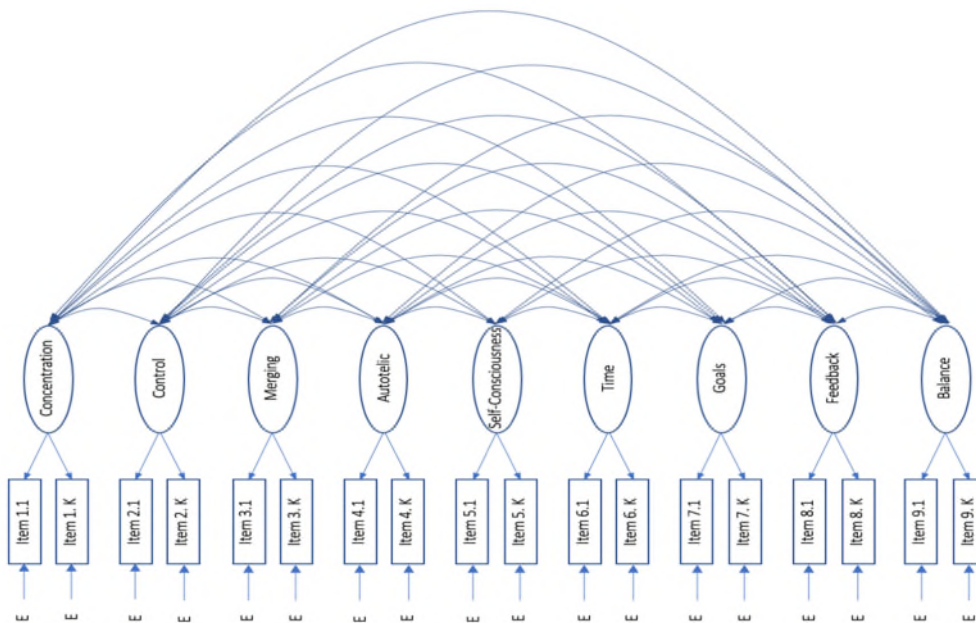
The nine-factor model (*Figure 2-1*) is a classic test theory model for confirming the nine intercorrelated elements (characteristics: concentration, control, etc.) of the flow constructs. The model illustrates how each element causes responses to the measured indicators (items in the model). The indicators are intended to assess people's flow experiences: the absence, presence or intensity of each structural element, indicating that person's subjective experience of flow (Jackson et al. 2008).

Figure 2-2: Single Factor Model

(Moneta 2012:42)
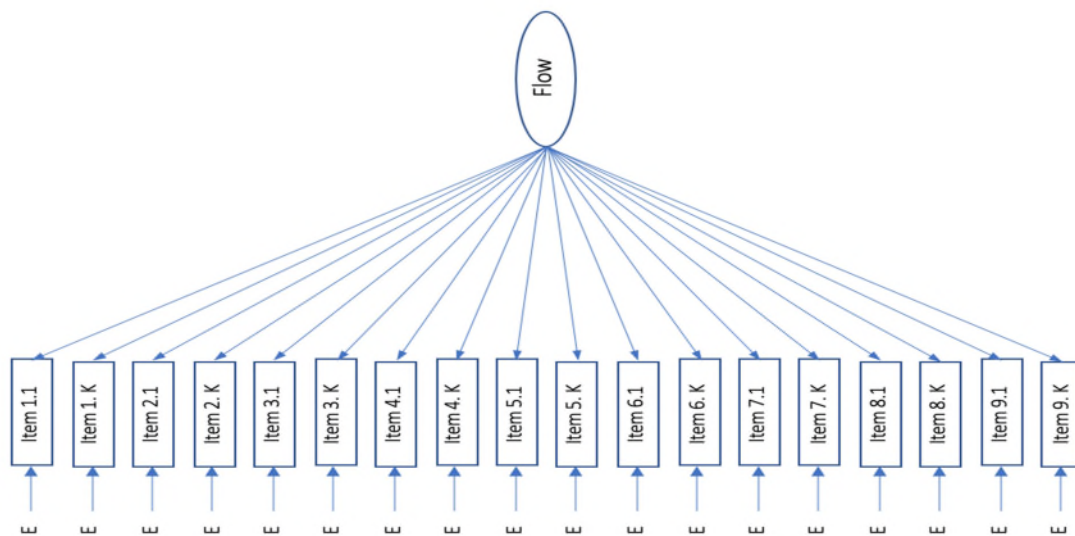
The single factor model (*Figure 2-2*) is another classical test theory model in which the phenomenon of flow causes differences in the measurement items' responses. Principally, the behaviours described by the questionnaire items indicate the phenomenon of flow (Moneta 2012).

The features that link these structural models are that each element of the component list coalesces to posit flow as either a disposition (trait) or as a feeling state. Each of the individual elements is equal in their contribution to the identification of flow as a state or trait (Jackson and Marsh 1996).

2.2.2 Sequential Flow Models

Sequential flow models utilise the same flow components as the structural models of flow with one significant difference: they also order the individual elements into a specific sequence. The sequence can generally be regarded as antecedents, signs and symptoms, and consequences. While there is some variance between the ways the models depict and qualitatively label the various elements, the general descriptions are similar.

Figure 2-3: Flow as a First Order Factor
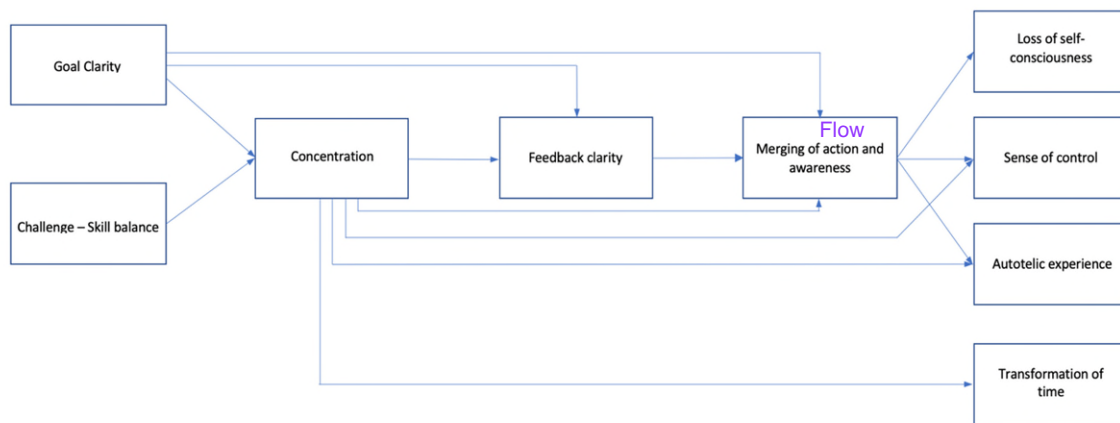
Quinn (2005), *Figure 2-3*, posits a sequential model of flow derived from an empirical investigation that differentiates between the various elements of flow, where the various elements are regarded as either antecedents or outcomes. All of the componential elements in the model are represented. The arrows in the model depict the relationships and order between the various elements of the model. The elements can be seen as originating with goal clarity and challenge-skill balance moving through to a sense of control, autotelic experience and loss of self-consciousness. In this model, flow is described as a first-order factor; goal clarity, concentration, challenge-skill balance and feedback clarity are antecedents of flow. That produces loss of self-consciousness, sense of control and autotelic experience.

As a product of empirical research, Quinn's model makes a distinction that differs from all other flow models. Flow is generally regarded as an emergent phenomenon, the product of the characteristics (*Table 2-1*). However, the first-order model directly associates flow with the merging of action and awareness. In Quinn's model (*Figure 2-3*), flow is simultaneously a psychological phenomenon and its indicator – merging action and awareness. Modelling flow in this way does not produce a surprise. As Csikszentmihalyi (1975:38) explains, "the clearest sign of flow is the merging of action and awareness. A person in flow has no dualistic perspective: he is aware of his actions but not aware of awareness itself". Therefore, while the merging of action and awareness is regarded as the clearest sign of flow, is it the actual flow phenomenon, as Quinn suggests?

Figure 2-4: Flow Engine Framework
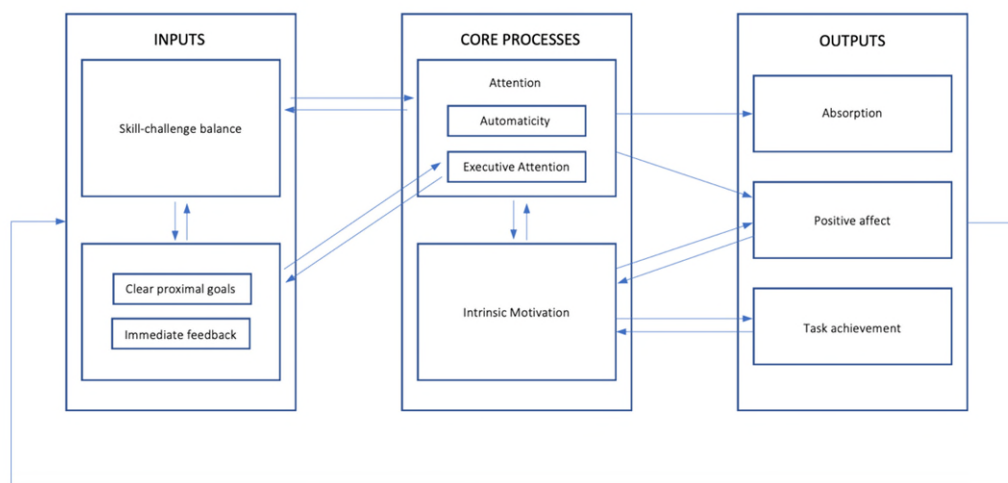
Šimleša et al. (2018) have produced a model of flow (*Figure 2-4*) that is believed to represent the psychological processing mechanism that generates flow. This model takes a significant theoretical step in its proposition of the psychological mechanism that generates flow. This model is presented as an explanation of the mental mechanisms that generate flow. Šimleša et al.'s theoretical model attempts to provide an explanatory functional flow model that depicts flow as a dynamic psychological process. The expressed intention is to predict the emergence of flow and act upon it.

This model comprises three main structural elements core processes, inputs and outputs. The arrows connecting the elements represent two types of relationships. The single arrows represent a causal relationship. The double arrows represent loops of interdependencies. For brevity within the model, some aspects of flow characteristics have been grouped under a single heading. For example, loss of ego, time distortion and focus have all been placed within absorption.

Figure 2-5: The Complexity Model of Flow
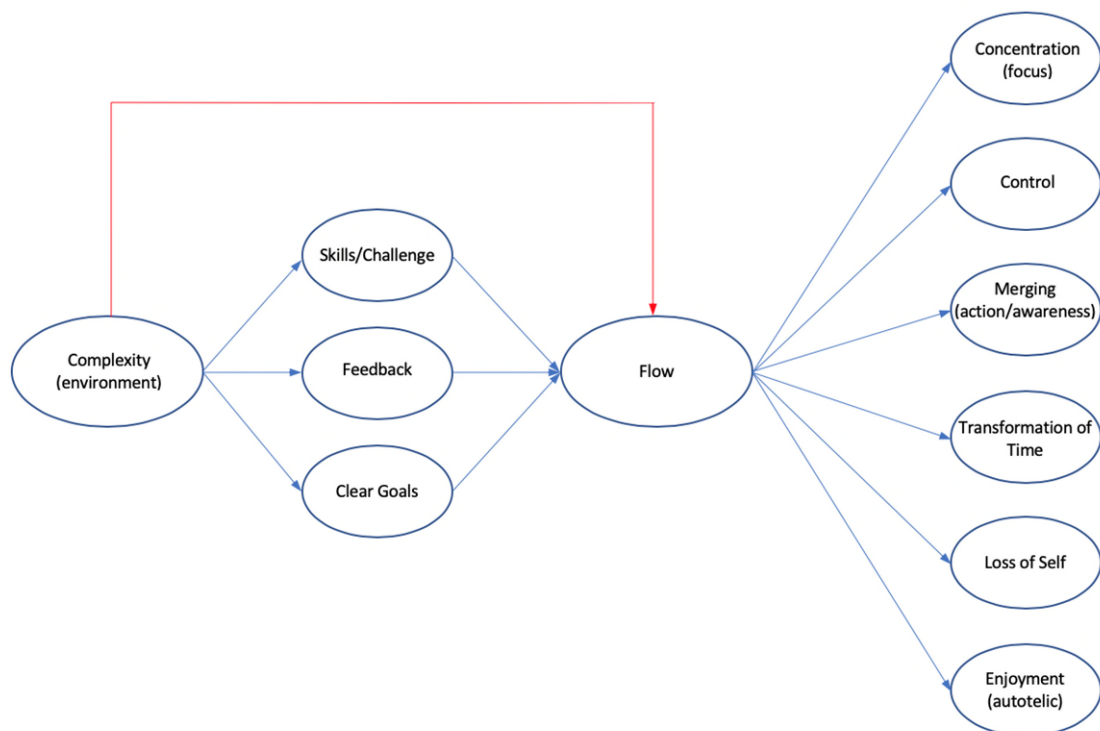
Guo and Poole's (2009) complexity model of flow (*Figure 2-5*) contains all of the elements of the other componential models with an additional element – environmental complexity. This model can be regarded as a combination of the structural and sequential models above. Guo and Poole identify that some studies use what they describe as "incomplete models of flow" (2009:369). Their expressed intention was to include the preconditions of flow (skills-challenge, feedback, clear goals). To this end, they posited four sequential componential models of flow with the additional element of complexity (of the environment)

specifically included in the model that feeds into the preconditions of flow. Guo and Poole's model differs from all of the other componential models flow. They do not assume the environment only in terms of the preconditions of flow. The environment is included as an additional complex element in the model. In Guo and Pool's model, not only does the environment produce the preconditions/antecedence of flow. The environment is shown to produce other influences that affect people's ability to experience flow. The effect that the environment has on a person's ability to experience flow is indicated by the red line linking complexity directly to flow in *Figure 2-5*.

2.2.3 A Summary of the Componential Models

The distinction between:

1. The nine-factor model of Jackson and Eklund *Figure 2-1* (2002)

2. The single-factor model *Figure 2-2* (Jackson and Eklund 2002; Jackson and Marsh 1996; Moneta 2012),

3. The first-order model *Figure 2-3* (Quinn 2005),

4. The flow engine framework *Figure 2-4* of Šimleša et al. (2018)

5. The complexity model *Figure 2-5* of Guo and Poole (2009),

The nine-factor model interrelates all of the component elements of flow to identify the emergence of flow. The single factor model utilises the items in a questionnaire derived from the components elements to indicate the presence of flow. Quinn's first order model depicts flow as the sequenced product of challenge-skill balance, feedback, and goal clarity. When a person experiences an alignment of these antecedents, their concentration is said to deepen, action and awareness merge. It is this merging of action and awareness that Quinn states is flow. The flow engine framework is a hypothetical model postulated as the psychological processing mechanism that generates flow. Šimleša et al. have argued that their model implies a mismatch between the characteristics used to retrospectively capture flow and flow as an emergent phenomenon of the person-environment interaction. However, the flow engine framework utilises the self-

same components used in all the other models; the researchers have simply placed the components in a different configuration claiming explanatory causal status. Finally, Guo and Pool's complexity model includes an additional element and path not used by any other models. While all these componential models imply context, they do not explicitly depict context as Guo and Poole do. The consequences of a statistically significant path depicted in the complexity model is important and far-reaching. This path implies that other environmental factors beyond the preconditions of flow affect a person's ability to experience flow. In other words, even if there is a balance between skill-challenge with immediate feedback and clear goals, a person may well not be able to experience flow due to other complex environmental factors. Subsequently, Guo and Poole's complexity model brings into question methods of measuring flow that are overly reductive in their use of componential elements such as the Work-Related Flow Inventory (Bakker 2008) or the Flow Metacognitions Questionnaire (Wilson and Moneta 2016) see Chapter 4.

Moreover, Guo and Pool's complexity model directly results from empirical research that focused on the interaction of people working on computers. The Work-Related Flow Inventory and the Metacognitions Questionnaire focus on work-related flow. Therefore, Guo and Pool's model cast doubt on the efficacy of these measurement methods and their failure to account for the complexities of the systemic person-environment interaction beyond the influence that environment has on forming the antecedents of flow.

This section has reviewed the componential models of flow. The following section will review the systemic (operational) models of flow.

2.3 Operational Models of Flow

What follows is a review of the models that depict an operational systemic view of flow. The commonality between the following models is that they depict an emergent phenomenology of people's experience, encapsulated in a Cartesian space of challenges and capabilities. The Y-axis represents action opportunities in the environment, often labelled challenges, and the X-axis represents the action capabilities of the person, often labelled skills or capabilities. In

combination, these dimensions depict a "…dynamic system composed of person and environment, as well as the phenomenology of person-environment interactions" (Nakamura and Csikszentmihalyi 2009:90). By structuring the variables systemically, the operational perspective is: "logically (i.e., analytically) independent of how happy, concentrated, motivated, or strong a person felt" (Csikszentmihalyi 1988:254). By constructing flow models systemically, experiments developed using such models become testable and amenable to falsification (Popper 1959).

2.3.1 The Flow Channel Model

The Flow Channel Model (FCM) was the first model of Flow to be developed by Csikszentmihalyi (1975). *Figure 2-6* is an aggregation of nine derivations of the FCM.

Figure 2-6: Flow Channel Model
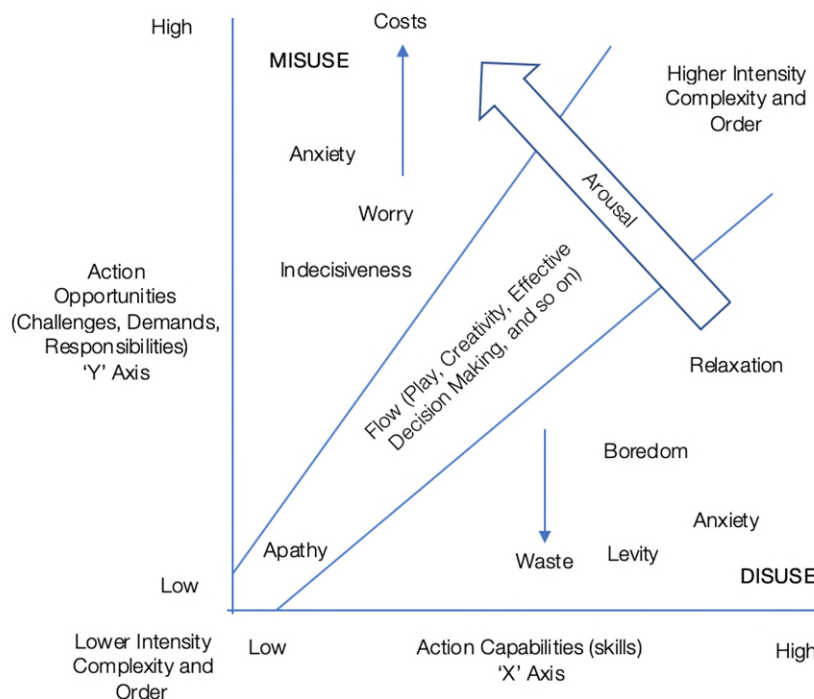
Aggregation of FC models' (Csikszentmihalyi 1975, 1988, 2003; Dodge et al. 2012; Fullagar, Knight, and Sovern 2013; Moneta 2012; Nakamura and Csikszentmihalyi 2009; Peifer et al. 2014; Stamp 1989)

Since its development in the mid-1970s, the FCM (*Figure 2-6*) has been in continual use as a simple but effective way of depicting the emergent phenomenology of a person's interaction with their environment viewed through the operational lens of Flow theory (for example see Navarro et al. (2019) use of the original FCM of Csikszentmihalyi (1975)).

The Cartesian space of the FCM is divided into three contiguous spaces that represent three thematically different and distinct experiences. The flow channel bisects the upper and lower spaces. For ease of analysis, Preedy's (2013) designation for the upper and lower spaces will be utilised:

1. Action opportunities high and actions capabilities low is labelled misuse.

2. Action opportunities low and action capabilities high is labelled disuse.

Aggregating all of the FCM models depicted in *Figure 2-6* produces a model that depicts a landscape of experience in the form of interrelated spaces (labelled Disuse, Misuse and Flow) populated with various experiential states and behaviours. By aggregating the models, anxiety is shown as a shared feeling state linking misuse and disuse. These spaces are delineated by complex and interactive thresholds as a consequence of an individual's metacognitive skills and their relationship with their immediate environment.

When considering the spaces labelled disuse and misuse, the aggregation of terms 'boredom, worry, levity, indecisiveness, waste and cost' cause these spaces to severely diverge in their qualitative analysis in terms of feeling states and behaviours relative to action capabilities and action opportunities. This analysis aligns a tertiary qualitative description of misuse and disuse with the model's normative description regarding the relationship between action opportunities and action capabilities.

A prominent feature of *Figure 2-6* is the arrow of arousal passing through the flow channel (Peifer et al. 2014). This feature is not apparent in other FCMs. Importantly, the relationship between flow and other feeling states is not a new idea. For example, Delle Fava, Massimini and Bassi (2011:74) write that arousal "presents the best experiential profile after optimal experience", and

Csikszentmihalyi (1975:127–28) provides two examples of surgeons recounting their experiences of being in flow and how relaxing they find the experience – indicating a positive correlation between flow and relaxation and not a negative one as depicted in *Figure 2-6*. Peifer et al. (2014) hypothesised in their empirical research that flow occurred between high levels of arousal characteristic of anxiety and low levels of arousal characteristic of relaxation. This analysis suggests a link exists between various levels of arousal flow and relaxation. When flow and arousal are taken in conjunction with play, creativity and good decision-making, there is an implication that more is going on than any single FCM suggests and that other positive states exist and that correlational relationships exist between states over and above flow.

This aggregation of FC models is merely an extension of Csikszentmihalyi's (1975) model. The original FCM did depict an upper space of two feeling states (worry and anxiety) and a lower space of two feeling states (boredom and anxiety). The aggregated model in *Figure 2-6* has added to the FC model's narrative with additional detail from other flow researchers' findings. By populating the FCM's topological landscape with greater detail, adding more feeling states, behaviours and outcomes, *Figure 2-6* depicts a model with what can be described as state spaces (spaces filled with states). This aggregation of FCMs and the emergent themes generates questions concerning what exactly does the FCM depict?

Moreover, the X-axis is labelled 'Action Capabilities (skills)' – what is meant by this label? While skills can be regarded as an individual's ability to carry out a known or given task. Action Capabilities imply metacognitive skills such as curiosity, cognitive flexibility and persistence (Asakawa 2004; Flavell 1979; Wilson and Moneta 2016), enabling an individual to be curious, structure activities and work with limited information (see *Chapter 4, Section 4.2.2*).

2.3.2 Models Depicting Subjective Experience

Chronologically, the FCM was followed by the development of the Quadrant Model (QM). The QM was developed in response to the limitations of the FCM. The theoretical breakthrough came from a team led by Massimini. They reasoned that flow occurred when the action opportunities present in the environment and the person's action capabilities were above a specific limit and in balance. When action opportunities and action capabilities are below some threshold, that person will not experience flow (Csikszentmihalyi and Csikszentmilhalyi 1988). This new flow model divided the Cartesian space of action opportunities and action capabilities into four distinct spaces representing a person's experiential states of anxiety, flow, boredom and apathy.

Since its development, the QM has undergone various forms of empirical testing. The results generally show that the model does not always perform well in explaining the flow construct. This finding has been replicated by Lambert, Chapman and Lurie (2013). Their study of college students found people's affective experiential states of enjoyment and happiness and their intrinsic motivational state with their experiences characteristic of activities associated with being in control rather than flow. In contrast, Hollenhorst and Perna (2003:29) reported that in the context of adventure sport, "…explanatory power of the flow model in this white-water river setting was higher than that reported in the majority of flow studies".

Comparing these two studies makes a distinction apparent – the importance of context and how context can influence subjective experience (see Guo and Pool's complexity model above). One of the studies, Hollenhorst and Perna (2003), viewed subjective experience through a lens of adventure sport. The other study, Lambert, Chapman and Lurie (2013), investigated subjective experience in an educational setting. When comparing these two studies and the explanatory power of the QM, it would appear that context becomes an essential variable in the way it influences a person's subjective experience. The difference between these two activities does not reside in their outward appearance but the personal discretion that an individual has in engaging in the activity. White-water rafting

and high-altitude mountaineering (Delle Fave et al. 2003) share a pervasive theme; individuals take part in the activity simply because they want to, demonstrating a person's total discretion over participation. People's ability to choose what they want to do is not necessarily the same for college students or employees (Fullagar et al. 2017; Navarro et al. 2019). Working and educational activities are structured in a very different way compared to how leisure activities are structured. As Taleb (2018:29) says, work and the division of labour are organised so that "labour is separated from the fruits of labour", a theme echoed by Marx. Educational settings are structured in the same way work is structured (Csikszentmihalyi 2003; Robinson 2014). Instead of quotas to be reached or deadlines met, educational settings are populated with intended learning outcomes, homework deadlines and assessment criteria. Does this potentially separate learning from the joys of learning and limit the individual's ability to utilise personal discretion?

In many ways, the Experience Fluctuation Model (EFM) *Figure 2-7* is a higher resolution depiction of the QM. Its development was the product of the belief that the balance between action opportunities and action capabilities "… at any one time is predictive of an even wider range of human emotion" (Massimini et al. 1987:545).

Figure 2-7: Experience Fluctuation Model
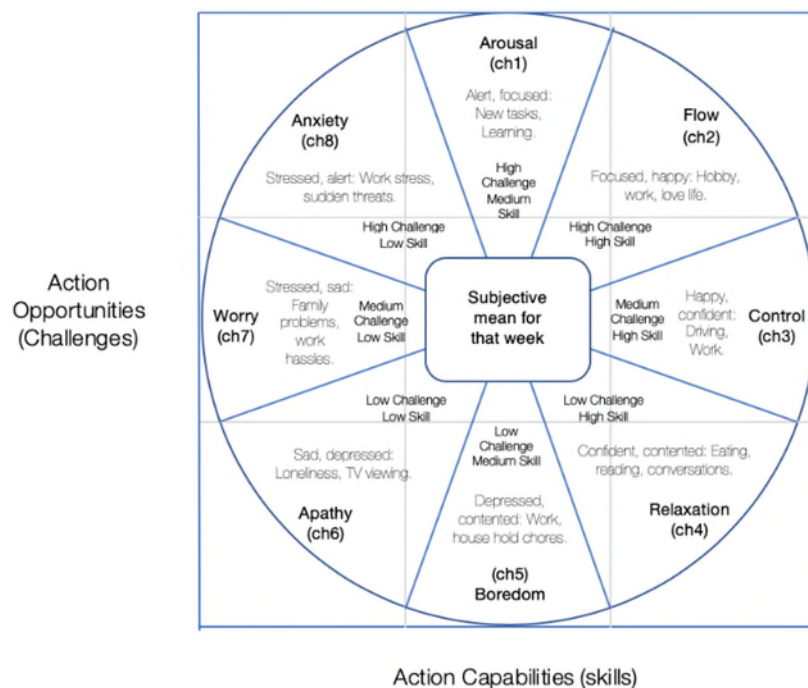
Aggregation of EF models' (Bassi et al. 2007; Csikszentmihalyi 2003; Delle Fave and Massimini 2005; Massimini and Carli 1988; Massimini et al. 1987)

The EFM (*Figure 2-7*) is constructed in many circumstances in a square; this is a less traditional representation of a Cartesian space. In just the same way that action opportunities and action capabilities bound the FCM, so too is the EFM. The EFM is constructed by dividing each axis into low, medium and high. Each state is then a product of low, medium or high action opportunities and low, medium or high action capabilities. For example, apathy is depicted as a product of low challenges and low capabilities; flow is a product of high challenges and high capabilities. Therefore, the relationship between challenges and capabilities is absolute. The ratio between the axes always predicts the individual's subjective experience in terms of experiential states to low, medium or high action opportunities and low, medium or high action capabilities. This absolute relationship contrasts the ratio of the FCM, which can be regarded as a relative scale. An important aspect to note about the EFM is that medium challenge and medium capability have no associated experiential state. So, what do people feel

when they experience a medium challenge in relation to medium capability? This particular but surely common relationship between challenge and capability is unanswered by the EFM.

By aggregating the model in *Figure 2-7*, as has been done in *Figure 2-6*, it becomes possible to see:

1. The experiential states are relative to challenges and capabilities (Flow, control, arousal etc.).

2. Affective states (happy-sad; stressed-content) relative to challenges and capabilities.

3. Associated activities and their corresponding feeling states (hobbies - Flow; TV watching - apathy).

The aggregation that results in *Figure 2-7* adds to Massimini, Csikszentmihalyi and Carli's intention of representing a more comprehensive range of human experience. Each segment of the model is divided into channels, i.e., ch1, ch2 to ch8. As opposed to the four channels of the QM. *Figure 2-7* provides a finer operationalisation of action opportunities and action capabilities compared to the QM generating a superior resolution within the Cartesian space with a broader range of experiential states, affective states and activities.

2.3.3 Discontinuity and Non-linearity in Modelling Flow

By depicting models in a two-dimensional Cartesian space (as depicted above), limits are placed on what can be depicted. Models depicted in graphical form can provide an intuitive idea of some of the main features of a function but can be misleading. Especially if the interconnections between the elements of the system are not fully understood or expressed. As Meadows and Wright (2008:16) explain, "if the interconnections change, the system may become greatly altered. It may even become unrecognisable". For example, what if people want the same performance but radically change the context from rafting in white water to working on some abstract task in an office? The implication from the studies above does not suggest that performance will be significantly altered. What will

be altered is people's subjective experience concerning those tasks, particularly if the task has been organised by a division of labour that takes no account of the people's knowledge, experience, skills or interests when carrying out the task.

Thom (1972:2) identified that "…the same local situation can give birth to apparently different outcomes under the influence of unknown or unobservable factors" (this links directly to Guo and Pool above in *Figure 2-5*). To this end, Thom developed a systematic method of modelling that facilitated an explanation of changing states instead of predicting when states will change. Ceja and Navarro (2012, 2017) have utilised this method of modelling flow building on the work of Guastello (1987) and Guastello, Johnson and Rieke (1999), producing a non-Linear Discontinuity Model of Flow (nLDMF) *Figure 2-8*.

Figure 2-8: Non-Linear Discontinuity Model of Flow
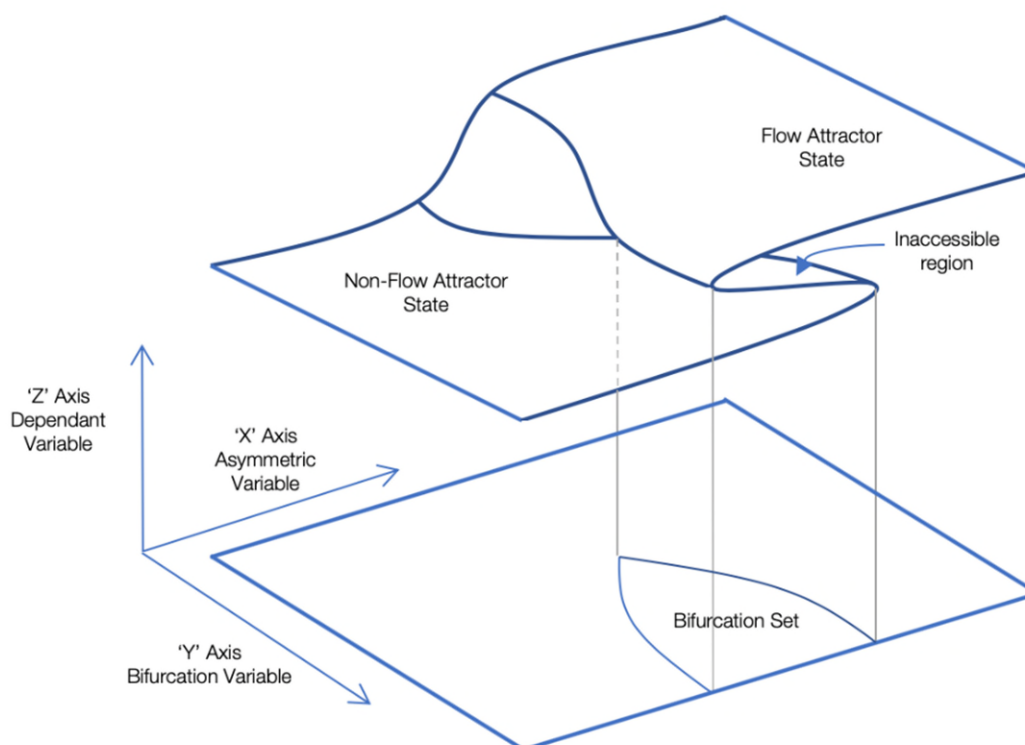
Ceja and Navarro's cusp catastrophe model of Flow (*Figure 2-8*) indicates two behaviours whereby people "move into and out of flow, from a non-flow state of consciousness" (Ceja and Navarro 2012:1108). This complex dynamical system depicts two attractor states of flow and non-flow. The first state is flow

characterised by intrinsically motivating activities that combine some or all of the characteristics outlined above. This attractor state of flow links all of the models as mentioned earlier. The second non-flow state of experience is where these characteristics are not realised.

This dynamic non-linear discontinuous model of flow with two distinct conscious states, flow and non-flow, presents a more complete and potentially realistic picture of flow. Whereby the variables associated with flow are no longer absolute as in the QM and EFM but are independent of each other. Each variable simultaneously and independently influences a particular function in the change process. In *Figure 2-8*, the 'X-axis is a bifurcation variable. The 'Y-axis is an asymmetric variable, and the 'Z-axis is the dependent variable representing a person's subjective experience – flow or non-flow. The three-dimensional surface represents all points of the control parameters 'X' and 'Y' (a direct product *Equation 2-1*).

Adapted from Zeeman (1976), the equation is a descriptive mathematical representation (model) of the nLDMF. Essentially, *Figure 2-8* is a 3-dimensional pictorial representation of all possible points of the coefficients (a, b, c), 'ax' represents capability, 'bx' represents challenge, and 'cx' represents personal bias.

Equation 2-1: Non-Linear Cusp Equation.

$$\mathbf{y} = \frac{1}{4}\mathbf{a}x^4 - \frac{1}{2}bx^2 - c\mathbf{x}$$

When the surface of *Figure 2-8* is folded back over itself, three surfaces are created: the lower attractor surface, the upper attractor surface and a surface that is in mathematical terms imaginary and therefore inaccessible. This fold in the surface forms the bifurcation set, depicted in *Figure 2-8*. The bifurcation set represents a region where two alternative states are equally possible, given the combination of variables (challenges and capabilities). In the bifurcation region, the dependant variable can jump from one attractor to another when the cusp line is crossed.

This approach of Ceja and Navarro resides in contrast to more traditional forms of flow research where the models are linear, the control variable is held constant, and the independent variable is manipulated. This concept of variables leads to the perception that relationships are purely linear. Those variables can simply be added together, or in more sophisticated relationships, a multiplicative moderator can be used (Guastello 1987). The importance of the cusp approach to modelling flow does not reside in the model's predictive ability – indeed, that is not the model's function. What this does is provide new insight into the way people experience action opportunities and how action opportunities may radically or adversely affect the feeling states of individuals.

While this appears to be a more realistic depiction of flow, is it does not align with the original flow model in *Figure 2-6*. For example, do people have just two different psychological states of flow, that of flow and non-flow? Comparing this to the original flow model of Csikszentmihalyi (1975), a model derived from purely qualitative empirical data shows that three thematically distinct and different spaces exist within the Cartesian space of skills and challenge. What is not clear from Csikszentmihalyi's model is the interaction and relationships between the three distinct spaces.

2.4 Evaluation of Flow Models

As Moneta (2012:47) writes, "… a gold standard for the modelling […] of flow is not at close reach". This assessment is corroborated and enhanced by empirical studies that suggest that current models fail to capture and express people's subjective experiences. Flow has been shown to exist simultaneously as both state and trait (Moneta 2012; Xanthopoulou 2017; Xanthopoulou, Bakker, and Ilies 2012). Subjective experience is exceptionally dynamic under certain conditions to the extent that it has been shown to exhibit all of the properties associated with and non-linear dynamical system (Ceja and Navarro 2012, 2017; Guastello et al. 1999). The skills challenge ratio is an important antecedent of flow but cannot be taken for granted because several studies have shown flow to occur when capability exceeds challenge (Engeser and Rheinberg 2008; Fong,

70

Zaleski, and Leach 2015; Fullagar et al. 2013). Furthermore, high levels of flow have been shown to ensue with medium levels of arousal (Peifer et al. 2014).

Importantly, what each of these models does as it pertains to this PhD study is to provide multiple lenses through which to view and deepen our appreciation of all of the related variables and characteristics that contribute to and constitute flow theory. While each of these models has deficiencies and limitations due to any model's limitations, models are simplifications of a real-world phenomenon. *Table 2-2* demonstrates the perspective that each flow model depicts in relation to flow theory and each other.

Table 2-2: Aggregation of Flow models and Characteristics

	Jackson-Marsh Model(s)	Quinn Model of Flow	Flow Engine Framework	Complexity Model of Flow	FCM	EFM	nLDMF
Characteristics (9)	Y	Y	Y	Y			
Psychological Traits	Y						
Experiential States	Y	Y			Y	Y	Y
Order of Characteristics states		Y	Y	Y		Y	
Dynamic			Y		Y		Y
Challenges					Y	Y	Y
Capabilities					Y	Y	Y
Person and Environment				Y	Y	Y	Y

The componential models of flow (Marsh and Jackson 1999) present flow as a multidimensional phenomenon. Depending on how it is structured, it can depict flow as an affective feeling state or psychological trait. This way of modelling flow provides insight into what sorts of things may be occurring within the flow channel of the FCM and the flow segment of the EFM. It also provides insight into what

may be occurring in the nLDMF on the upper flow plane of the Z-axis. The Quinn model and the flow engine framework provide insight into what order to look for specific characteristics. For example, it may be pertinent for the environment to be aligned to a particular individual's knowledge, experience, skill and interests in terms of antecedents. Once this has been achieved, it is then possible to look for the indicators of flow. Only then can the outcomes of flow occur.

The FCM and the EFM share the same axis but present differing depictions of flow. The FCM comprise three distinct spaces populated with states delineated by complex and interactive thresholds as a consequence of an individual's metacognitive skills and their relationship with their immediate environment. The EFM is a state flow model depicting peoples' experiential states, affective states, and associated activities; however, this is only a partial representation. The model's utility is enhanced when paired with descriptions of the feeling states listed in *Appendix B*. What the aggregation of the FCM (*Figure 2-6*) shows is the thematic symmetry that it shares with the EFM (*Figure 2-7*). Essentially, some of the feeling states in the EFM are duplicated in the FCM. What the EFM fails to depict are the thresholds of disuse and misuse.

Furthermore, comparing the states within and between the FCM and EFM are the similarities that exist between some of the experiential states. Typically, research focuses on flow and the positive outcomes of flow on people's self-worth and well-being; however, in their research with quadrant model Lambert, Chapman and Lurie (2013) report how the state of control produces feelings of happiness and enjoyment. These outcomes are typically associated with being in flow. Also, Delle Fava, Massimini and Bassi (2011) have reported that arousal presents the closest descriptive and affective profile to the flow state of any other affective states in the EFM. Moreover, Csikszentmihalyi (1975:127–28) describes two instances of people reporting being relaxed and directly linking relaxation with flow. So, what else is going on in people's experience of being challenged that is not being captured or represented in these models of flow?

Another insight provided by comparing the models is the dynamic behaviour of flow. The FCM clearly depicts an upper and lower boundary of flow, where people's experiences in those spaces are vastly different from an individual in flow. What these boundaries imply is discontinuity. Where transitions between the boundaries are distinct but linear, implying predictability. Indeed, researchers discuss the possibility of predicting flow (Šimleša et al. 2018; Wilson and Moneta 2016). However, the nLDMF (*Figure 2-8*) depicts a very different view of flow dynamics. When an individual is experiencing a level of challenge in relation to their knowledge, experience and skills that places them within the bifurcation set of the nLDMF, they can indiscriminately and quite randomly shift between flow and non-flow for no discernible reason. This characterisation of psychological change is the antithesis of predictability and is non-deterministic. A critical element of flow that none of the other models in this review can capture or express.

Additionally, the complexity model (Guo and Poole 2009) distinctly demonstrates how a person's flow experience is affected by other influences beyond the preconditions of flow. This finding is problematic because none of the flow measures addresses this problem, see Chapter 4. This finding indicates that environmental influences and their effect on an individual's subjective experience of challenging environments require further research.

Finally, when directly comparing the componential models and the operational models of flow, it can be seen that they are complementary. The componential models investigate what occurs in either the flow channel of the FCM, the flow segments of the EFM or the upper plain of the nLDMF (flow state). This breakdown of flow models is helpful because it facilitates an analysis of flow that is presented in three very different ways. However, the componential models do not provide information on what is happening anywhere else in the models. Neither do the componential models provide information about how people transition between states. There is very little information about how this occurs or what some of the paths may be in state-to-state transitions.

2.5 Conclusions

This analysis shows that none of the current models of flow can depict flow from all the various perspectives covered in the literature review of flow models. Ideally, what is needed is to synthesise all the various elements that the models in this review depict. Therefore, the question that this literature review posits:

- *Is it possible to synthesise a new model of experience that captures all of the various elements of flow theory?*

2.6 Chapter Summary

This chapter addressed objective 1a and began by differentiating the models of flow into two distinct types componential and operation. Firstly, the componential models were reviewed. The review showed that the componential models are structured in various ways to generate the phenomenon of flow—these structures tend to follow the antecedent, indicators and consequences format. However, the models themselves show there is disagreement between the various flow researchers regarding the exact way that flow is generated. What is agreed upon is the inclusion of all flow components. However, one caveat to this arises in Guo and Pool's (2009) complexity model of flow. This model depicts the environment as a complex element influencing a person's ability to experience flow. A feature that does not appear in any of the other componential models of flow. Importantly, this model directly links the componential models of flow and the operational models of flow; all the operational models of flow depict the person-environment interaction within their structure.

An evaluation of the models showed that while there is disagreement between researchers regarding how flow is structured, there is significant agreement about the elements that constitute flow. These elements need to be synthesised as no model of flow currently represents all these elements (as reflected in the research question above).

Therefore, the central theme of Chapter 3 will be the research question stated above. Chapter 3 will present the design and development process of an entirely new synthesised model of experience.

Chapter Three

Development of New Synthesised Model of Flow and System of Simultaneous Boolean Equations

To unfold the secret laws and relations of those high faculties of thought, by which all beyond the merely perceptive knowledge of the world and of ourselves is attained or matured, is an object which does not stand in need of commendation to a rational mind.

George Boole 'An Investigation of the Laws of Thought' 1854 p3

3 Introduction – Developing a New Model of Experience

This chapter follows directly from the literature review – modelling flow (Chapter 2). It is the second of four theoretical chapters locating this doctoral research project within the theoretical landscape of flow theory and research. This chapter focuses exclusively on designing and developing a New Synthesised Model of Experience and a corresponding Relational System of Simultaneous Boolean Equations with the intention of realising objective two (*Table 1-1*).

This chapter seeks to answer the question that concluded Chapter 2:

- *Is it possible to synthesise a new model of experience that captures all of the various elements of flow theory?*

Firstly, the characteristics of flow, descriptions of flow, and descriptions of experiential states were gathered from across the literature on flow and are treated as data. Regardless of whether those descriptions originate from the componential perspective of modelling or the operational perspective of modelling.

Secondly, any differing examples of the FCM and EFM were collected. The collation process was carried out as the literature review in the previous chapter (Chapter 2) identified that the FCM and the EFM presented the flow landscape from multiple perspectives and offered the best opportunity for synthesis.

This chapter begins with a detailed description of the design process and the methods selected and used to synthesise the new model of experience and the project's overall structure. Next, the results of each element of the design process are systematically presented, showing how each set of findings feeds into and informs the next part of the study. Finally, the new synthesised model of experience is discussed in its entirety and is then evaluated against the contemporary models of flow, demonstrating the contribution to knowledge made by this PhD thesis and the new synthesised model of experience. This chapter concludes with a summary of findings that feed into Chapters 4, 5 and 6.

3.1 Design and Methods

The first task in developing a new experience model was to gather as much data as possible about the EFM, FCM and descriptions of the various states. Firstly, multiple depictions of the EFM and the FCM were gathered. Secondly, an array of descriptions of experiential states from within the EFM and FCM were gathered. To prioritise and filter the information, each of these depictions and descriptions was organised into three distinct data sets:

1. Data set 1 is derived from the EFM (Chapter 2, *Section 2.3.2, Figure 2-7*). In total, four variations of the model were identified. In 3 of the depictions, the eight channels are encapsulated within a Cartesian space of skills and challenges. The only model not depicted within a challenge skills Cartesian space is the original EFM of Massimini, Csikszentmihalyi and Carli (1987). This data formed the foundation for identifying the descriptions of feeling states in data set 2.

2. Data set 2 comprised descriptions of the channels (feeling states) within the EFM and the FCM. In total, 29 descriptions were sourced from the literature. Eighteen of these descriptions were drawn from the literature on flow; eleven were taken from psychology's broader literature (*Appendix B*). Drawing on the broader psychological literature was necessary because there is a discrepancy in the distribution of studies investigating the feeling states. Only four major channels have been extensively studied (Delle-Fave et al. 2011). Also, the characteristics of flow were included in this data set as they directly contribute to the descriptions of flow.

3. Data set 3 was derived from the FCM. Nine similar yet distinct model depictions were identified (Chapter 2, *Section 2.3.1, Figure 2-6*).

Figure 3-1 depicts the design and structure of the multi-method approach used in this study.

Figure 3-1: Project Design and Structure
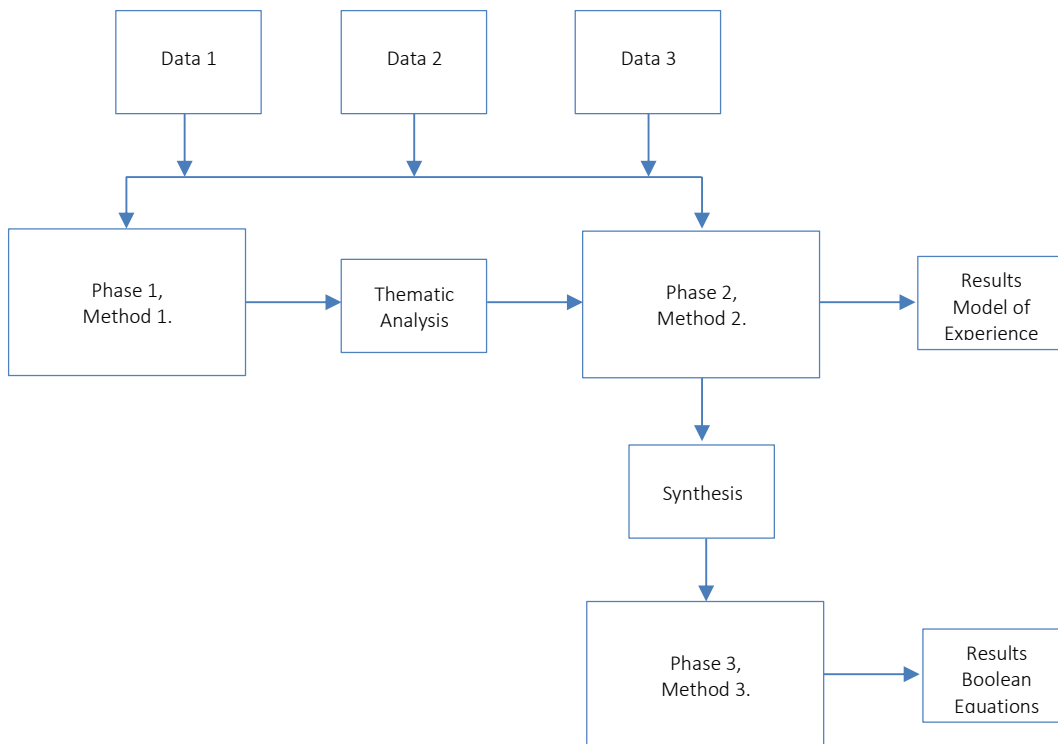
The project was divided into three phases. The first phase was designed to enhance understanding of the FCM, identify the latent characteristics of disuse, misuse and flow, and extend the project's understanding beyond the superficial aggregation of the FCM in Chapter 2. The second phase was then designed to take the first study's findings and combine them with the data to see if it was possible to synthesise the FCM with the EFM. A third phase was then conducted to identify and extract the Boolean state-to-state mathematical relationships. To achieve these three studies, it became imperative to identify and utilise three explicit and complementary methods appropriate for each study:

1. Method 1: a thematic analysis (Boyatzis 1998). This method combined data sets 1 & 2 with data set 3 to identify latent themes in the discontinuous spaces of the FCM, *Figure 2-6*, Chapter 2.

2. Method 2: a systematic synthesis of the findings from the thematic analysis of study 1, the combination of data sets 1 & 2 and 3. A truth-table method was applied to synthesise the finding of the thematic analysis (method 1) with the data sets. This synthesis method is derived from a general system of mathematical logic (Gibson and Isaac 1978; Jaques 1978).

3. Method 3: applying an ordinal binary code to each of the channels in the truth table and then utilising Karnaugh maps to identify the mathematical relationships between the state-to-state transitions of the truth table (Karnaugh 1953).

The author primarily conducted the data analysis of all studies in collaboration with the primary and secondary doctoral supervisors (Jeremy Hilton and Dr Lorraine Dodd). Both supervisors reviewed the data, the coding process and the data coding by reading and discussing the data for the duration of both studies. This collaborative approach was adopted to achieve a consistency of coding (Boyatzis 1998). The author identified, collected, and organised all 3 data sets and identified and chose all the analysis and synthesis methods.

3.2 Method 1: Thematic Analysis

The first study aimed to develop a detailed qualitative description of the three spaces in the FCM depicted in *Figure 2-6*, Chapter 2. This thematic analysis was achieved by developing two tables. The first table represented disuse and misuse and their associated experiential states from the 9 FCM's. The second table represented the flow channel of the FCM and its associated feeling states. Taken together, each of these tables represents the aggregated structure of the FCM *Figure 2-6*. By structuring and representing the data in this way, it became possible to apply a deductive thematic analysis (Boyatzis 1998) and identify themes across each of the three trait spaces in the FCM.

Identifying the first study themes relied on structuring and interlacing data set 2 and data set 3. These two data sets were used to create a descriptive, qualitative structure that reflected the three spaces of the FCM (disuse, misuse and flow). These spaces within the tables were populated with descriptions of the feeling states found across all 9 FCMs. Structuring and interlacing the data facilitated the identification of specific patterns in the data, rendering manifest a hitherto latent list of characteristics that describe the lower and upper spaces of the Flow Channel Model.

The first table depicted a partial structure of FCM. The table was essentially designed to tabulate the spaces of disuse and misuse found in the FCM in relation to the six feeling states identified in the nine depictions of the FCM. The table comprised three columns and six rows. Column 1 of the table presents all the experiential states in disuse and misuse spaces within the FCM *Figure 2-6*: anxiety, worry, boredom, relaxation, arousal and apathy. Column 2 of the table represents the various descriptions of the feeling states associated with disuse: anxiety, boredom and relaxation. Column 3 of the table represents the various descriptions of the feeling states associated with misuse: anxiety, worry, and arousal. For a theme to be identified, it had to appear in 2 of the descriptions of the experiential states. The aim of constructing these tables was to identify the descriptive characteristics of disuse and misuse.

The second table developed represented the flow channel of the FCM. The table comprised four columns and one row. Column 1 contained descriptions of the flow channel and the six characteristics of flow (Nakamura and Csikszentmihalyi 2009). The subsequent four columns represented descriptions of arousal, flow, control and relaxation. These experiential states were identified because their descriptions in data set two identified themes in the experiential states' descriptions that correlated to descriptions and characteristics of column 1. For an experiential state to be included as a theme in the table, the experiential state's descriptions had to correspond with descriptions and characteristics of column 1. The aim was to identify experiential states that correspond with the flow channel.

The three *Tables 3-1, 3-2* and 3-3 below presented in the analysis of phase 1 in the section below tabulate the themes identified from the two structured analytical tables described directly above.

3.3 Method 2: Truth Table Synthesis

Method 2 utilises the analysis of phase 1 to hypothesise that the experiential states of the EFM reappear in a more complex context depicted within the spaces of the FCM. Implying that there are multiple experiential states within the spaces of the FCM.

Gibson and Isaac's method uses five levels of abstraction to facilitate a complete analysis of the data (Jaques 1978). Level 1 identifies objects that can either be accepted or rejected: YES or NO; level 2 introduces basic truth tables; level 3 extends the truth tables to identify conjunctions between set elements such that the truth table takes on the quality of a system; in level 4, the table columns become sets, and the relationship is no longer between the elements of the table, but between the columns themselves, enabling the generalised principles to be extrapolated; in level 5, the analysis becomes that of relations between the columns – a relation between the general and the specific or in the case of this analysis between the discontinuous spaces of the FCM (column) experiential state (element).

The thematic analysis of phase 1 facilitated the identification of latent themes within the discontinuous spaces of the FCM. This encoding was achieved by discriminating each element of the FCM and the EFM. Whereby, the rows of the truth table, *Table 3-4*, represent each of the eight channels (experiential states) of the EFM, and the columns of the truth table represent each of the three discontinuous spaces of the FCM.

Structuring the data within the truth table enables the identification of conjunctions or implicit dualities, rendering manifest those relational statements between the items within the columns of the truth table. The conjunctions between the truth table columns are arranged such that the truth table "takes on the quality of a system of items occurring in a unidirectional series from which

extrapolations can be made" (Jaques 1978:pull out). The aim was to identify relations between the column set, thereby generating an interrelated, coherent system of psychological traits and feeling states that can be rendered explicit.

3.4 Method 3: Binary Encoding and Mapping

Phase 3 was dependent on the truth table in phase 2. Phase 3 aimed to identify the Boolean mathematical relationships between each of the various states and traits in the truth table (*Table 3-5*). This portion of the study required a two-part process.

The first part of the process necessitated encoding each channel (arousal, flow, control, etc.) with an ordinal binary code. Specifically, a binary grey code facilitated an ordering of the channels into a binary numerical system. Each successive code in the sequence only ever differs by one binary digit (Lucal 1959). The benefit of this form of coding resides in the codes ability to loop and not break the sequence of the code differing by one binary digit.

The second part of the process necessitated the development of Karnaugh maps (*Figure 3-2*). Karnaugh maps were developed by the American physicist and mathematician Maurice Karnaugh (1953). The maps diagrammatically depict the set relationships between the cells of a truth table. Karnaugh maps take advantage of people's pattern recognition abilities to extract Boolean expressions from the maps. Karnaugh maps negate the need for any complicated mathematical simplifications. However, this does not remove the need for a complex and detailed analysis once the equations have been identified.

From the Karnaugh maps, it was then possible to develop a system of Boolean logical simultaneous equations. Boolean algebra can be expressed in any number of canonical (established) forms. For this study, the Blake canonical form was utilised. This form represents the complete sum of prime implicants in a Karnaugh map. It represents a 'disjunctive normal form' (DNF) of the complete sum of 'prime implicants' (a person's subjective states) derived from the truth table in *Table 3-5*. A DNF is a standardisation of a logical formula which is a disjunction of conjunctive clauses.

This format is seen in *Equations 3-1* below as a sum of products or as an 'OR of ANDs'. The 'OR' is the disjunctive feature, and the 'AND' is the conjunctive feature of the equation. In philosophical logic, this is known as a cluster concept. These cluster concepts enable a complementary perspective to be developed between the state-to-state transitions of a person's subjective experiences – what it is like to be *that* person, in *that* situation, engaged in *that* activity, at *that* time.

3.5 Analysis

3.5.1 Phase 1: Identification of Latent Themes (Variables)

3.5.1.1 Themes (variables) of Disuse in the FCM

The final patterns identified describing the lower space of disuse were:

- Pattern 1: inability to exert personal control or choice (the self is exposed to an unpleasant experience) where the individual experiences an acute awareness of self.
- Pattern 2 the experience is neither intrinsically nor extrinsically motivating – where concentration lapses are the product of an un-stimulating environment.

Table 3-1: Themes in Disuse

Feeling State Themes in Disuse (characteristics)

Feeling states	Theme (identified)	Pattern (describing disuse)
Boredom (ch5) Anxiety (ch8)	craving relief not feel able to cope with the situation	Inability to exert personal control or choice (the self is exposed to unpleasant experience) an awareness of self
Relaxation (ch4) Boredom (ch5) Apathy (ch6) Anxiety (ch8)	concentration lapses lack of stimulation low values of motivational components Difficulty in concentrating or mind going blank	The situation is not intrinsically or extrinsically motivating

83

Pattern 1: Control or influence (lack of). Control and an individual's ability to exact control are present across data set 2, both at the manifest and latent levels. Indeed, control (ch3) is identified as one of the EFM's main channels. The latent pattern of control identified within this structure corresponds to a lack of control or the individual's inability to exert influence over their task or environment. This theme is formed from the alignment of boredom (ch5) and anxiety (ch6). Where the descriptions "craving relief" (Koerth-Baker 2016:1) and "not feel able to cope with the situation" (Delle-Fave et al. 2011:74–75) imply an individual's inability to remove themselves from a situation. This inability is also conditional with choice, the ability, or more importantly, inability, of the individual to choose to remove themselves from a situation or select a more acceptable situation.

Pattern 2: Motivation (lack of stimulation). Motivation appears across data set 2 at the manifest and latent levels. The structure that reveals this latent pattern is realised by aligning relaxation (ch4), boredom (ch5), anxiety (ch6) and apathy (ch8) with their corresponding descriptions. At this level, motivation correlates to environments or situations that lack the requisite levels of personal stimulation. The descriptions from data set 1, "concentration lapses" (Massimini and Carli 1988:273), "a lack of stimulation" (Koerth-Baker 2016:1) and "difficulty in concentrating or mind going blank" (American Psychiatric Association 2013:222), "low values of the cognitive, emotional, and motivational components" (Delle-Fave et al. 2011:74), demonstrate a link between a lack of stimulation and low levels of cognitive and emotional motivation.

When combined, pattern one and pattern two (as a product of structuring the data) generate a new descriptive perspective of the Flow channel model's lower space (disuse). A space that is no longer limited to a one-dimensional description correlated to the low levels of challenge experienced by an individual.

The disuse space can be appreciated descriptively: a task, activity or situation that lacks stimulation, producing inanition with cognitive and emotional stagnation. The individual lacks the ability to choose and exert control over their own destiny to create the desired outcome.

Disuse can be simply characterised as:

1. The inability to control or influence one's immediate environment.

2. Low motivational states of being that influence personal affective states.

3.5.1.2 Themes (variables) of Misuse in the FCM

The final patterns identified describing the upper space were:

-   Pattern 3: being out of control (the self is exposed to threats and dangers) an awareness of self.
-   Pattern 4: the situation loses any motivational qualities, either intrinsic or extrinsic.
-   Pattern 5: misalignment of the situation and individual recourses (an individual is limited to a single way to deal with situation and environment is overwhelming – pressure (Weisinger and Pawliw-Fry 2015)).

Table 3-2: Themes in Misuse

Feeling State Themes in Misuse (characteristics)

Feeling states	Theme (identified)	Pattern (describing misuse)
Anxiety (ch8) Worry (ch7)	lack of control uncontrollable	Being out of control (the self is exposed to threats and dangers) an awareness of self
Anxiety (ch8) Apathy (ch6)	low intrinsic motivation low values of motivational components	The situation is not intrinsically or extrinsically motivating
Arousal (ch1) Anxiety (ch8)	reduces utilisation of cues high concentration but a difficulty in concentrating Difficulty in concentrating or mind going blank	Misalignment of the situation and individual recourses

Pattern 3: Control (thoughts out of). As previously stated, control occurs across data set 2 at the manifest and latent levels. The relationship to control that is rendered manifest through linking anxiety (ch6) and worry (ch7) is being out of control. This out-of-control-ness is produced from "lack of control" (Massimini and

Carli 1988:273) and "… difficulty controlling" (Borkovec 2002:76). This lack of or difficulty in control corresponds to difficulty or inability to control one's own thoughts, rather than to lack of control over the activity

Pattern 4: Motivation (lack of). Motivation appears across data set 2 at the manifest and latent levels. The structure that reveals this latent pattern is realised by aligning anxiety (ch6) and apathy (ch8) with their corresponding descriptions. The un/non-motivating situation is produced from "…low intrinsic motivation" and "…low values […] motivational components" (Delle-Fave et al. 2011:74). This analysis indicates a person being held or anchored to an environment or situation, void of the will to get or move away.

Pattern 5: Options (lack of). This pattern corresponds to the distinction between stress and pressure (Weisinger and Pawliw-Fry 2015) predicated on the availability of options and alternatives or 'ways' (Smith 2007). In a pressure situation, the individual feels that there is only 'one way' to respond to the requirement: that is, the task must be completed correctly – or else. The structure that reveals this latent pattern is realised by aligning arousal (ch1) and anxiety (ch6). This lack of options is revealed by "…reduces utilisation of cues" (Easterbrook 1959:183) and "..high concentration […] but difficulty in concentrating" (Massimini and Carli 1988:273) and "difficulty in concentrating or mind going blank" (American Psychiatric Association 2013:222). The reduction of useable cues and the need to concentrate but limited or reduced cognitive recourses impinges on a person's ability to identify other options or courses of action.

When combined, patterns 3, 4 and 5 generate a new description of the upper space of the FCM. A space that is no longer limited to a description in terms of an action opportunities and action capabilities ratio.

The misuse space can now be qualitatively described: a task, activity or environment that is overwhelming, impinging on a person's ability to manage and control their own thoughts. The person becomes locked into a single course of action because cognitive processes are already over-taxed, limiting the

motivational states isolating the individual from the immediacy of their environment.

Misuse can be characterised as:

1. Lack of control, specifically thoughts, are challenging to control. Generally, the environment is challenging to control.

2. Little or no motivation, feelings of isolation, influencing positive affective states.

3. It is challenging to see or appreciate other options.

3.5.1.3 Feeling State Themes (variables) in Flow Channel of FCM

The patterns identified describing the flow channel were:

- Pattern 6: resonance occurs between the person and the activity
- Pattern 7: the individual and activity forming a coherent whole
- Pattern 8: a positive restorative state requiring little effort

Table 3-3: Themes in Flow

Feeling State Themes in Flow (characteristics)

Feeling states	Theme (identified)	Pattern (describing trait of flow)
Arousal (ch1) Flow (ch2)	cognitive involvement, activity A state of high and effortless concentration, involvement	Intrinsic motivation as a result of a specific activity demonstrating the resonance between individual and activity
Flow (ch2) Control (ch3)	control of the situation pervasive experience of control	An alignment between individual and activity. Outcomes are easily managed, where the individual can demonstrate their innate competencies—void of any effort to regulate their positive emotions.
Relaxation (ch4)	positive mood intrinsic motivation	A restorative state of low effort where

Pattern 6: Resonance as a product of deep concentration and involvement in the activity. Deep concentration and task involvement are recurrent themes within data set 2. The pattern is produced when the descriptions of arousal (ch1), flow (ch2), and the flow channel's characteristics and descriptions are directly compared in search of common themes. When the state descriptions "cognitive involvement, activity" (Massimini and Carli 1988:273) and "a state of high and effortless concentration, involvement" (Delle-Fave et al. 2011:74) are then compared with "complete involvement of the actor with his activity" (Csikszentmihalyi 1975:36) and "intense focus and concentration on the task" (Nakamura and Csikszentmihalyi 2009:90), the link between the feeling state of arousal and the Flow channel becomes explicit.

Pattern 7: Manageability. Relationship between capabilities and mood regulation. Emotional regulation and control are common themes in data set 2. They are produced when the descriptions of flow (ch2), control (ch3), and the flow channel's characteristics and descriptions are directly compared in search of themes. "… Control of the situation" and "…pervasive experience of control" (Delle-Fave et al. 2011:74) and "sense of control over what one is doing" (Nakamura and Csikszentmihalyi 2009:90) produce an effortless cycle of observation and response, or perfect action and interaction.

Pattern 8: Restorative. An effortless combination of a positive mood with an intrinsically rewarding activity. Intrinsically motivating activity and positive affective states are recurrent themes in data set 2. This theme is the product of relaxation's (ch4) relation to the flow channel. "Positive mood" (Delle-Fave et al. 2011:74) relates to "sense of enjoyment" (Nakamura and Csikszentmihalyi 2009:90) in the Flow channel. Also, "…intrinsic motivation" (Delle-Fave et al. 2011:74) directly maps to "…intrinsic motivation" (Nakamura and Csikszentmihalyi 2009:90) in the flow channel. All producing a restorative state of low effort.

This analysis produces a broader conceptualisation of the flow channel in the FCM. Populating the channel with multiple feeling states arousal, control and relaxation. These findings are consistent with Csikszentmihalyi's original

descriptions of the feeling states. In addition to this is the notion of flow channel comprised of other thematically linked states (arousal, control, relaxation) where the flow state suggests flow as having different levels (Guo 2004; Moneta 2012)

3.5.2 Phase 2: Systemic Synthesis

Synthesis of the Data Sets and Thematic Analysis

This portion of the project utilises all three data sets and the thematic analysis outputs (Phase 1). The identification ordering and structuring equate to level 1 of Gibson and Isaac's (1978) method of mathematical logic.

The first four levels of logic facilitated the synthesis of flow's hypothesised model (*Figure 3-3*). *Table 3-4* depicts the encoding of feeling states into traits from which relations between truth table columns are identified. This structure means that the truth table takes on the qualities of a system from which extrapolations can be made (Jaques 1978).

Table 3-4: Formal Coding of State to Trait

Truth Table Synthesis			
Feeling State	Disuse	Flow	Misuse
Arousal (ch1)	N	Y	Y
Flow (ch2)	N	Y	N
Control (ch3)	N	Y	N
Relaxation (ch4)	Y	Y	N
Boredom (ch5)	Y	N	Y
Apathy (ch6)	Y	N	Y
Worry (ch7)	Y	N	Y
Anxiety (ch8)	Y	N	Y

Arousal (ch1): was coded into misuse and flow. The descriptions of arousal corresponded to Pattern five of misuse and the research conducted by Peifer et

al. (2014). Arousal was also coded into flow because of its appearance in pattern six.

Flow (ch2): coded into the flow channel. Importantly in the analysis, different descriptions and characteristics were used to delineate flow state from the flow channel (see *Appendix B* and descriptions of flow in Chapter 4, *Table 4-4*). Crucially the descriptions of flow render the state antithetical to its alignment to either disuse or misuse.

Control (ch3): coded into the flow channel. Delle Fava, Massimini and Bassi (2011:74) say that control "resents the best experiential profile after optimal experience (Channel 2)". Furthermore, a positive experience of control aligns with pattern seven, facilitating its coding into flow. Again, like the flow state, positive experiences of control do not code into either disuse or misuse.

Relaxation (ch4): coded into disuse and flow. Relaxation, like arousal, appears to span the divide between traits. Relaxation was coded into disuse for three reasons (i) Peifer et al. (2014) hypothesised and empirically tested research see figure 2-6, (ii) Massimini and Carli (1988:273) say, "…concentration lapses and the experience seem to become more passive", (iii) relaxation forms the theme of pattern 2. However, in contrast, relaxation also appears in the flow channel with its composition in pattern eight.

Boredom (ch5): coded into disuse and misuse. Boredom represents one of the most difficult channels to code. It easily codes into disuse, as seen in *Table 3-1* and *Figure 2-6*. However, boredom was coded into misuse too. The evidence supporting this decision was derived from the descriptions that we collated:

1. "Apathy syndrome" (Massimini and Carli 1988:273).

2. "Low levels of cognitive investment and a lack of goals" (Delle-Fave et al. 2011:75).

3. "Boredom isolates, individuates, even as it blurs the world grey […] An (unpleasant) experience without qualities" (Goodstein 2005:1).

90

4. "Specific mental state that people find unpleasant — a lack of stimulation that leaves them craving relief" (Koerth-Baker 2016:1).

These four descriptions aligned with the characteristics derived from the thematic analysis for misuse: lack of control, specifically thoughts are difficult to control, little or no motivation; feelings of isolation; influencing positive affective states, and it is hard to see or appreciate other options.

Apathy (ch6): coded into disuse and misuse. Massimini and Carli (1988, p.273) describe apathy as "bringing together all of the negative poles". Furthermore, Delle Fava, Massimini and Bassi (2011:74) state apathy has "… low values of the cognitive, emotional, and motivational components of experience". These descriptions of apathy correspond to aspects of the characterisations of phase 1 of disuse and misuse: disuse, pattern 2, low motivational states of being and misuse, pattern 4, little or no motivation, feelings of isolation, influencing positive affective states.

Worry (ch7): coded into disuse and misuse. Worry codes directly into misuse, as in Figure 2-6. Additionally, a person experiencing worry has "low levels of control of a situation" (Delle-Fave et al. 2011:75) and "difficulty controlling […] worrisome process" (Borkovec 2002:76). These descriptions of experience correspond with disuse, pattern 1, the inability to control or influence one's immediate environment, misuse, pattern 3, lack of control, specifically thoughts are difficult to control; generally, the environment is difficult to control.

Anxiety (ch8): as in *Figure 2-6*, anxiety codes directly into disuse and misuse.

3.5.3 Phase 3: System of Simultaneous Boolean Equations

The first part of phase 3 takes the truth table developed in phase 2 (*Table 3-4*) and applies a grey binary encoding – *Table 3-5*.

Table 3-5: Grey Binary Encoding of Truth Table

			Truth Table Synthesis			
A	B	C	Feeling State	Disuse	Flow	Misuse
0	0	0	Arousal (ch1)	0	1	1
0	0	1	Flow (ch2)	0	1	0
0	1	1	Control (ch3)	0	1	0
0	1	0	Relaxation (ch4)	1	1	0
1	1	0	Boredom (ch5)	1	0	1
1	1	1	Apathy (ch6)	1	0	1
1	0	1	Worry (ch7)	1	0	1
1	0	0	Anxiety (ch8)	1	0	1

Columns A, B and C represent the binary grey code. Arousal is labelled 0 0 0, flow is labelled 0 0 1 etc. Where each successive row only varies by a single bit. A critical feature of this encoding occurs between arousal and anxiety. Anxiety is labelled 1 0 0, and arousal is labelled 0 0 0. This binary coding means that even though arousal and anxiety are at opposite ends of the truth table, the binary encoding process means that they are ordered next to each other, creating a seamless ordinal loop of feeling states. This encoding preserves and maintains the channels' exact and consistent ordering as they are represented in the EFM (*Figure 2-7*).

For reasons of convenience only, each of the cells within the columns of disuse, misuse and flow were populated with 1's and 0's instead of Y's and N's.

The second part of phase 3 was to develop 3 Karnaugh maps (*Figure 3-2*) from the truth table. The purpose is to extract a system of simultaneous Boolean equations that mathematically and logically represent what it is like to be **that** person in **that** situation engaged in **that** activity at **that** time. The equations not only represent the potentiality of the feeling states that could be present, but they will also represent those states that are not present.

Figure 3-2: Karnaugh Maps – Disuse, Misuse and Flow
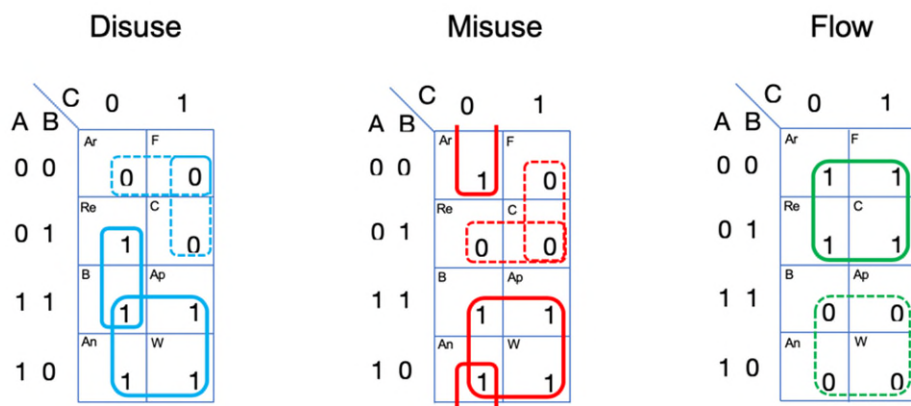
Each Karnaugh map represents a single column of the truth table (*Table 3-5*). The 1's represent each of the feeling states that are present, and each of the 0's represent the states that are not present. Populating each map with the appropriate 1's and 0's means that each map is a topological depiction of the entire landscape but represents that landscape in terms of either disuse, misuse or flow. Each map is labelled with A, B and C that directly relate to the Karnaugh maps' cells. These labels are directly representative of the labelling of *Table 3-5*. Therefore, Karnaugh maps are an alternate yet completely equivalent way of representing the truth table when seen together.

To aid the reader's interpretation: each cluster within the Karnaugh maps has been grouped with a different colour or style of line. In each of the maps, it can be seen that certain states cluster. Joining clusters of cells together follows set rules. The cells can only cluster into groups of 2, 4 or 8. As can be seen in disuse: boredom, apathy, anxiety and worry all cluster together, so do relaxation and

boredom. Importantly, the 1's and the 0's never cluster together. By systematically following the rules of clustering, Boolean equations can be derived into the standard canonical form, a disjunctive normal form of the complete sum of prime implicants. This process involves categorising and grouping all the elements. Each element within the clusters has a 'logical operator' relationship, and each cluster has a 'logical operator' relationship following the disjunctive normal form. These logical operators are AND, OR and NOT. *Table 3-6* depicts the logical relationships of logic operators. 'A' and 'B' in the table represent every combination of '1' and '0', the AND, OR and NOT depict the logical relationships to 'A' and 'B'.:

Table 3-6: Logic Functions and Associated Symbols

A	B	AND '∧'	OR '∨'	NOT (A) '~'
0	0	0	0	1
0	1	0	1	1
1	0	0	1	0
1	1	1	1	0

Therefore, each equation is a direct mathematical relational representation of the range of experiential states that a person can experience when in a particular trait. Moreover, each equation depicts those states that a person cannot experience while in a particular trait. These equations, therefore, represent the state-space (disuse, misuse, flow) relationships through the state-to-state relationships.

Equation 3-1: System of Boolean Equations

$$\text{Disuse} = \Big(\boxed{(B \wedge Ap \wedge An \wedge W)} \vee \boxed{(Re \wedge B)} \Big) \vee \Big(\underline{(\sim Ar \wedge \sim F)} \vee \underline{(\sim F \vee \sim C)} \Big)$$

$$\text{Misuse} = \Big(\boxed{(B \wedge Ap \wedge An \wedge W)} \vee \boxed{(Ar \wedge An)} \Big) \vee \Big(\underline{(\sim Re \wedge \sim C)} \vee \underline{(\sim F \vee \sim C)} \Big)$$

$$\text{Flow} = \Big(\boxed{(Ar \wedge F \wedge C \wedge Re)} \Big) \vee \Big(\underline{(\sim B \wedge \sim Ap \wedge \sim An \wedge \sim W)} \Big)$$

Tabulating and synthesising the feeling states of the EFM across disuse, misuse and flow of the FCM provides a new way of viewing the relationships of feeling states within and between disuse, misuse and flow. Indeed, the truth table in *Table 3-4*, in its way, represents a new model of experience.

3.5.4 Summary of Analysis

The sections below will discuss (i) interpretation of the table and its extrapolation to the model in *Figure 3-4*; (ii) how the development of this new synthesised model affects the contemporary research outlined in the introduction; (iii) implications of the new synthesised model; and (iv) potential avenues of future work.

3.6 Results: The Models of Experience

What follows is a discussion of the new models of experience developed in this chapter. This section is critical because these models have several previously unseen features in flow models and models of experience based upon flow theory. Therefore, this section is divided into four parts. The first two parts will discuss the shared characteristics of the models: *Section 3.6.1* will discuss the inclusion of the boundary of the models, and *Section 3.6.2* will discuss the appearance of states and state duplications in each model. Then *Section 3.6.3* will specifically discuss the New Synthesised Model of Experience, and *Section 3.6.4* will discuss the System of Simultaneous Equations.

3.6.1 The Boundary of the Models

The models developed in this chapter contain elements from both componential models of flow and elements from operational models of flow (see Chapter 2 for a complete discussion of the concepts). To wit, the data sets comprise variations of the FCM, the EFM, descriptions of experiential states, descriptions of flow, and flow characteristics. However, the data sets present only a partial picture of the composition of the models: this is like identifying the ingredients of a fine meal but ignoring the way the meal is cooked. The methods applied in phases 1, 2 and 3 represent how the ingredients are cooked. Essentially, phase 1 is a differentiation process, and phases 2 and 3 are integration processes. That is to say, identifying elements (differentiation) and clarifying relationships (integration). Additionally, as discussed in method 2, *Section 3.3* above: level 3 extends the truth table synthesis to identify conjunctions between set elements such that the truth table takes on the quality of a system (Gibson and Isaac 1978). Therefore, because each of the models comprises differential and integrative processes and at level 3 of integration take on the quality of a system, the models can be regarded as systems.

This systemic perspective is entirely consistent with Nakamura and Csikszentmihalyi's, who view experience as a "…dynamic system composed of person and environment, as well as the phenomenology of person-environment interactions" (2009:90). However, for a model to fully represent a system, the model should comprise three distinct features elements, relationships and boundaries (Jackson 2019). While all flow models comprise elements and relationships in their various forms, all flow models lack a boundary and fail to fully represent a complete systemic conceptualisation of experience (see Chapter 2). This failure to include boundaries leads to a lack of clarity as to what is being investigated and what is being included in the conceptualisation of the research problem on behalf of the researcher. For example, many studies (see Chapter 4) investigate flow from the perspective of its antecedents, clear goals, immediate feedback and challenge-skill balance and then measure the person's experience in terms of its indicators (see Chapter 2, *Table 2-1*). This type of investigation fails to acknowledge the extent to which the complexity of the environment impacts

the person's experience while engaging in a given activity, as depicted in Guo and Poole's (2009) model of flow (see Chapter 2, *Section 2.2.2*). In other words, models that depict a person's experience in terms of a balance between challenges and skills where the activity has clear goals with immediate feedback imply either a system that is closed (spherical chicken in a vacuum) or ignores extraneous variables (Meadows and Wright 2008).

Therefore, each of the new models (*Figure 3-3 and 3-4*) is contained within a dashed boundary firstly, to ensure that as a systems model, all three features of a systems model are included; and secondly, to ameliorate this obfuscation and confusion from a lack of boundaries. Moreover, the boundary is dashed to demonstrate that the system is not closed and that extraneous environmental factors cannot be excluded from influencing an individual's experience of engaging in a given task (Guo and Poole 2009).

3.6.2 The New Models and their Depiction of States and Meta-skills

As shown in *Figure 3-1*, the outputs of the three phases of this study are used to produce two new models of experience. Both models depict the same phenomena but present them from two different yet interconnected perspectives. The first model is qualitative synthesis, and the second model is a relational mathematical synthesis. The unique feature of each of the models is that they simultaneously depict a person's experience in terms of states and meta-skills. This synchronisation of states and meta-skills is only possible because of the explicit and rigorous methods applied in the three phases described above.

The themes identified in phase1 of this study are present in each of the models in two distinct but related ways; essentially looking at the relationship (for a given individual) between states and meta-skills from two directions: from the perspective of states (as a fragile state of experience) and the meta-skills (see Chapter 4*, Sections 4.2.1* and *4.2.2*). Moreover, by capturing the meta-skill perspective and rendering it explicit in each of the models (in terms of variables) a triangulation check for the truth table mapping process becomes possible (as depicted in *Table 3-7* directly below). Essentially, the variables represent the dimensions of the three state spaces (disuse, misuse, flow). *Table 3-7* shows

how the meta-skills map to the variables and how the variables act as dimensions and vary across disuse, misuse and flow.

Table 3-7: Mapping of Meta-skills, Variables

Meta-skills See section 4.2.2	Variables (Phase 1)	Disuse	Misuse	Flow
Order opportunities Cognitively flexible	Control (a)	Lacks control	Out of control	Effortless
Persistence Not self-centred Curiosity Intrinsic enjoyment	Motivation (b)	No positive motivation	No positive motivation	The task is valued for its innate qualities
Fully apply themselves	Concentration (c)	Lapses in concentration, causing the mind to wander	High levels of concentration required sapping energy	A person is fully absorbed, and coherence

Table 3-7 summarises the themes, variables, and spaces, and their relationship to meta-skills. When written out in full:

Disuse:

- Control – the individual is acutely aware of self and craves relief but lacks the control necessary to change the situation.
- Motivation – the situation lacks any positive motivational components.
- Concentration – the situation lacks stimulation, causing concentration lapses and wandering the mind.

Misuse:

- Control – the individual is acutely aware of self due to vulnerability of being out of control.
- Motivation – the situation lacks any positive motivational components.
- Concentration –high concentration levels are required, but the individual struggles to concentrate. There is a mismatch of personal resources in relation to the situation.

Flow:

- Control – absorption, there is no clear line between the individual and the task (subjectively perceived).
- Motivation – positive experience engagement is effortless.
- Concentration – the task is experienced and valued for its own sake. For the individual, the task has an existential quality.

Having states and meta-skills equally represented in each model presents an unbiased view of a person's experience. This representation means that attribution is not unduly biased towards either a meta-skill perspective of behaviour or a state perspective of experience. In other words, an individual's experience is universally mediated and moderated by complex conjunction of two relational elements: state and meta-skills.

On the one hand, the ease or difficulty with which a person experiences a particular state is due in part to dispositional elements (meta-skills). On the other hand, the emergence of experiential states is explained by momentary, within-person fluctuations of states as a product of variation in the environment. This multidimensional perspective of experience captures the theoretical assumptions that explain people's variegated experiences. Kimiecik and Stein (1992) suggest that for a person to experience flow depends not only on the person's disposition but also on the specific characteristics of the situation (challenge level, feedback, goals), as well as how the person feels or acts regarding the specific situation (level of motivation, control and concentration). Thus, a person's experience depends not only on the person's predisposition but also on the momentary conditions in the situation; since these conditions are highly variable, states should be expected to fluctuate even in those with significant predispositions to experience flow. Even if a person has an extremely high dispositional flow threshold, if the situational elements are wildly out of synchronisation, that person will not and cannot experience flow. Therefore, while a person may have a propensity to experience flow, flow is a fragile optimal state of experience: the presence, absence or intensity being contingent upon the momentary fluctuations and transitory conditions on a moment-by-moment basis in any given situation

(Fullagar and Kelloway 2009). It is this balanced perspective of states and meta-skills that each of the new models presents (see Chapter 4, *Sections 4.2 to 4.2.3*).

3.6.3 The New Synthesised Models of Experience

Combining the three phases has produced two complementary depictions of a person's subjective experience as they engage in everyday activities. The first is a qualitative synthesised depiction of the state-to-state and metacognition transitions of everyday experiences with associated descriptions of the state spaces (*Figure 3-3*). The second is a simultaneous Boolean equation system that expresses the relationships between the states, disuse, misuse and optimal experience of human experience (*Figure 3-4*).

These new models of experience draw themes out of the data in such a way that 'optimal' experience is contingent on the individual's subjective experience of the challenge. The thematic analysis identified themes between arousal, flow control and relaxation wherein disuse and misuse identify discrepancy between the individual and their environment (the 'I – it' relation, see Chapter 5). In contrast , optimal experience denotes a harmonious relation between the individual and their environment where the individual ceases to be aware of the self and the 'I' is replaced with a seamless flow of awareness. For this reason, the space of flow (arousal, flow, control, relaxation) will be labelled 'optimal experience'.

Sections 3.6.1 and *3.6.2* have discussed the common themes between the models (boundaries, states, meta-skills). What follows is an analysis of the two complementary models:

- how these models relate to the modelling of flow theory;
- how these models advance our understanding of flow; and
- how these models can be used to design an investigation to address the two research questions (see chapter 4).

The first and second phases above produced a qualitative synthesised depiction of a person's subjective experience as they engage in everyday activities with associated descriptions of the state spaces and meta-skills. The model (*Figure 3-3*) diagrammatically depicts the state-to-state transitions of a person's

experiences across metacognitive boundaries. The model has six distinctive new features compared to other flow models (see chapter 2):

i.   Each state space has a description in terms of control (a), motivation (b) and concentration (c) discussed above.

ii. There are three complex boundaries between disuse, misuse and optimal experience.

iii. The boundary between disuse and misuse comprises two states: boredom and anxiety.

iv. Misuse and disuse are 20% larger than optimal experience.

v.   Boredom appears in misuse.

Figure 3-3: New Synthesised Model of Experience
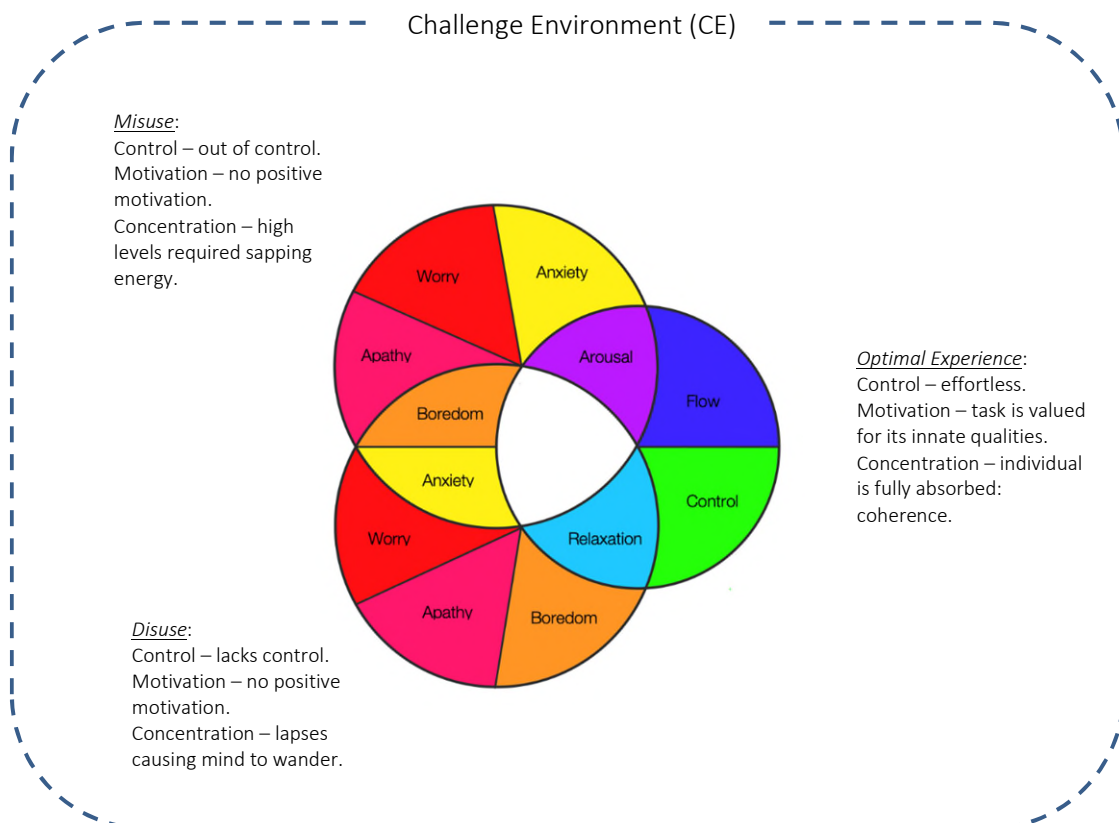
Point i: the first feature of the New Synthesised Model of Experience is the descriptions of the three state spaces in relation to each other. The spaces are

described in terms of control, concentration and motivation (*Table 3-7*). The differences between each of these themes enable the spaces to be distinguished from each other. Importantly, these are general descriptions of how a person feels in those spaces where each space depicts a very particular environment (from the lived subjective perspective of the individual). When combined with the descriptions of states, these space descriptions differentiate disuse and misuse, combining the qualities of both the FCM and the EFM.

Point ii: the overlaps between disuse, misuse and optimal experience are derived from the truth table above (*Table 3-4*). The state of relaxation links disuse and optimal experience, identified by the blue loop. The state of arousal links misuse and optimal experience, identified by the green loop. The states of boredom and anxiety link disuse and misuse, identified by the red loop. The arrows in the truth table then depict the directions of tendency, where if the activity remains stable, people are drawn. For example, if a person starts a new job for which they are well-matched, they become proficient in the job over time, and they will be drawn towards disuse. However, if the job develops with the person's knowledge, skills, and experience, the model implies they should remain in flow. It is this newly identified theoretical boundary between disuse and misuse where a serious problem can occur. This boundary requires three research questions:

1. Does a person trapped in anxiety in disuse get thrown up into anxiety in misuse?

2. Does a person trapped in boredom in misuse get thrown down into boredom in disuse?

3. If the first two questions are correct, does a person become trapped in a cycle of disuse and misuse?

Point iii: a feature of the synthesis (*Figure 3-3*) that other flow models do not capture is that disuse and misuse pull people away from optimal experience. This feature of the new model is entirely consistent with Csikszentmihalyi (2003). Moreover, disuse and misuse act and interreact with each other. If a person starts in boredom in disuse, it would appear that they are pulled through boredom into

apathy through worry and into anxiety. In contrast, should a person be experiencing anxiety in misuse, it would appear that they are pulled through anxiety into worry through apathy and into boredom.

Point iv: a distinguishing feature of the synthesised model (*Figure 3-3*) is the size differences between disuse misuse and optimal experience. While disuse and misuse each contain five states, flow only contains four states. This size difference between the state spaces provides a new way of viewing subjective experience that is entirely consistent with flow theory and empirical studies yet are not captured in any of the other models of flow reviewed in Chapter 2. From this new perspective, disuse and misuse can be considered attractor basins (Guastello 2001), each having a mass greater than the mass of optimal experience. Depending on the individual and the task, the individual will be continually pulled towards either disuse or misuse away from optimal experience. If the challenge and interest of the task remain static, then the person will be pulled towards disuse. For the person in this situation to remain in the space of optimal experience, their interest must be maintained, and the task challenge must continue to increase in relation to the person's knowledge, experience, skills and interests. Conversely, if the challenges or responsibilities increase too quickly or become out of phase (imbalanced) with the person's knowledge, experience and skills, they will be drawn towards misuse. This explanation of subjective experience is consistent with empirical investigations of flow (Csikszentmihalyi 2003).

Point v: the appearance of boredom in misuse was a surprise. Boredom is typically associated with disuse; this has been demonstrated in many studies (see Csikszentmihalyi 2000). However, in terms of the thematic analysis and synthesis, new studies have demonstrated that boredom is strongly associated with producing feelings of depression and anxiety (Koerth-Baker 2016). This theme places boredom in misuse. Furthermore, as another study on boredom demonstrates, boredom does not tend to afflict people who can exert control (Struk, Scholer, and Danckert 2016). This analysis is consistent with boredom appearing in both disuse and misuse.

The third phase produces a system of three simultaneous equations Boolean equations (*Equations 3-1*). These equations read as:

Disuse, in terms of the states, felt and NOT felt states are:

(Boredom AND Apathy AND Anxiety AND Worry) OR (Relaxation AND Boredom) OR (NOT Arousal AND NOT Flow) OR (NOT Flow AND NOT Control)

Misuse, in terms of the states, felt and NOT felt are:

(Boredom AND Apathy AND Anxiety AND Worry) OR (Arousal AND Anxiety) OR (NOT Relaxation AND NOT Control) OR (NOT Flow AND NOT Control)

Optimal Experience, in terms of the states, felt and NOT felt are:

(Arousal AND Flow AND Control AND Relaxation) OR (NOT Boredom AND NOT Apathy AND NOT Anxiety AND NOT Worry)

Figure 3-4 presents these equations in the form of a systems diagram. Each of the circles represents the affective experiential states, including the states that cannot be present. The blue circle represents disuse, the red circle represents misuse, and the green circle represents optimal experience. The circles each house all of the states represented in each of the equations. By examining disuse, misuse and optimal experience in this form, it becomes easier to see the anatomical distinctions between the spaces in terms of states. The equations show the physiology of states in terms of their mathematical, logical relationships.

Figure 3-4: System of Simultaneous Boolean Equations
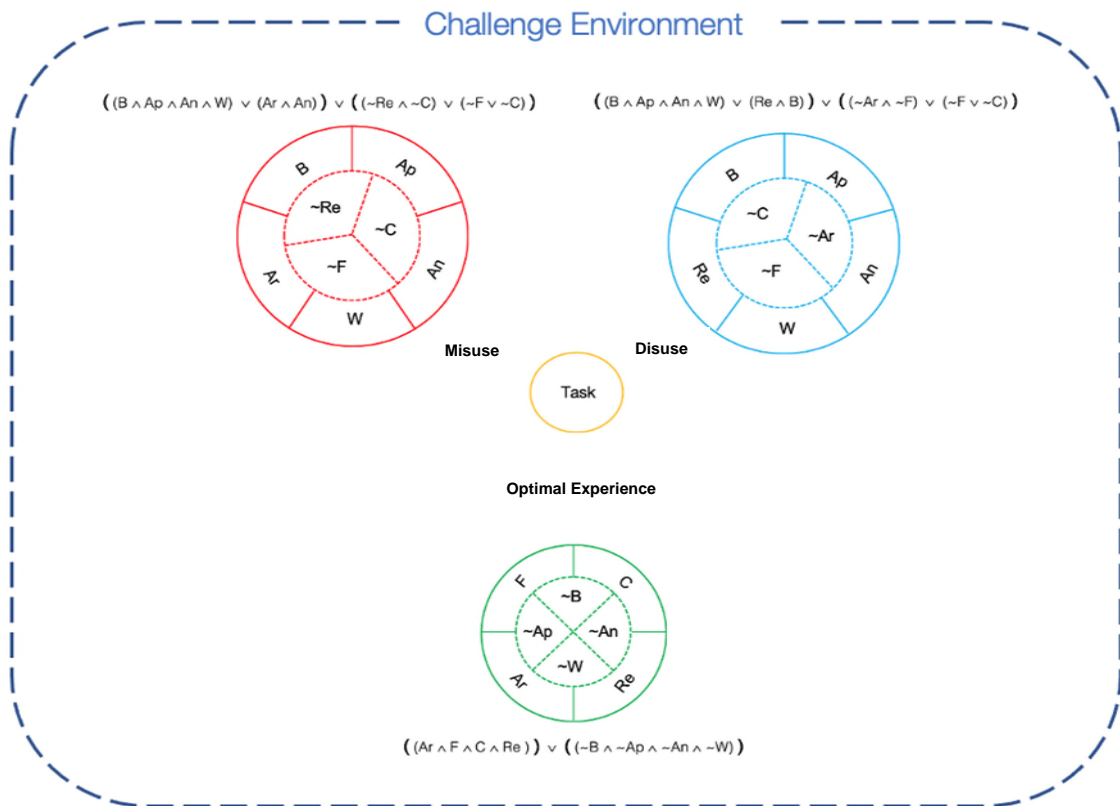
By comparing disuse and misuse in *Figure 3-4*, it can be seen that arousal is absent from disuse and appears in the centre circle of disuse as NOT arousal and relaxation is absent from misuse and appears in the centre circle of misuse as NOT relaxation. Furthermore, when a person is in optimal experience, boredom, apathy, anxiety, and worry will not be present as depicted in the centre of the green circle that shows NOT boredom, apathy, anxiety and worry.

These Boolean equations depict clear interrelationships and interdependencies between disuse, misuse and optimal experience. Therefore, depending on task and context, the spaces and task act and interreact. It operates as a four-body systems diagram, where the task and its context attract a particular state within either disuse, misuse or optimal experience and repelling the others. For example, when a person is engaged in a task causing them to be bored in disuse, both flow and misuse are repelled. When a person is anxious in misuse, both

optimal experience and disuse are repelled. Alternatively, when a person is in the state of control in optimal experience, then misuse and disuse are repelled. This simple analysis demonstrates the dynamic nature of what a person subjectively experiences engaged in *that* task, in *that* context, at *that* time. Essentially, disuse, misuse and optimal experience act and interreact in relation to the person's experience as they engage in the task.

This analysis presents a person's subjective experience as a dynamic non-linear phenomenon dependent upon the task that the person is engaging in and the felt capability of that person at that time. Therefore, when challenge (task) and capability are considered together, these two new synthesised depictions present a complete view of flow theory. To date, none of the individual models discussed in Chapter 2 depict all of these features of flow theory.

3.7 Discussion

When reviewing the new synthesised model in relation to the findings of Chapter 2 (literature review of flow models), the new synthesised model captures and depicts many of the elements that research has identified as lacking in contemporary models of flow. The synthesised model depicts a person's subjective experience as a non-linear dynamic phenomenon and adds enhanced detail absent in previous models. (Ceja and Navarro 2012, 2017; Ceschi, Sartori, and Guastello 2018; Guastello et al. 1999). Non-linearity and discontinuity are no longer presented in terms of flow and non-flow but are depicted in state-to-state transitions, including descriptions of states, meta-skills and the logical relationships between the states.

Moreover, while the balance between capabilities and challenges is a critical ratio in the flow theory, several studies have returned results questioning its absolute validity. Engeser and Rheinberg (2008) and Fullagar, Knight and Sovern (2013) showed that flow can occur when capability exceeds challenge. Furthermore, high levels of flow have been shown to occur with medium levels of arousal (Peifer et al. 2014). Previously, these findings were incommensurate with the existing models of flow. What this investigation has achieved is to integrate these findings into the new synthesised model seamlessly. This synthesis was

achieved by identifying arousal, control and relaxation as experiential states within a broader context of optimal experience. The incorporation of relaxation into optimal experience in the model generates alignment with historical research. Csikszentmihalyi (1975:127–28):

> *"An operation that Is 'easy and straightforward' is 'satisfying',*
> *'pleasant', productive of a 'great feeling'. It is relaxing but not*
> *boring; as one surgeon puts it, that type is 'a technical*
> *accomplishment and simply satisfying'. Another finds that 'it can*
> *be an enjoyable lapse into familiarity – everything clicks along.*
> *There is enjoyment of the craft –'symphony of motion'. In this*
> *relaxing state one can think of other things chat with the staff or*
> *with colleagues, or more seriously, 'explain academic points to*
> *residents'. […] Operations that are relaxing can merge into the*
> *state of flow"*

This synthesis also incorporates reading with relaxation within optimal experience (*Figure 2-7*), as reading has been identified as one of the most common flow activities (Thissen, Menninghaus, and Schlotz 2018). Additionally, the integration of arousal (ch1), flow (ch2), control (ch3) and relaxation (ch4) into the flow trait is commensurate with Guo's (2004) conception of mild flow, moderate flow and deep flow (Miles 2012; Moneta 2012). No model of flow has as yet been able to capture and depict this conception of flow.

3.8 Conclusions

The new synthesised model generated in this PhD study has addressed the original remit set out in this chapter's introduction. That is to develop a model of experience that retains the qualities of the previous models of flow but also increases the resolution of the wider topological landscape of normal human functioning. The thematic analysis made manifest those themes that were latent within the data. The truth table synthesis structured those themes in conjunction with the FCM into a new synthesised model of experience. This new model depicts the latent themes identified in this study with the qualities of previous flow

models into a single coherent model of experience. This new synthesised model depicts a topological landscape of human experience that enhances the topological landscape's resolution on either side of the flow channel. This synthesis means that the new model provides descriptions of state spaces and the logical-mathematical relationships that link them.

This new synthesised model directly contributes to flow theory and the modelling of the phenomena. The model provides a detailed landscape of human experience that synthesises feeling states and the limits of metacognitive skills. The model directly addresses:

    a. The flow experience still occurs when capability exceeds challenge (Engeser and Rheinberg 2008; Fong et al. 2015; Fullagar et al. 2013).

    b. High levels of flow can ensue with medium levels of arousal (Peifer et al. 2014).

    c. Flow is a non-linear and discontinuous phenomenon (Ceja and Navarro 2012, 2017; Guastello et al. 1999).

Furthermore, the design strategy that generated the model utilised a combination of methods for synthesis that has never been applied in the domain of flow theory prior to this PhD thesis. The deductive thematic analysis identified latent themes within the pre-existing literature; the truth table synthesis provided a coherent and explicit method to organise those themes. Once the truth table was constructed, it became possible to interpret the themes as a system of interrelated and interdepend elements. Then, by explicitly identifying the conjunctions and dualities between the set elements (as highlighted by the coloured loops and arrows within the truth tables *3-4* and *3-5* above), it was possible to develop the new synthesised experience model.

The development of a system of simultaneous Boolean equations that mathematically describe the state-to-state transition of the first-person subjective experience as they engage in an activity in the challenging environment. The Boolean equations provide a new theoretical perspective to view an individual's

subjective experience as they engage in a task or activity. This relational mathematical model directly complements the model described above (*Figure 3-3*); it is the first relational mathematical model of its type in flow theory. This system of Boolean equations represents a direct contribution to knowledge to the theory of flow. In addition, the methods used to generate the relational mathematics utilised to create the system of simultaneous Boolean equations:

- The truth table synthesis (Gibson and Isaac 1978).
- Grey code encoding of the truth table (Lucal 1959).
- The application of Karnaugh Maps (Karnaugh 1953).

These methods have never been used as techniques to model the emergent phenomenology of flow. However, caution must be applied as these equations remain untested and purely theoretical. What the equations do, is to provide researchers with a new way of thinking about the nature of the relationship between varying degrees of challenge and the individual's subjective experience of that challenge as regulated by capability, simultaneously identifying the presence and absence of states.

In conjunction with this, the new synthesised model provides a way of looking at and investigating the long term effects of people being out of flow and developing strategies to help people find flow in their life with all of the associated benefits (Tse, Nakamura, and Csikszentmihalyi 2019).

3.9 Chapter Summary

This chapter addressed objective two (*Table 1-1*) and described the design and development of a New Synthesised Model of Experience and a Relational System of Simultaneous Boolean Equations in response to the research question developed in Chapter 2.

In the first part of the design process, the characteristics of flow, descriptions of flow, descriptions of experiential states and differing examples of the FCM (*Figure 2-6*) and EFM (*Figure 2-7*) were collated and treated as data. Following the data collection, the design was split into three sections where a suite of

complementary methods was used to synthesise the new model of experience and the associated system of Boolean equations.

Finally, the new experience model was discussed in its entirety and then evaluated against the contemporary models of flow, demonstrating the contribution to knowledge made by this PhD thesis and the new synthesised model of experience.

Therefore, having described the new model of experience in its entirety, the following chapter (Chapter 4) is a complimentary chapter to Chapter 2 and will review the literature on flow from the perspective of this doctoral research project and seeks to address objective 1b (*Table 1-1*):

1. The philosophical perspectives that are applied to flow research.

2. The methodological approaches that flow, researchers, have adopted.

3. The methods and practices used by researchers for identifying and measuring flow.

Chapter Four

Literature Review: Flow Theory – Methodologies and Methods

Dimension implies direction, implies measurement, implies the more and the less. Now, all our lines are equally and infinitesimally thick (or high, whichever you like); consequently, there is nothing in them to lead our minds to the conception of that Dimension. No `delicate micrometer' - as has been suggested by one too hasty Spaceland critic - would in the least avail us; for we should not know what to measure, nor in what direction. When we see a Line, we see something that is long and bright; brightness, as well as length, is necessary to the existence of a Line; if the brightness vanishes, the Line is extinguished. Hence, all my Flatland friends - when I talk to them about the unrecognised Dimension which is somehow visible in a Line - say, `Ah, you mean brightness': and when I reply, `No, I mean a real Dimension,' they at once retort `Then measure it, or tell us in what direction it extends'; and this silences me, for I can do neither.

Edwin A Abbott. Flatland: A Romance of Many Dimensions (1884)

4 Introduction – Flow Theory, Methodology and Methods

This chapter directly follows the development of a new theoretical model of experience – The New Synthesised Model of Experience and its associated system of Boolean Equations (Chapter 3). This chapter is the third of four chapters locating this doctoral research project within the landscape of flow theory and research. It focuses exclusively on the theory (flow as state and trait), methodologies and methods, thereby addressing objective 1b (*Table 1-1*).

The chapter begins by reviewing the literature pertaining to flow as a transitory experiential state and a psychological trait and reviews the difficulties researchers face investigating the phenomenon, particularly from the perspective of capturing flow in a person's everyday environment.

Following this, the chapter investigates the literature regarding the theoretical implications of capturing a person's lived experience of challenge and the ways challenge can cause an individual's intra-subjective experience to fluctuate. This section will then move on to distinguishing between research approaches.

The next section of the literature review will focus on the various methods researchers have used to investigate flow, such as interviews, questionnaires, the Experience Sampling Method (ESM), observational methods and experiments. The final section will evaluate the research methodologies between naturalistic correlational studies and experimental methodologies.

Finally, the chapter will present the review findings from the perspective of the research problem: the review concluded that more qualitative studies are required to investigate the intra-subjective fluctuations of people's lived experiences in challenging environments. However, the current methods for capturing fluctuations of intra-subjective experience are inadequate.

From identifying these theoretical and methodological issues, two specific research questions have been developed, directly addressing this PhD's research problem.

4.1.1 Systematic Approach to Investigating the Literature

As previously discussed in Chapter 2 (Models of Flow), the literature review was divided into two sections. The first section reviewed the literature as it pertained to modelling flow, and the second review focused on flow theory, methodology and methods. Each of these sections was investigated from the perspective of the research problem:

- How the quality of a person's lived subjective experience is affected by differing degrees of challenge: stress (challenge) in the form of pressures and demands overwhelm that person's capabilities.

With the overarching purpose:

- To investigate the balance between challenges and capabilities to identify the thresholds (points) at which imbalance occurs.

A preliminary 'syntopical review' (Adler and Van Doren 1972) of the literature, including significant texts on the topic (as discussed in Chapter 1), identified several keywords and search strings as seen in *Table 4-1*.

Table 4-1: Literature Search Terms

Search Term	Search String	Rationale
Flow theory Optimal Experience	flow theory OR optimal experience AND work-related flow	The specific context for the area of relevance. Search results to be reviewed with and without this included. The context may restrict/constrain results.
Flow Models	(flow OR optimal experience) AND model*	Modes present the theoretical landscape of a research domain. Optimal experience is used interchangeably with flow. This term is used to differentiate the search from engineering papers using the term flow.
Challenge – Capability ratio	challenge AND (capability OR skills)	The challenge/capability ratio is a central theme. However, capability and skills appear to be used interchangeably
Subjective Experience	*subjective experience AND flow	The level of interest between flow as a state and flow as a trait. This string captures literature concerned with flow at that level of consideration.

Through consultation with the library staff, five databases were selected in which to perform the searches. These were considered to provide access to the majority of relevant publications for the literature domains and context of relevance.

Table 4-2: Research Data Bases

Google Scholar	A repository that captures a broad range of literature from an array of sources – publishers, professional societies, online repositories and universities.
Scopus	An extensive index covering publications from 5,000 publishers in all areas of science, technology and social science
Springer	Access to purchased eBooks in the areas of business and management and social sciences
Web of Science (WoS)	WoS includes the Conference Proceedings, Journal Citation Reports (JCR). It covers a broad range of subjects relating to science and social sciences. Includes the ability to carry out citation searching.
Wiley Online Library	Access to more than 350 online peer-reviewed journals and 250 e-books. The subject areas include business, computer science, education, and psychology.

However, having identified specific papers that were not available through the research database mentioned above, other resources were drawn upon to access these research papers. This included inter-library loans and personally contacting the researchers Dr Susan Jackson, Professor Jose Navarro, Professor Viv Burr and Professor Corinna Peifer.

Additionally, the bibliographies of important papers were used to identify key researchers and papers that may not have been identified through the various databases and keyword search strings.

This section has outlined the systematic approach adopted by this literature review, including the review of flow models conducted in Chapter 2. What follows

is the literature review of the theory, methodology and methods applied in capturing the phenomenon of flow.

4.2 Theoretical Perspectives of Flow (State-Trait)

Research has revealed flow to be a robust, enjoyable, coherent psychological phenomenon that ensues when people are intrinsically motivated, meeting challenges and developing skills. However, experience as a subject of organisational psychological enquiry is often neglected due to the focus on behaviour (Hogan 2007). This issue is complicated further because flow has been identified as having both state-like and trait-like qualities. This dualistic distinction has critical theoretical and practical implications for flow theory. So, where does the phenomenon of flow as either a state-like experience or as a personality trait reside? Privette and Bundrick (1991) suggest that experience is more comprehensive than behaviour and less global than personality. So, what might it mean to give primacy to the experiential qualities of people? Rosini (1977), as quoted in (Jackson 1992), says that individual experience requires focusing on subjective states as they are situationally evoked, affecting a person's ability to choose and reject alternatives; influencing the processes with which the individual finds, makes and organises meaning in the world. By extrapolating this definition to a challenge environment: if flow is a state-like phenomenon that fluctuates in relation to the varying conditions manifest in the challenge environment, people should focus on crafting and engaging in activities that promote flow.

Conversely, if flow is trait-like, people should focus on individuals with a predisposition for experiencing flow. States are transient, variable and reactive to situational forces and systemic pressures; traits are stable, long-lasting and internally caused (Chaplin, John, and Goldberg 1988). Presenting flow as both state and trait creates a duality that theory and theorists struggle to reconcile.

4.2.1 Flow as Transitory Affective Feeling State

Research has shown that flow is an enjoyable and rewarding psychological state that people experience across all facets of their daily lives, but most frequently when engaging in work-related activities. LeFevre (1988:317) identified that "respondents spent proportionately more work than leisure time in flow". A central theme that permeates flow theory is the challenge-capability ratio and the various experiential feeling states that ensue from fluctuations in the ratio (Engeser and Rheinberg 2008; Fullagar et al. 2013; Massimini et al. 1987; Navarro et al. 2019). On the one hand, flow tends to ensue when there is a balance between a person's knowledge, experience, skills and interests in relation to the challenges they experience, enabling them to achieve well-defined goals; an important caveat is both skills and challenges should be high and in balance with each other (Csikszenthmihalyi 1990). On the other hand, when there is an imbalance between challenges and capabilities, people are more likely to experience negative psychological states such as worry, boredom and anxiety, as depicted in the EFM *Figure 4-1*. This feature is also captured in the New Synthesised Model of Experience, Chapter 3. Generally, flow is experienced during activities that the person finds intrinsically rewarding. The individual's knowledge, experience, skills and interests are perceived by the individual to be above the average and imbalance with the high-level opportunities for action (challenges) manifest in the activity. According to Nakamura and Csikszentmihalyi (2009), when the perceived opportunities for action are balanced with the person's skills and experience, where goals are clear and proximal with immediate feedback about the progress that the person is making: under these conditions, an optimal experience unfolds moving seamlessly from moment to moment. This optimal experience exhibits the following elements (see characteristics *Table 2-1*, Chapter 2):

1. The individual is intensely focused and concentrated on the activity at hand.

2. The person experiences a merging of action and awareness. They cease to be aware that they are aware.

3. There is a sense of being in control of one's actions.

4. The person's sense of time becomes distorted – a temporal distortion effect (the sense that time has sped up, slowed down or disappeared).

5. The activity is intrinsically rewarding (the end goal is just an excuse for the process) – "The mountaineer does not climb in order to reach the top of the mountain", Csikszentmihalyi (1988:33) writes, "but tries to reach the summit in order to climb".

Importantly, the balance between action opportunities and action capabilities is fragile. As can be seen in EFM *Figure 4-1* below, if challenges begin to exceed/lead capabilities during the activity, the individual first becomes anxious and then worried. Conversely, if capabilities begin to exceed/lead challenges, the individual initially becomes relaxed and eventually bored, should the activity continue in this way. This imbalance between challenges and capabilities means that fluctuations in subjective feeling states provide critical feedback about an individual's changing relationship with their environment (Nakamura and Csikszentmihalyi 2009). This systemic relationship of the person-environment and the emergent phenomenology of the person-environment interaction is depicted explicitly in the EFM *Figure 4-1*.

Figure 4-1: Experience Fluctuation Model (EFM)
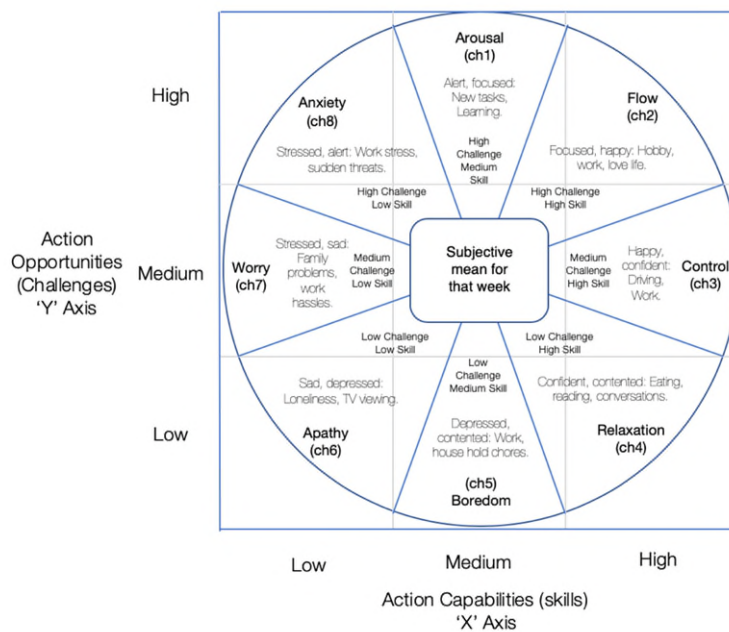
Aggregation of EF models (Bassi et al. 2007; Csikszentmihalyi 2003; Delle Fave and Massimini 2005; Massimini and Carli 1988; Massimini et al. 1987)

Work-related flow has been described as "a short term peak experience" (Bakker 2005:27). That is characterised by intrinsic motivation, enjoyment and absorption (Bakker 2005, 2008). This description explicitly focuses on what occurs when a person is experiencing flow with its associated characterisations. This characterisation is most appropriately depicted in the EFM *Figure 4-1*.

The central assumption that underpins this description of the flow experience as a product of the elements of flow; is that flow occurs suddenly, is of relatively short duration and exhibits substantial variations within the same person (Csikszentmihalyi 1993). When this is analysed utilising the FCM (*Figure 4-2*), the flow channel provided a great deal of scope for substantial variations at the individual within-person subjective level of experience. What the characterisations do is describe a person's flow experience at a particular moment. The absence, presence, and intensity of these various characteristics provide a partial description and a location within the channel.

Initially, flow researchers appear to have a consensus with their descriptions of flow – flow is an enjoyable state of experience that is short-term, fragile, contingent upon an array of conditions, and varies in intensity and duration. However, while the form of flow in terms of its descriptions is similar, there is a divergence between researchers regarding the structure of flow in terms of the way flow is characterised, as seen in *Table 4-3*.

Table 4-3: Comparison of Flow Characteristics

Csikszentmihalyi and Nakamura (2009)	Bakker (2005, 2008)	Llorens, Salanova and Rodriguez (2013)
1. Concentration deepens. 2. The present is what matters. 3. Control is not a problem. 4. The sense of time is altered. 5. The loss of ego.	1. Absorption. 2. Enjoyment. 3. Intrinsic motivation.	1. Absorption. 2. Enjoyment.

However, when Bakker's (2005) characterisations are broken down into their constituent elements:

1. Absorption: a state of total concentration.

   a. Time adjusts itself to the activity,

   b. Focus is complete, and people forget everything around them.

2. Enjoyment, people who enjoy their work tend to make favourable judgements about the quality of their work experiences.

3. Intrinsic motivation, engaging in a work-related activity that is rewarding in and of itself.

Analysis reveals that the characterisations are essentially a factorisation of Csikszentmihalyi and Nakamura (2009). This analysis demonstrates how Bakker's characterisation of flow is a reductive, simplified methodology when identifying work-related flow.

4.2.2 Flow as a Dispositional Trait

From a research perspective, flow is not limited to a transitory state, where a person's capacity to experience flow appears to be widespread and ubiquitous (Delle Fave et al. 2011). Flow has also been conceptualised as a dispositional trait. People who have a propensity to experience flow regularly across a wide range of activities, essentially exhibiting a trait like predisposition towards flow, have been described as having an 'autotelic personality' (Csikszentmihalyi 1975; Csikszentmihalyi and Csikszentmilhalyi 1988). The word autotelic is derived from Greek, 'autos' meaning self, and 'telos' meaning end or goal. For people with this predisposition, autotelic individuals engage in activities for the intrinsic enjoyment inherent in the activity. People with this personality characteristic (trait) can recognise and subjectively order the opportunities within a broad range of situations in such a way that they are more likely to experience flow (Csikszentmihalyi 1975). Autotelic individuals have an active and creative relationship with their environments in which they are able to identify opportunities for action and engagement. Nakamura and Csikszentmihalyi (2009:93) write, "This kind of personality is distinguished by several meta-skills or competencies that enable the individual to enter flow and stay in it. These meta-skills include a general curiosity and interest in life, persistence, and low self-centeredness, which result in the ability to be motivated by intrinsic rewards". These meta-skills are captured in the boundaries that delineate the flow channel in *Figure 4-2*.

Figure 4-2: Flow Channel Model (FCM)
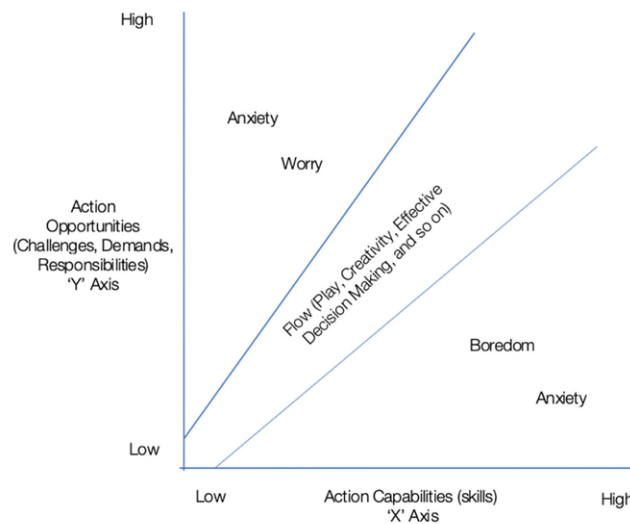
An important distinctive feature of people with an autotelic personality is that they pay more attention to what is occurring around them and that they are willing to invest more attention in activities for their own sake (intrinsic motivation), without the expectation of extrinsic rewards. While people with an autotelic personality are not necessarily happier than people with a lower propensity to experience flow, they tend to experience higher levels of self-worth with a greater propensity to having more positive experiences in their daily lives (Adlai-Gail 1994). In addition, Moore (2013) identified that cognitive flexibility is a good predictor of a person's disposition towards flow, implying that autotelic individuals can respond and adapt more readily to a changing environment.

Asakawa (2004) distinguished non-autotelic and autotelic dispositions when studying Japanese students. The distinction resides in people's ability to actively create and shape their own challenges. The non-autotelic students were unaware of or unable to create meaningful challenges in their activities due to their inability or unwillingness to fully exert their own cognitive and emotional energy to the activities. In contrast, the autotelic students were able to find or create optimal challenges in the activities, fully applying themselves and enjoying the emergence of flow from the activity.

121

4.2.3 The Relationship Between Flow State and Flow Trait

In essence, the universality of the flow experience is mediated and moderated by a complex conjunction of two relational elements: state and trait. On the one hand, the ease or difficulty with which a person experiences flow is due in part to dispositional elements (meta-cognitive skills). On the other hand, the emergence of flow is explained by momentary, within-person fluctuations of states as a product of variation in the environment. This multidimensional perspective of flow captures the theoretical assumptions that explain people's variegated flow experiences. This view incorporates the role of people's dispositional propensity to reach a state of optimal experience (flow) in conjunction with the characteristics of the activity that a person is engaged in at any given moment that influence their affective experiential state (Csikszenthmihalyi 1990; Delle-Fave et al. 2011; Nakamura and Csikszentmihalyi 2009).

Therefore, while it is possible to differentiate between autotelic and non-autotelic personalities, Kimiecik and Stein (1992) suggest that for a person to experience flow depends not only on the person's disposition (trait) but also on the specific characteristics of the situation (challenge level, feedback, goals), as well as how the person feels or acts in regard to the specific situation (level of motivation, control and concentration). Thus, the experience of flow depends not only on the person's predisposition but also on the momentary conditions in the situation; since these conditions are highly variable, flow should be expected to fluctuate even in those with significant predispositions to experience flow. Even if a person has an extremely high dispositional flow threshold, if the situational elements are wildly out of synchronisation, that person will not and cannot experience flow. Therefore, while a person may have a propensity to experience flow, flow is a fragile optimal state of experience: the presence, absence or intensity being contingent upon the momentary fluctuations and transitory conditions on a moment by moments basis in any given situation (Fullagar and Kelloway 2009).

Autotelic individuals are predisposed to experience flow when confronted with a task that they find challenging and intrinsically motivating so they experience flow with greater frequency. When trait flow is measured, it is generally measured at

the between-person level in terms of frequency (see *Section 4.5.4*). The majority of findings indicate that flow is predominantly a task-related state. This research means that tasks/activities have a greater influence in affecting a person's experiential state (the within-person) than their disposition in influencing the way they feel while engaging in a particular task or activity (Fullagar et al. 2017). This research has significant and practical consequences for people and organisations. Since flow is a fragile, highly ordered, coherent and negentropic state of experience, its occurrence is mediated and moderated by conditions that fluctuate over time in any task or situation. These results suggest that the working environment provides rich and varied opportunities for people to attain optimal states of experience. However, for people and organisations to benefit from the opportunities for action in an organisational environment, it is essential to investigate the with-person (first-person intra-subjective) experience as it fluctuates in relation to the moment-by-moment changes in tasks and activities. This research cannot solely focus on flow but should include other optimal states and identify thresholds into non-optimal states of experience in relation to action opportunities in the challenging environment. This evaluation directly pertains to the New Synthesised Model of Experience developed in Chapter 3 and the states depicted within the model.

4.3 Theoretical Importance of Capturing Fluctuations of an Individual's Subjective Experience

What does the study of the first-person subjective experience of work and work-related flow contribute to the development of positive organisational behaviour? The benefits of investigating work and work-related flow from the first-person subjective experience perspective are twofold:

Firstly, this approach allows researchers to observe a person's experience of work as it unfolds and evolves over time, to track and capture the individual's intra-subjective response to the proximal and distal changes in their working environments (Xanthopoulou 2017). As evidenced by Nakamura and Csikszentmihalyi (2009) statement above, shifts in a person's internal experiential state indicate a person's changing relationship to their environment.

In other words, intra-subjectivity describes a person's internal response to external stimuli. Thus, state approaches to investigating work-related flow facilitate the within-person variations in flow that are considered random errors in trait approaches (Ceja and Navarro 2011a, 2012).

Secondly, utilising declarative methods to study work and work-related flow from the first-person subjective perspective help describe the phenomenon of inner experiential states in relation to stimuli more systematically. Studies from the first-person perspective have shown that flow frequently occurs in people's lives across various contexts. For example, Massimini, Csikszentmihalyi and Carli (1987), when studying 47 Milanese university students, using the Experience Sampling Method (ESM), identified that the students experience a flow-like state 21% of the time in relation to the other seven states depicted in the EFM (*Figure 4-1*). Flow has also been shown to occur with a higher-than-expected frequency in work-related activities. These types of studies have all utilised the ESM to capture the first-person perspectives of study participants while engaging in work overtime (Bassi and Delle Fave 2012; Ceja and Navarro 2011a, 2012; Fullagar and Kelloway 2009; LeFevre 1988; Nielsen and Cleal 2010; Peifer and Zipp 2019). These methods facilitate the possibility of capturing a range of intra-subjective responses in relation to external variables as subjective states occur moment-by-moment, or very close to it. The intention is to reduce retrospective bias and capture with greater accuracy and resolution the phenomenon of changing states as they occur directly related to the working environment's action opportunities (Ohly et al. 2010).

These points demonstrate that investigating fluctuations at the intra-subjective level in relation to variables from action opportunities in the working environment adds to theory development because it provides a broader conceptualisation of the direct effect of action opportunities on within-individual affective experience. Additionally, situational, first-person investigations facilitate the collection of rich and variegated data that relates to the subjective character of an individual's experience of phenomena in a multidimensional challenge environment. For example, trait studies measuring flow at the between-person trait level have

shown that some people experience flow more frequently than others. These studies have shown persistent correlations between predictors and outcomes of work-related flow, such as:

1. Intrinsic motivation (Csikszenthmihalyi 1990; Delle Fave et al. 2011).

2. Asakawa (2004) identified that students who exhibited a propensity to experience flow could identify optimal challenges in the challenging environment relative to personal capability.

The critical distinction between trait and state approaches identified in these various studies (and why it is important to study a person's intra-subjective experience in relation to action opportunities) resides in the fact that people who are predisposed to experience optimal states of experience are not and cannot experience optimal states of experience all the time (meta-cognitive skills are not limitless). To understand when a person is about to enter or exit an optimal state of experience, it becomes crucial to study the momentary conditions that precede and are acute and proximal to the individual that influences the individual's intra-subjective state and the consequent outcomes.

Empirical evidence on the most acute and proximal causes and consequences of optimal experiences may explain what promotes and causes people to experience optimal states in some instances and not others (Xanthopoulou 2017). This information facilitates researchers understanding of why people experience a broad range of psychological states (both positive and negative), because these acute and proximal momentary conditions are the ones that initiate the psychological processes that generate intra-subjective states (Xanthopoulou et al. 2012).

A further implication for studying affective states at the with-person level (and not just assuming the enduring predictors and outcomes from between-person studies directly translate and apply to within-person studies) is highlighted by Chen, Bliese and Mathieu (2005). They differentiate between theories that contain parallel constructs and parallel relationships but are studied at different levels of analysis, as is the case of flow theory. They suggest that theoretical

assumptions derived from between-person (trait) studies should not be routinely applied to first-person subjective experience studies. This distinction across abstractions is because the psychological processes that explain trait variations in a psychological phenomenon do not necessarily parallel the psychological processes that explain the intra-subjective (state) variations at the within-person level of psychological phenomena. Trait level studies fail to account for the dynamic relationships that emerge at the intra-subjective level of analysis. Thus, between-person studies can only partially contribute to the entirety of a theory. Empirical findings that have identified this discordance between trait theory and state investigations have already been touched upon in Chapter 2. A trait theory did not align with a first-person subjective state study. Lambert, Chapman and Lurie (2013) used college students' experience to investigate the skills-challenge ratio with the quadrant model and the EFM. They found that contrary to generalised flow theory, enjoyment and happiness in an educational setting were associated with high skills and moderate challenge and not high skill and high challenge as would have been expected originally. This analysis supports the idea that findings from trait studies do not directly apply at the intra-individual level of investigation.

This section discussed the within-person processes that describe the dynamic psychological phenomenon and that these processes may differ depending on the analysis level and across contexts. This distinction between analysis levels highlights the importance of not assuming generalised theories and findings at the trait level and then applying them to subjective experience studies at the state level.

4.4 Methods and Theoretical Implications for Capturing an Individual's Experience of the Challenge Environment

Blaikie and Priest (2017) have argued that the choice of research method, methods and methodologies is secondary compared to the fundamental choices a researcher should make between research paradigms and between ontological and epistemological assumptions. The choice of methods and whether a study should be qualitative, quantitative or both appear to sidestep philosophical and

methodological complexities favouring a pragmatic approach to social science research. Choosing between different methods and deciding whether a study should be qualitative, quantitative or both appears to be a pragmatic alternative to dwelling on social science research's philosophical and paradigmatic complexities. Moreover, the pragmatic approach solves none of the study design problems, research methodology, and appropriate choice of methods in direct relation to research questions, philosophical perspectives, and paradigm choice. Adopting what appears to be a pragmatic approach merely sidesteps problems that will not solve themselves and will directly affect the quality of research outcomes if left unaddressed. Therefore, it is imperative to understand the benefits, features, and limitations of research methods and methodologies in relation to philosophical perspectives (see Chapter 5).

When reviewing the methods that have been employed in flow research, what becomes apparent are the methodological considerations and choices made by Csikszentmihalyi and colleagues during the foundational stages of flow research. In essence, flow was a surprise. Csikszentmihalyi was not investigating flow; he was following his research interests of investigating creativity. He concluded that reductionist psychological explanations of sublimation (those outwardly observable behaviours adopted by people as a substitution for more primal urges) failed to account for the entirety of the behaviours exhibited by artists (Csikszentmihalyi 1975). However, an emerging complementary stream of research was evolving at this time – intrinsically motivated behaviour. This new perspective of human motivation went beyond the traditional psychological perspective of all human behaviours motivated by extrinsic rewards to some behaviours motivated by intrinsic rewards. That is to say, people choosing to engage in activities because the activity itself was rewarding for its own sake. The research agenda adopted by scientists investigating intrinsic motivation at this time focused on the mechanisms that produced intrinsically motivated behaviour and the identification of the consequences of intrinsically motivated behaviour.

Additionally, research investigating intrinsic rewards were "restricted to laboratory settings, in which the behaviour of small children was observed according to a

few fixed experimental paradigms. Very little was known about intrinsic motivation in natural settings" (Csikszentmihalyi 1988:7). These studies accept the existence of intrinsically motivated behaviour without investigating what the experience of being intrinsically motivated was like for the individual: creating a research lacuna. It is this lacuna to which Csikszentmihalyi applied his research interests. In other words, the investigation of the quality of an individual's subjective experience, the within-person experience that made a particular behaviour rewarding. Essentially, what it means to be intrinsically motivated and what it is like to be intrinsically motivated (Seifert and Hedderson 2010).

4.5 Distinguishing Between Research Approaches

Understanding the distinction between these two types of studies and their research interests differentiates Csikszentmihalyi's approach to investigating the phenomenon of intrinsic motivation. Csikszentmihalyi's research interests were distinct and clear:

- How do intrinsic rewards feel, and why are they rewarding?
- Is the phenomenon (identified in artists during his doctoral studies) common among adults in other walks of life?
- Is the deep involvement that people experience a manifestation of an underlying experience so enjoyable as to be a reward in its own right?

The development of these research questions and research interests (namely, the quality of subjective experience) dictated Csikszentmihalyi's approach in terms of research objectives and aims (objectives are those things a researcher is trying to achieve in relation to purpose and aims are those activities (methods and their application) the researcher carries out to realise research objectives). The following sections will be presented chronologically, reviewing each of the methods used as they appear in the literature, covering interviews, questionnaires, the Experience Sampling Method (ESM), mixed methods and observational and experimental approaches.

4.5.1 Interviews

Initially, Csikszentmihalyi wished to discover how people described an activity when it was going particularly well. Importantly, this was limited to people engaging in activities that were strenuous, unpaid, and with little or no recognition. Essentially, activities that were thought to be intrinsically motivated. When Csikszentmihalyi began his research, little was known about the phenomenon under investigation; therefore, a phenomenological method was utilised to develop an appreciation of intrinsic motivation – the qualitative interview.

In the first few years of flow research, Csikszentmihalyi and his students conducted over 200 interviews with amateur athletes, chess players, climbers, cavers, dancers, high school basketball players and music composers. Interviews were chosen as a method to give the study participants the time, space and freedom to answer questions in their *own* voice, using their *own* language and *own* terms, thus allowing the interview participants to feel as if they are engaging in a normal conversation. The utilisation of qualitative interviews facilitated the identification of themes across a range of activities, where the respondents reported a shared experience that was ultimately named — Flow (Csikszentmihalyi 1988). People involved in the interview process often used flow as a metaphor to describe their experience when involved in those activities they found deeply rewarding. Anthropologists call terms such as 'flow' 'native categories'. They are words people frequently use to describe a particular experience (Csikszentmihalyi 1975).

Medicine represents an early application of the interview method when investigating flow in a working domain. Surgeons were asked about their flow experiences while conducting surgery (Csikszentmihalyi 1975). Surgeries are activities with a clear beginning and end. They provide the surgeon with an explicit set of challenges within a very specific domain. The surgery provides immediate feedback, an unambiguous standard of right and wrong, in a situation that demands high levels of concentration and focus. When these characteristics coalesce and are in line with the surgeon's capabilities, the chances that the surgeon will experience flow are increased (Csikszentmihalyi 1993).

For example, an ophthalmic surgeon who specialised in corneal transplants describes how he enjoys the procedure saying, "completely absorbed – never bored or distracted," because the task requires him to be completely meticulous, "Everything is important – if you don't close it the right way, the cornea will be twisted, and vision will be impaired…. It all rests on how precisely and artistically you do the operation" (Csikszentmihalyi 1975:128).

Another early example of interview studies being used to develop an appreciation of people's subjective experience of flow in a context-specific situation can be seen in Jackson (1992). In this study, Jackson utilised interviews to investigate 16 former U.S. figure skating champions' flow experiences. Jackson's study mirrored the purpose and assumptions that drove Csikszentmihalyi in the choice of interviews as a preferred method to investigate flow as a phenomenon of subjective experience. The position adopted by Jackson resides in the juxtaposition of objectivism vs subjectivism. How can psychology be objective when subjectivity is the critical feature of the object of investigation (Csikszentmihalyi 1982). To this end, Jackson utilised an interpretive approach to gain insight into the figure skaters' context-specific experiences. An interview method was used as a way of gathering data. The data comprised the skater's own words in the form of a text. The analysis method was a hermeneutic procedure where the text's global meaning determines the meaning of the text's parts.

Another feature of Jackson's qualitative approach was the development of a protocol so that all of the interviews then followed the same structure:

1. The researcher asks the participant: describe an optimal experience in your skating. An experience you would consider to be the most satisfying personally and which you would like to remember for the rest of your life.

2. The researcher then seeks to elicit more information about the quality of the experience concerning the first question.

3. The challenges and skills of the performance were rated on a ten-point scale – this method is used to identify the degree of flow within an activity.

4. The skaters were then asked if they were familiar with the term flow and its significance to them.

5. The frequency with which they experienced flow was assessed.

6. The skaters were asked what they thought were the most critical factors for them to experience flow.

7. They were then asked which of these factors they perceived as controllable.

8. Finally, they were asked to identify what factors disrupted or prevented flow from occurring.

In addition to the qualitative method, a quantitative assessment was carried out with the skaters (this is reviewed in the mixed-methods section below).

Following this study, Jackson (1996) conducted a further interpretive study that broadened her previous study's scope yet narrowed its focus. Jackson's stated intention was to determine whether athletes from a wide range of sports experience flow similarly or differently from athletes in one particular sport (elite figure skaters). In this study, 28 elite athletes from seven different sports who competed at an international level were interviewed. Hence the broadening of scope from a single sport. The rationale for choosing only elite athletes was manifold; Jackson's stated intention was:

1. More clarity may be obtained by interviewing athletes of a comparable standard of participation.

2. The flow experience may differ for athletes who vary widely in skill and experience.

3. It was thought that athletes operating at a high skill level would be more familiar with the concepts to be discussed than athletes of lesser competency.

4. Also, experienced athletes have an extensive reference base to draw on when thinking about personal flow experiences.

5. Finally, 'purposeful sampling' was an appropriate way of selecting information-rich case studies. This approach was used as a way of focusing the study.

To maintain conformity and consistency across the interviews, Jackson developed a guide. This guide provided an explicit structure for the interviewer to follow across all the interviews. The guide was structured as follows:

1. Participants were asked to describe an experience while engaging in their activity (either training or competing) that stood out as above average.

2. Three quotes were read to participants; each quote described the flow experience to help them understand what was being asked for or react to as a comparison to their experiences (this approach links directly to the flow-q).

3. Finally, the athletes were asked a series of questions about flow. These included:

   a. What were the athletes most aware of during the flow experience?

   b. What were the most distinguishing characteristics of the experience?

Reading quotes that describe the participant's flow experience as used in part 2 of the guide is a common feature of flow research. This approach was originally adopted by Csikszentmihalyi (1975, 1988).

While interviews are not the most common approach for investigating flow, multiple studies have utilised this method when investigating embodiment-type activities: activities involving physical body movement as a requisite feature of the activity. Hefferon and Ollis (2006) applied a semi-structured interview technique to investigate nine professional dancers' flow experiences. Following this tradition, Ryba (2007) investigated subjective phenomenology pertaining to flow and its relationship to enjoyment in children while they engaged in competitive figure skating. Ryba used an unstructured interview method with eight children. This particular approach differs from the one used by Jackson and

Csikszentmihalyi in that it adopts a subjectivist perspective in contrast to an objectivist perspective. The subjectivist phenomenological approach attempts to elicit and contextualise an individual's subjective experience. Ryba (2007:61) writes, "to extract the phenomenon from its context is to fail to account for the articulated totality of the life-world of the individual", where the account of an experience as it ensues in a particular context is the experience.

While several studies have applied interviews to the study of subjective experience in embodiment activities, a paucity of studies have utilised this approach in working environments. Li-Chuan (2010) used a multi-method approach that included interviews as part of the approach to investigate:

1. The impact that Job Characteristics Model (JCM) and personality traits have on an individual's flow experience in a working environment.

2. Whether or not a worker that is in flow helped influence the organisation's overall productivity.

Li-Chuan conducted his study in a Taiwanese consulting company. The study involved five staff members from across the organisation. The interview process was similar to that of Jackson (1996), where the study participants were shown three descriptions of flow as developed by Csikszentmihalyi (1975).

A mixed-method approach incorporating interviews as part of the research protocol was utilised by Ceja and Navarro (2011b) when studying dynamic patterns of flow in a working environment. Their multi-method study utilised semi-structured interviews as one of their preferred methods. Their semi-structured interview was constructed using 29 different questions aimed at collecting information about the person and the characteristics of their job (this relates again to the JCM). This study will be reviewed in more detail in the mixed methods section below.

4.5.1.1 The Variegation of the Qualitative Interview

Kidder and Fine (1987) suggest that qualitative studies span a spectrum between what they describe as small-q and big-Q. In this spectrum, small-q studies can

be regarded as falling within a positivist paradigm, and big-Q studies reside with a constructivist paradigm (Hyett, Kenny, and Dickson-Swift 2014). In other words, while all the studies discussed above are qualitative, their outcomes as a product of the researcher's assumptions and intentions can be very different. For example, Ryba's (2007) stated intention was to develop an appreciation of her study participants in context. Whereas Jackson's (1996) expressed, intention was to identify if people's experiences (identified in an earlier study) were generalisable across similar contexts. Where Ryba's study focuses on developing an in-depth appreciation of an individual's subjective experience directly related to a specific context, Jackson's study focuses on the existence and transferability of a specific phenomenon (flow) across contexts. Each of these studies makes deliberate trade-offs; for example, Jackson's (1992) original study focused on the elite skater's subjective experience. However, to investigate subjective experience across contexts, Jackson (1996) had to develop an entirely different protocol because of the development of her stated purpose. So, where Li-Chuan (2010) study may be regarded as a 'small-q' study, and Ryba (2007) can be regarded as a 'big-Q' study, what is clear is that whatever form the study may take, the researcher's assumptions and intentions should be fully explored in advance of any choice of research method.

This analysis demonstrates that studies are not qualitative or quantitative but are indelibly linked to the purpose of the research and the researcher's philosophical position. Qualitative studies should not be a superficial choice on the researcher's part whether to use words or numbers. Researchers' should employ philosophical principles to inform their choices to connect their expressed purpose coherently with empirical research methods.

Furthermore, there is a need when conducting a study, either qualitative or quantitative, to recognise those principles that, when identified acknowledged and applied, supply guidance and support to the researcher when conducting a research study and alert those people when reading about the study to its quality and trustworthiness as exemplified in Jackson (1996). As Checkland (1999) points out, a methodology is a set of principles that guide the researcher to

identify appropriate approaches and methods for their research. Jackson (1996) identified some of these principles as the only researcher in the studies reviewed above to explicitly include the principles that she adopted to alert the readers of her paper to the study's quality.

4.5.2 Adopting Different Philosophical Principles for Different studies

What the analysis above reveals as it pertains to the various interview methods is the importance of a clear and explicit statement of researcher intentions, the purpose of the research and how the research will be conducted. The principles expressed by Jackson are captured and expressed by Lincoln and Guber (1985). They identify thick description, prolonged engagement, member checks, triangulation, audit trail and peer review as essential principles to safeguard the quality of qualitative research. These principles are essential because human research from a phenomenological perspective includes the assumption that the individuals giving meaning to something or making sense of something generate forms of reality that are meaningful, or more meaningful, to study than physical realities when investigating subjective human experience (Kelly 1955). In comparison, positivist research approaches rely heavily on factors that can be weighed, measured, assessed or otherwise quantified and falsified. Constructivist inquiry shifts the focus from quantification. It moves from tangible or measurable variables to focus on the quality of an individual's social constructions. Social constructions are those qualitative products of meaning-making and sense-making as an emergent product of the individual's actions and interactions with other people and their environment (Burr et al. 2014; Lincoln 2007). Therefore, this movement from positivist to constructivist perspectives requires alternative methods of identifying the quality and reliability of qualitative research.

This perspective is complemented by Tracy (2010), who asks what makes good qualitative research? Tracy's answer is an 8-point conceptualisation that includes a worthy topic, rich rigour, sincerity, credibility, resonance, significant contribution, ethical and meaningful coherence. What can be seen in Tracy's

framework is that the study's credibility and trustworthiness include the elements from Lincoln and Guber. This framework shows that the specific elements that provide credibility to a qualitative phenomenological study can be fitted into a more comprehensive strategic set of guiding principles to develop and design a research project.

Metaphorically speaking, an interview can be regarded as a net cast to gather data. The type, form and size of data gathered will explicitly depend on where the net is cast and the type of net that is cast. It is up to the researcher to construct the net. The researcher must decide the type and size of the line and the exact size of the holes (if the hole is too big, the data will pass through. If the hole is too small, the data will be unmanageable). Additionally, the researcher must decide exactly where to cast the net (whether deployed at a surface level or deployed deeply).

Moreover, while interviews are an invaluable tool to develop an appreciation of a phenomenon's subjective dimensions (such as flow), as Csikszentmihalyi and Csikszentmihalyi (1988:252) write:

"… the limitations of the interview are obvious. Being
retrospective, the interview cannot easily separate the actual
event from the cultural forms and the personal wishes that may
influence its retelling. More than anything else, interviews are
limited by the vagaries of memory and by the difficulty that
persons unsuited to reflection have in reporting events, especially
internal events that only take place in consciousness."

This analysis directly corresponds to Kahneman and Riis (2012) when discussing the experiencing and remembering self.

4.5.3 Questionnaires

The second approach adopted by Csikszentmihalyi and colleagues was the questionnaire. There were multiple reasons for adopting this approach. Firstly, there were several criticisms in the early years of the theory development. The

theory was too "ethereal, bordering on the mystical. It lacked the hard, concrete objectivity that a pragmatic psychological concept should have" (Csikszentmihalyi 1988:11). Secondly, the researchers wished to understand how people from different cultures describe the flow experience in its onset, continuation and how it feels while it lasts. Finally, to identify what kinds of activities make the experience of flow possible and what they suggest about replicating biological and cultural instructions. To this end, Csikszentmihalyi developed the first flow questionnaire, the flow-Q. The intention was to add an element of structure and standardisation to the data collection process. Developing a standard instrument made it possible to uniformly administer and collect data from disparate sample groups.

An example of this can be seen in Massimini Csikszentmihalyi and Delle Fave (1988) when they identified 12 different sample groups from a wide range of cultural and socioeconomic backgrounds totalling 636 people. They included people from the USA, Italy and Bangkok. People living in mountain villages in Val d'Aosta, Northern Italy and people living in Turin, native American students from the Navajo Community College in Arizona, and Mahidol University Bangkok students. The study included white-collar workers, students, cavers, dancers and former drug addicts.

Today, questionnaires tend to be the most enduring and commonly used method when investigating flow, whether they are utilised singularly or used in concert with other methods. These questionnaires often have a closed answering format utilising a Likert type scale. Schiepe-Tiska and Engeser (2017) have identified that there are distinct approaches in questionnaire design:

1. A central component of the questionnaire is the balance between challenge-skill. The opportunities for action in relation to capabilities are assessed to quantify the intensity with which individuals are experiencing flow.

2. Flow is measured by selecting components. Occasionally, new components are added to this method beyond those discussed in Chapter

2. New components are added to measure what the instrument's developers believe flow to be.

3. Flow is assessed by many or all of its components (Chapter 2).

A review of the most prolific and historically significant flow questionnaires follows. These are presented in a synoptic form in *Table 4-5*.

Firstly, the flow-q was developed from the interviews with study participants who represented a variegated demographic who reported a wide range of activities and occupations (discussed above). The interviews produced an abundance of textual descriptions of the flow experience in a wide range of human activities. Some of the best descriptions of the flow experience were then selected and distilled to create the first significant flow measurement questionnaire (Massimini et al. 1988). Essentially, to begin with, the questionnaire was made up of three descriptions of the flow experience, as seen in *Table 4-4*. These descriptions are taken from Moneta (2012:25):

Table 4-4: Descriptions of Flow

My mind isn't wandering. I am not thinking of something else. I am totally involved in what I am doing. My body feels good. I don't seem to be hearing anything. The world seems to be cut off from me. I am less aware of myself and my problems.	My concentration is like breathing. I never think of it. I am really quite oblivious to my surroundings after I really get going. I think that the phone could ring, and the doorbell could ring, or the house could burn down or something like that. When I start, I really do shut out the whole world. Once I stop, I can let it back in again.	I am so involved in what I am doing. I don't see myself as separate from what I am doing.

The questionnaire then followed with:

1. Have you ever felt similar experiences?

2. If yes, what activities were you engaged in when you had such experiences?

3. Please write here the name of the activity—among those you quoted, if any— which best represents the experience described in the three quotations, that is, the activity where you feel this experience with the highest intensity.

4. On the next pages, there are a number of items referring to the ways people could feel while doing an activity (e.g., ratings on the activity quoted in section 4, work or study, or spending time with the family). For each item, please tell us how you feel doing each of these activities.

The questionnaire's primary intention was to measure the frequency with which study participants experienced the flow state. This approach directly relates to flow as a psychological trait – is the participant a flower or non-flower? The flow-q, therefore, asks respondents to see if they recognise the descriptions provided and describe the situations and activities they experienced flow, and then rate their personal subjective experiences whilst they engage in flow generating activities. The five items above show the flow questionnaire's key sections, including the three quotes that describe the flow experience (*Table 4-4*). The second question requires a simple yes or no answer, thus identifying the study participant as either a flower or non-flower. Question 3 onwards was only directed at those study participants who answered positively to question 2. Question 3 asks the participants to list the activities that induced flow for them. Question 4 asks the participants who reported two or more flow inducing activities to select one activity that best represents the experience described in the quotes in question one. Question 5 asks respondents to rate their subjective experience when they were engaged in the best flow inducing activity and in other activities such as work or being with family. This part of the questionnaire utilised Likert scales. These Likert scale questions involved expressions that had merged from previous interviews, such as 'I get involved' and 'I enjoy the experience and the use of my skills'. This section of the questionnaire also included the operationalisation of flow theory pertaining to the FCM (*Figure 4-2*): the subjective 'challenge level of the activity' and the subjective 'skills level in the activity'.

The flow-q is an example of a questionnaire that investigates flow as a psychological trait. The feature that distinguishes the flow-q from other flow questionnaires is that it uses open and closed questions. However, more often than not, flow questionnaires rely solely on closed questions with Likert scales. Some of these questionnaires investigate flow as a state, others as a trait. Some utilise all the characteristics of flow, while others omit some of the characteristics. Additionally, some utilise different characteristics. Out of the thirteen questionnaires in *Table 4-5* below, all the questionnaires use Likert scales of various ranges.

Table 4-5: Questionnaires

Developers	Name	Purpose	Characteristics	Questions
(Jackson and Marsh 1996)	Flow State Scale (FSS)	Measuring flow as a state	All 9 characteristics	Likert scale 0-5, 36 items
(Jackson and Marsh 1996)	Dispositional Flow Scale (DFS)	Measures the frequency with which a person experiences flow	All 9 characteristics	Likert scale 0-5, 36 items
(Jackson and Eklund 2002)	FSS-2 and DFS-2	Measuring flow as a state and frequency with which a person experiences flow	All 9 characteristics	Likert scale 0-5, 36 items
(Jackson et al. 2008)	Abbreviated versions of FSS-2 and DFS-2	Measuring flow as a state and frequency with which a person experiences flow	All 9 characteristics	Likert scale 0-5, 9 items
(Bakker and Schaufeli 2008)	Work-Related Flow Inventory (WOLF)	Designed to measure flow in a work context	Uses 3 characteristics derived from descriptions of flow.	Likert scale 0-7, 13 items
(Schwartz and Waterman 2006)	Flow Experience Scale (FES)	To measure the subjective experiences immediately present when a person is fully engaged in an activity.	Uses 8 of the characteristics of flow. Does not include	Liker scale 1-7, 8 items
(Engeser and Rheinberg 2008)	Flow Short Scale	Applied to measure flow during all activities	All 9 characteristics Plus 3 items to measure perceived importance	Likert Scale 7point, 10 items (plus 3)
(Guo and Poole 2009)	Human-computer interaction in an online shopping experience	Measuring flow as people engaged in an online environment	Posits flow including its 9 characteristics with the addition of environmental complexity affecting both antecedent and flow	Likert scale 0-7, Over 50 items (some derived from FFS)

Table 4-5 continued.

(Payne et al. 2011)	Activity Flow State Scale (AFSS)	Derived from FSS for generalisation across activities and populations, as some items did not translate well from sports	Uses all 9 characteristics of flow. Derived from FSS	Likert scale 0-5, 36 items
(Redaelli and Riva 2011)	Flow for Presence Questionnaire (FPQ)	Measuring the presence and flow state of the users of technological devices.	Part 1: contains 3 descriptions of optimal experience (as in F.Q.). Part 2: A self-selected. Part 3: Derived flow-q	Likert scale 0-5
(Yoshida et al. 2013)	The Flow State Scale for Occupational Tasks	The degree of a patient's absorption in tasks as a measure of rehabilitation effectiveness	All of the characteristics of flow with the additional question addressing boredom directly. Derived from FSS	Likert scale 1-7, 14 items
(Wilson and Moneta 2016)	Flow Metacognition Questionnaire (FMQ)	Measuring people's belief in flow as a beneficial state. Their abilities for achieving and maintaining flow.	Utilises a different set of characteristics derived from research.	Likert scale 0-4, 12 items
(Thissen et al. 2018)	Reading Flow Short Scale (RFSS)	A reading specific measure of flow.	Derived from the FSS	Likert scale 1-7, 8 items

An analysis of the questionnaires in *Table 4-5* reveals that the questionnaires are predominantly derived from characterisations and descriptions of flow from two central routes. The first is derived from Jackson and colleagues, and the other is from the flow-q of Csikszentmihalyi. The exception to this is the flow metacognition questionnaire of Wilson and Moneta (2016), who developed a complementary set of meta-characteristics. For the most part, these questionnaires use all the 9 characteristics of flow, including the capability-challenge ratio. By using the characterisations of flow and applying Confirmatory Factor Analysis (CFA) and, in some cases, Expandatory Factor Analysis (EFA),

the questionnaires become a direct measure of positive flow state or trait (depending on the instrument) to produce psychometrically robust measures (Moneta 2012).

Additionally, it can be argued that the characterisation of flow presented by Bakker is overly reductive. For example, Bakker's characterisation fails to take control into account a requisite element when regarding work-related flow.

However, while the application of questionnaires within flow research is widespread, they have some methodological and practical limitations when investigating the phenomenon of flow. The first problem occurs in what Kahneman and Riis (2012) regard as the remembering self and the experiencing self. The issue that underlies this problem is that flow is an experiential state of being (meeting challenges and developing skills). The central feature of flow, as discussed previously, is 'a loss of the sense of self'. This characteristic of flow produces a conundrum – if the individual loses themselves to the activity and in so doing loses their sense of self, how does the person retrospectively respond to a questionnaire investigating an experience for which they have no clear memory or a memory that is tarnished somehow? As Kahneman and Riis point out, the remembering self is dominant to the experiencing self, and the "remembering self is sometimes simply wrong" (2012:286).

A second issue with questionnaires and investigating the phenomenon of flow as an experiential state is expressed by Westmarland and the issue of having a series of predefined close questions measured on a Likert scale – "the questions not asked can influence the research findings as much as the questions asked" (2001:5). As discussed above, assuming characteristics at the between person-level will not necessarily transfer to the within-person state level of analysis. Simply rewording a question in a questionnaire to move between state and trait levels of analysis may not be sufficient to adequately investigate flow at the first-person intra-subjective level of analysis. Finally, these questionnaires force flow on study participants Moneta (2012).

An additional issue arises when using flow questionnaires to measure flow as a psychological trait, such as in the DFS in *Table 4-5*. Not only is this questionnaire

applied at the between-person level (frequency), it asks questions in terms of the characteristics of flow (see *Table 2-1*), rather than in terms of meta-cognitive skills as discussed above in *Sections 4.2.2* and *4.2.3*. This analysis would appear to be problematic for the measurement of the flow trait using these questionnaires.

4.5.4 Experience Sampling Method (ESM)

The purpose of the two methods discussed above, interviews and questionnaires, is to develop an appreciation of people's experience of flow in social scientific terms. Interviews are aimed at the phenomenon of flow – what it is like for people to be in flow. Questionnaires are a uniform (psychometrically robust) way of measuring flow (state and trait) across divergent populations. However (as discussed above), flow is a transitory state that fluctuates in relation to changes in environmental conditions. The ESM was developed to understand and develop an appreciation of people's overall life experiences in work, school, and home. Beal (2015:4) defines the ESM as "a representative sampling of immediate experiences in one's natural environment". An ESM is a sampling design involving intensive repeated assessment with brief intervals over a period of time – studies lasting from 5 days to two weeks with intervals ranging between 1 hour and once a day. This description of ESM is intended to provide only a flavour of ESM.

Moreover, Beal (2015) suggests that the ESM is an overarching term that covers a wide range of methods, the purpose of which is to capture the first-person / within-person experiences of people as they occur in their natural environments. This approach is exemplified in Peifer et al. (2020). In summary, two studies were conducted. The first study used an online survey of 93 employees. However, the second study used a diary method involving 149 participants to record their experiences in the morning, after work and before bed. Moreover, a diary method was used to investigate interest as a moderator in balancing capabilities and challenges in relation to work-related flow (Bricteux et al. 2017). However, this section will focus on the ESM as developed by Csikszentmihalyi and colleagues.

Again, like questionnaires investigating a single state or trait of experience, the ESM was a uniform way of investigating people's lived experiences across a

diverse range of populations. This uniformity was achieved in the ESM with its explicit conceptual framework and standard methodology. The theoretical model was derived from the relationship between individual capabilities and challenges. The shared methodology became known as the ESM (Csikszentmihalyi and Csikszentmilhalyi 1988). The expressed intention of developing the ESM as a tool was to develop a method to enhance the resolution of people's lived experiences as they engage in their everyday activities.

However, in its initial application, the ESM produced such a rich and detailed description of everyday life that the study's initial purpose – investigating flow was placed on hold. Instead, the data from 107 workers in Chicago was used to provide a detailed description of people's daily activities. Such was the nature of the data that the ESM produced an array of unexpected questions. For example, were the responses to the ESM culturally specific? During the first decade of the ESM, research was predominantly data-driven, not concept-driven (Csikszentmihalyi and Csikszentmilhalyi 1988). This first decade of the ESM saw Csikszentmihalyi and Larson's (1986) investigate adolescents' subjective internal experiences as they engage in their daily activities. Moreover, the ESM was the instrument used by Massimini, Csikszentmihalyi and Carli (1987) when developing the Experience Fluctuation Model (EFM – see Chapter 2, *Section 2.3.2*). The ESM did not become the concept-driven instrument for which it was initially intended until the latter part of the 1980s.

Since then, the ESM has been applied to investigating flow and people's experience of being in school (teachers and pupils) (Asakawa 2004; Bassi et al. 2007; Bassi and Delle 2012; Bassi and Delle Fave 2012; Shernoff et al. 2003). Moreover, people's experience of work from various perspectives has been investigated by applying the ESM (Ceja and Navarro 2009; Engeser and Baumann 2016; Fullagar and Kelloway 2009; Nielsen and Cleal 2010; Peifer and Zipp 2019). Sartori et al. (2014) used the ESM to investigate patients' quality of experience while in hospital. Additionally, Delle Fave, Bassi and Massimini (2003) used the ESM to investigate the experience of mountaineers on an expedition to

the Himalayas. A location that would have been exceptionally difficult for the researchers to be present.

4.5.4.1 How Does the ESM Measure Flow?

The ESM is a single questionnaire (often referred to as a form) that is completed at multiple points over a day for a set period of time, say a working week. Originally, study participants were provided with a pager and a book containing the requisite number of forms for the study. Every time the pager beeped, the participants would complete the next form in the book. Typically, the participant is signalled 7-8 times a day for the period of a week (or whatever period the research is focusing on): producing anywhere between 49 and 56 forms representing the participants experience at a given moment. While technology has added a hint of sophistication, the process effectively remains unaltered. Each form contained open and closed items, including location and activity, subjective experience, mood and physical condition.

Figure 4-3: Exerts of Early Experience Sampling Form

(adapted from Csikszentmihalyi and Csikszentmilhalyi 1988:255).

<u>As you were signalled:</u>

Date: _____   Time   Signalled: Time   filled   out:
                       _____   _____

1. Where were you signalled?

2. What were you doing?

3. What are you thinking about?

Figure 4-3: continued.

<u>Subjective experience:</u>

	no	some	quite	very
How well were you concentrating?	• • • • • • • • • •			
How self-conscious were you?	• • • • • • • • • •			
Were you in control of your actions?	• • • • • • • • • •			

<u>Mood:</u>

	very much	quite much	somewhat	do not feel either	somewhat	quite much	very much	
hostile	•	•	•	•	•	•	•	friendly
alert	•	•	•	•	•	•	•	drowsy
happy	•	•	•	•	•	•	•	sad
tense	•	•	•	•	•	•	•	relaxed

<u>Physical:</u>

	none	slight	bothersome	severe
headache	• • • • • • • • • •			
body ache	• • • • • • • • • •			
other physical symptoms	• • • • • • • • • •			

<u>Were you:</u>

Alone ( ) with friends ( ) with co-workers ( ) with supervisor ( ) with family ( ) with strange ( ) other …

Figure 4-3: continued.

<u>How you felt about what you did:</u>

	no	some	quite	very
Challenges about the activity	• • • • • • • • •
Your skill in the activity	• • • • • • • • • •
Would you wish you had been doing something else	• • • • • • • • • •

<u>What do you remember since you were last signalled:</u>

_____ daydreaming

_____ talking, whistling or singing to yourself

_____ watching people or things or staring into space

<u>To be filled out every 24 hours:</u>

Time you went to bed last night: _____

How long did you take to fall asleep: _____

Time you woke up this morning: _____

Overall, the original Experience Sampling Form (ESF) contained 30 measurement points to base the respondents' subjective experiences. As shown in *Figure 4-3*, the form asks the participant what they are doing at a given moment. This question includes the context, aspects related to interest, motivation, mood, physical condition, the participants' thoughts, and the quality of the participants' sleep. Moreover, the form asks some questions about the

components of flow in terms of challenges and capabilities (skills) and concentration levels.

However, even though the ESM gathers some of the flow characteristics, these characteristics are not used to measure flow. Csikszentmihalyi and colleagues chose a different path. While how happy, concentrated, or amount of control a participant experienced correlates with a person's experience of flow, measuring flow in this way would equate to measuring flow as positive states of consciousness, such as happiness or high concentration. It was thought that this would be a synthetic relationship between flow and other positive, conscious states. To overcome this correlation, flow was defined in terms of a balance between challenges and capabilities. "This ratio has been one of the fundamental features of the flow model (operational – Chapter 2, *Section 2.3*), and it was (i.e., analytically) independent of how happy, concentrated, motivated, or strong a person felt" (Csikszentmihalyi and Csikszentmilhalyi 1988:254). By making this critical theoretical step of developing an analytic relationship the study of flow that had been critiqued for its lack of rigour in its early developmental stages, flow theory became amenable to falsification and rigorous empirical testing (Popper 1959).

Having distributed the ESM and gathered thousands of self-reports from study participants, the relationship between challenges and capabilities was successful in its predictive quality in relation to flow and intrinsic motivation. However, the balance of challenge and capability ratio failed to predict other critical features of flow theory. This failure of the balance between challenges and capabilities to predict other outcomes of flow caused consternation for flow theorists. The theoretical breakthrough came when a Milanese team of researchers under Massimini developed the idea that flow only ensues when challenges and capabilities are balanced and above a certain level. This operationalisation of the challenge-capability ratio was the threshold above which the optimal experience should occur. By transforming the participant's raw scores into z-scores, when the reported challenges and capabilities (skills) were greater than the

participant's average, they were classified as experiencing flow (Schiepe-Tiska and Engeser 2017).

This new development in the theory of flow (at that time) demonstrates the importance of synthetic and analytic relationships between theoretical concepts and their predicted outcomes and the limitations of methodologies and methods in developing and testing theory. Moreover, this analytic relationship is not limited to ESM is also applied in experimental settings (discussed below). Additionally, the balance between challenges and capabilities can be thought of as being informative about other subjective experiential states.

However, the balance between challenges and capabilities is far from perfect as a tool for predicting experiential states. What is seems to be needed is a combination of measurement metrics that combine both componential and operational measures.

4.5.4.2 Difficulties in Applying ESM

All methods come with their benefits and their limitations. The ESM is no exception. The benefits of the ESM have been described above over other single measurement studies. However, the ESM has problems with its implementation that other methods do not have. Perhaps the most significant of the issues is the additional burden that study participants face when engaging in ESM studies. As ESM studies typically measure the same set of parameters at multiple intervals throughout a day, completing the ESF becomes another task (challenge) for respondents to achieve in an already busy and challenging day. When these studies may continue for a week or more, the participant can experience excessive fatigue as a consequence of engaging in these studies. It has been shown that excessive fatigue can reduce response rates, thoughtless responding, or subject manipulation of the responses. Responding in a way that interferes with an accurate account of the respondents' experience is exemplified in Meade and Craig (2012).

In summary, Meade and Craig identified two different forms of what they describe as 'careless responses' patterns, random and non-random. The first type of

pattern resulted in participants randomly selecting their responses. The second type of pattern resulted in participants responding in a recurring pattern. These forms of participant response can result in poor quality data. Moreover, studies such as Dale and Hagen (2007) have reported how study participants are not perturbed by repeated assessment.

Another limitation to this form of assessment resides in the study participants foreknowledge of what they will be asked. For example, suppose a worker knows that they will soon be asked how they experience a particular challenge (personal appraisal). In that case, foreknowledge may affect how they respond to the particular event, how they interpret the nuances of the event and altering how they feel as a result of the event (Barsky, Kaplan, and Beal 2011). This issue of foreknowledge is particularly salient to the study of flow. If study participants become overly attentive to their experience of the activity, being aware of their level of awareness directly conflicts with the ability of the individual to experience flow. Indeed, "being absorbed in the activity, individuals are not aware of themselves as separate from the actions they are performing" (Delle Fave et al. 2011:45). By focusing attention on their experience in the course of an activity, the individual may inadvertently interfere with the experience – flow can be a fragile state of experience. Moreover, should the study participant be signalled during a flow experience, the participant will cease to be in flow, disrupting their experience and adversely affecting what the study is attempting to investigate. Finally, while the ESM is a method capable of producing a rich and detailed data set, the ESM as a repeatedly presented questionnaire is subject to all of the limitations of questionnaires described above.

4.5.5 Observational Methods of Assessing Flow

Flow is described as a fragile experiential state of complete absorption in an activity. All the methods discussed above rely on investigating the phenomenon after it has occurred (requiring a period of self-reflection and assessing the experience retrospectively) or interrupting the phenomenon as it occurs. In contrast to these declarative methods, non-declarative methods have been used since the inception of flow theory. Csikszentmihalyi (1988) used observational

methods when studying artists during his doctoral research. Observational methods have been used to assess children's flow experience while playing music (Custodero 1998, 2005). In conjunction with a questionnaire, direct observation was used as an evaluation method to assess the efficacy of introducing a game to enhance medical students' ability to learn microbiology (Beylefeld and Struwig 2007). Finally, Seifert and Hedderson (2010) began studying skateboarders using observations of the skateboarders to structure their interviews. The purpose of the study was to develop an appreciation of the intrinsic motivations of the skaters.

All of the observational studies mentioned above have been qualitative studies that tend towards the big-Q end of the spectrum (Kidder and Fine 1987). However, observational methods are not limited to big-Q studies. Observational methods have been used in experimental studies investigating flow. For example, Chapman and Reithel (2015) used an experimental approach and observation as a means of rating participant responses to a simulated experience. Video footage from cameras in the study participants' computers was reviewed to identify and code the individual participant's responses to variations of the independent variables.

While observational methods are predominantly associated with qualitative research, Chapman and Reithel (2015) demonstrate how different methods can be orchestrated to produce a focused research design strategy. In their study, Chapman and Reithel combined observation with an experimental approach. This study demonstrates how particular methods are not limited to a particular research paradigm. Indeed, Moller, Meier and Wall (2013) have argued that the majority of research investigating flow has been correlational and that what is needed is more experimentation. This conclusion is supported by Šimleša et al. (2018). What follows is a brief review of studies that have employed experimental approaches to investigate the phenomenon of flow.

4.5.6 Experimental Studies

The Oxford Dictionary of English (2010:245511) describes an experiment as "a scientific procedure undertaken to make a discovery, test a hypothesis, or

demonstrate a known fact". As the definition demonstrates, experiments play three significant roles in scientific investigations. Generally, experiments involve establishing some level of control and manipulating one or more variables of interest to establish or track some form of cause and effect (Alberts and Hayes 2002). The common theme that differentiates the experimental studies from all of the methods previously discussed is the researcher's deliberate manipulation of experimental variables to identify effects and causal relationships. Each of the following studies shares an experimental approach to investigating flow. Moreover, each of these experimental studies utilises some form of flow questionnaire to identify the study participants' flow experiences.

Experimental research investigating the phenomenon of flow utilises some form of controlled challenge activity or simulated environment that investigates people's flow experience. An early experimental study that departed from the more traditional paradigm of investigating flow – correlational methods in natural, everyday environments was developed by Keller and Bless (2008). In summary, a computer game (Tetris) was used as the bespoke challenge activity to investigate the study participants experience of time and their level of involvement and enjoyment in the activity. The experiment's central theme was to investigate the participants experience at three levels of challenge – low, medium and high. The theoretical model utilised to develop the experiment was the FCM. At the low level of challenge (boredom condition), participants were expected to experience negative affect (boredom). At the medium level of challenge (adaptive condition), the participants were expected to experience flow. In the high level of challenge (overload condition), participants were expected to experience negative affect. This hypothesis was tested in two ways 1) 72 participants played Tetris at all three levels of challenge, and 2) 149 participants were randomly divided into three groups, and each group played Tetris at a specific level of challenge. The results of the experiment confirmed the hypothesis.

Using computer games to expose study participants to a known level of challenge is a common theme in flow experiments. Chess (computer game) was used by Tozman, Zhang and Vollmeyer (2017) to investigate the correlation between flow

and cortisol. Again, this study used the FCM as a theoretical foundation to structure the experiment and split the degree of challenge relative to capability into three low, medium and high (underload, fit and overload) groups. The participants' capability was assessed using their ELO score (named after the physicist Arpad Elo). This scoring system provided an appropriate way of manipulating the challenge-capability ratio and sorting the payers into one of the three challenge groups. The study's results showed that cortisol levels were affected by the capability challenge level manipulations. Participants in the overload group (high challenge relative to capability) showed higher cortisol levels than the participants in the group with a match between challenges and capabilities. Moreover, the experiment confirmed the researcher's hypothesis and the 'U' shaped profile of cortisol release and the participants level of absorption (a characteristic of the flow experience) in the challenge activity.

Yoshida et al. (2013) is another example of computer games used to manipulate the independent variable. In this experiment, the participant's experience of the challenge was used to develop a questionnaire as a quantitative assessment instrument to evaluate the alignment of occupational tasks to aid people rehabilitation. Moreover, picture puzzles were used to investigate the mitigating effect of teamwork and flow proneness in relation to high levels of challenge. A flow questionnaire was used to identify the participant's flow experience (Tse et al. 2018). Findings: even though high levels of challenge are negatively associated with flow, team games helped mitigate the negative effect between high levels of challenge and the flow experience.

Ulrich et al. (2014) applied a similar research protocol to the abovementioned studies. They subjected 27 study participants to a challenging activity (mental arithmetic using a computer) across three levels of challenge low, medium and high (boredom, flow and overload conditions). However, the feature of the analysis that differentiates Ulrich et al. from the previous studies is the application of functional magnetic perfusion imaging to identify activity in particular brain regions. The study's results showed that the flow experience was associated with relative increases in activity in the left anterior inferior frontal gyrus and the left

putamen. Additionally, decreases in neural activity were observed in the medial prefrontal cortex and the amygdala. The study concluded that changes in these regions of the brain map with the psychological characteristics of flow: a deeper sense of cognitive control, decreases in self-reference (loss of sense of self), and decreased negative arousal.

While the studies above can be described as experimentally testing theories derived from correlation studies, several experimental studies have investigated the flow experience and its relationship to stress. Peifer et al. (2014) investigated the relationship between people's experience of flow and physiological arousal in a simulated stressful environment. The study involved a sophisticated experimental protocol that comprised of three distinct stages 1) a training exercise, 2) induced stress using Trier Social Stress Test, and 3) performing the cabin air management system (CAMS) in the simulated test. Moreover, to maintain stress levels, the participants were told that the CAMS test was a predictor of future job success, and the session would be videoed. Following the protocol, the participants were asked to complete a flow questionnaire. Of the three hypotheses the experiment set out to investigate, only the second hypothesis in the second half of the experiment was not confirmed. This outcome was due to the study participants stress levels reducing at the end of the experiment. However, overall, the results supported the relation between flow-experience and sympathetic hypothalamic–pituitary–adrenal (HPA-axis) in an inverted u-shape.

4.6 Evaluation of Correlational and Experimental Methodologies

The distinction between correlational and experimental methodologies from the perspective of this doctoral research project resides in the natural environments of correlational studies and the simulated environments of experimental studies. The correlation studies investigating a person's daily experiences are akin to anthropological studies. In contrast, experimental studies are closer to what might be expected in a natural science laboratory. However, on close examination, these methodologies are not competing but represent an iterative complimentary research strategy. The purpose is to develop a rich picture of human actions,

behaviours, and experiences – to identify what is shared between people and that which is different and to identify the correlations and causes of positive human functioning (positive psychology – flow theory).

The relationship between correlational and experimental methodologies can be seen in experimental approaches using methods of measurement developed with correlational methodologies. For example, Tozman, Zhang and Vollmeyer (2017) used the FSS (Engeser and Rheinberg 2008) and Keller and Bless (2008) used a flow questionnaire to evaluate specific characteristics associated with people's experience of flow. Moreover, several experimental studies have used theoretical foundations (FCM) developed in correlational studies (Keller and Bless 2008; Peifer et al. 2014; Tozman et al. 2017). Additionally, experimental studies have directly tested the characteristics of flow developed from qualitative, correlational studies against what is known of neural activity and chemistry (Peifer et al. 2014; Tozman et al. 2017; Ulrich et al. 2014).

These experimental findings support the core findings of correlational studies. This intern helps to continue the cycle of research in naturalistic environments. Allowing researchers conducting those studies to have increased confidence in the validity of the instruments they apply.

However, no matter the methodological approach, research will always be limited by the theoretical foundations it adopts and the sensitivity of the instruments it utilises. This problem is exemplified in all bar one of the experimental studies described above. All of the experiments manipulated challenge in terms of boredom, flow/adaptive and overload. In other words, the independent variable can be thought of as being low, medium and high, and the corresponding dependent variable being boredom, flow and anxiety. This theoretical, experimental model is a description in prose of the FCM (see Chapter 2). When this theoretical model is compared to the Experience Fluctuation Model (Massimini et al. 1987), it can be clearly seen that far more experiential states exist around the state of flow before the states of boredom or anxiety are reached. Therefore, in these terms, manipulating the independent variable to identify

fluctuations in the study participants experiential states by using only three levels of challenge equates to hitting the challenge variable with a large hammer.

Moreover, identifying fluctuations in individual subjective experience requires instruments that are sensitive to variations in subjective experience. This situation is problematic because flow questionnaires are precisely calibrated to identify flow. They are not calibrated to identify control or arousal. This problem is compounded when the simulated experimental environments are considered and compared to the natural environments of correlational studies. This problem is exemplified in Peifer et al. (2014). In this study, the researchers could not confirm their second hypothesis because the participants artificially induced stress levels dropping below the threshold, making confirmation of the hypothesis impossible. While this inability to confirm the hypothesis cannot be regarded as evidence of absence, it can be regarded as the absence of evidence.

The inability of the researchers to maintain the participants' stress levels is, to some extent, related to the simulated environmental conditions. To what extent did the study participants have 'skin in the game' (see Taleb 2018). That is to say, what did the study participants honestly believe was personally at stake? Weisinger and Pawliw-Fry (2015) make the distinction in this instance between stress and pressure:

1. Stress is experienced when we perceive multiple different approaches to challenge.

2. On the other hand, pressure is experienced when a challenge is characterised by a single, critical (make-or-break) course of action.

Here we see that Weisinger and Pawliw-Fry provide an explicit boundary between stress and pressure: a person under stress becomes 'pressured' when their options and alternatives are reduced to a single make-or-break course of action (see Chapter 5, *Section 5.4*). This distinction between stress and pressure shows the difficulty experimental researchers face when trying to induce stress when the participants feel that they have nothing to lose as they do in their natural day-to-day lives.

4.7 Findings

The literature review revealed:

1. Work is required at the methodological level for flow to be regarded as a complementary theory with other work-related constructs (Fullagar et al. 2017).

2. Methodological approaches intentionally pre-orientate study participants to the state or trait of flow. This approach acts as a form of biasing, orientating study participants to the subjective experience under investigation and may impede the participant's ability to express any other form of subjective experience. This can be seen in interview techniques questionnaires such as the Flow Questionnaire and the Flow Metacognitions Questionnaire.

3. Studies are needed to identify fluctuations in a person's subjective experience as they engage in challenging activities (Šimleša et al. 2018; Xanthopoulou 2017).

4. There is an overreliance on correlational methods to identify people's subjective experiences. That is to say, studies rely solely on the testimony of study participants. This approach is exemplified in study participants evaluating the level of challenge they feel they are experiencing (Šimleša et al. 2018).

5. The various methods in the form of questionnaires used to identify subjective experience either in terms of state or trait are precisely calibrated to identify and measure quantitatively either the state or trait of flow and cannot appropriately capture any other experiential state or trait.

6. The quality of subjective experience is far more complex and nuanced than can be expressed in the numbers emerging from quantitative studies. Therefore, there is a need for more qualitative studies investigating what is it like to engage in challenging activities (Fullagar et al. 2017).

From these findings, two interdependent and interrelated research questions were developed:

- RQ-1 – Is it possible to encode a person's signs and symptoms of being in flow and moved out of flow state through the various instances and absences of states?
- RQ-2 – What effect does challenge have on a person's subjective character of experience?

The first research question (RQ-1) was developed as a direct response to points 1, 2, 3 and 4 above. If flow theory is to extend beyond studies that:

- Specifically investigate flow in terms of state and trait

- Bias participants to flow (state and trait) with explicit descriptions (as exemplified in the flow-q)

Then it is necessary to design studies that investigate a broader range of experiential states as depicted in the New Synthesised Model of Experience (see Chapter 3) and then deliberately and explicitly vary the level of challenge experienced by a study participant to identify fluctuations in subjective experience.

The second research question (RQ-2) was developed in response to points 4 and 5 above. Flow is measured quantitatively as an experiential state or psychological trait, excluding the nuances and fluctuations of subjective experiences relative to fluctuations in a challenging activity.

This literature review has defined the knowledge gap outlined above. It highlighted the limitations in the formal approaches (methodologies) used to investigate subjective experience and the measurement methods used to capture a person's subjective experience of a challenging activity. By adding definition to the knowledge gap, this literature review fulfils objective 1b and clarifies the knowledge gap 3a and 3b (*Table 1-1*).

Therefore, this literature review on the methodologies and methods for capturing flow and the relationship between challenge and capability directly fulfils the

requirements of objective 1b and begins the process of addressing part 3 of the knowledge gap. The review clarifies the boundaries of the knowledge gap and facilitates the development of the research questions. These questions provide an explicit focus for the research and demonstrate the contribution made by this doctoral research project to the body of knowledge.

4.8 Chapter Summary

This chapter was the third of four theoretical chapters developing the theoretical foundations of this doctoral research project. This chapter aimed to review the literature on flow as it pertained to the expressed purpose of this PhD: to investigate the balance between challenges and capabilities to identify the thresholds at which imbalance occurs. Therefore, this chapter solely focused on the theory, methodologies, methods and practices applied in flow theory.

The chapter began by reviewing the literature pertaining to flow as a transitory experiential state and a psychological trait and the difficulties researchers face investigating the phenomenon, particularly from the perspective of capturing work-related flow in organisational environments.

Following this, the chapter investigated the literature in terms of the theoretical implications of capturing a person's lived experience of challenge and the ways challenge caused an individual's intra-subjective experience to fluctuate. This section then moved on to distinguishing between research approaches.

The next section of the literature review focused on the various methods researchers use to investigate flow, such as interviews, questionnaires, ESM, observational methods and experiments. The review's final section evaluated research methodologies between naturalistic correlational studies and experimental methodologies.

Finally, the chapter presented the review's findings from the perspective of the research problem. The review concluded that there is a need for more qualitative studies investigating the fluctuations of people's lived experience in challenging environments but that current methods of capturing these fluctuations are inadequate. From this perspective, two interrelated research questions were

developed that directly pertain to this PhD's research problem. Moreover, by conducting a literature review of the theory, methodologies and methods of investigating the phenomenon of flow, this chapter addresses objective 1b and clarifies the knowledge gap 3a and 3b (*Table 1-1*).

The following chapter, Philosophical Perspective, is the fourth chapter in a series of four chapters that develop the theoretical foundations of this research project. This chapter will use the research questions developed in this literature review to develop a detailed account of this study's philosophical position.

Chapter Five

Philosophical Perspective

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*The aim of philosophy, abstractly formulated, is to understand
how things in the broadest possible sense of the term hang
together in the broadest possible sense of the term.*

Wilfred Sellars 'Philosophy and The Scientific Image of Man' (1963 p1)

5 Introduction – Philosophical Perspective

This chapter directly follows the literature review – theory, methodologies, and methods of capturing flow (Chapter 4). It is the fourth and final chapter locating this doctoral research project within the theoretical landscape of flow theory and research. This chapter focuses exclusively on philosophically locating this research project within the domain of social science research with the explicit intention of realising objective three (see *Table 1-1*).

Chapter 4 concluded with the development of two interrelated research questions:

- *RQ-1: Is it possible to encode a person's signs and symptoms of being in flow and moved out of flow state through the various instances and absences of states?*
- *RQ-2: What effect does challenge have on a person's subjective character of experience?*

This chapter seeks to contextualise and locate this PhD within the broader philosophical research traditions. The research is grounded in a realist philosophical perspective and utilises two contrasting yet complementary research paradigms from which to view and investigate the research questions.

With respect to the ontological view of reality, the philosophical position will be reviewed thoroughly as part of the broader realist paradigms between the shared characteristics of Interpretivism and Critical Realism (Blaikie and Priest 2017). To clarify this position as a means of identifying the nature of subjective experience as being ontologically distinct and irreducible to epistemology. A detailed analysis of the works of Isaac and O'Connor (1978), Buber (1970), Levinas (1969) and Nagel (1974) will be conducted as a necessary means for the researcher to come to terms with the study participants.

Moreover, this chapter combines the New Synthesised Model with the work of Weisinger and Pawliw-Fry (2015) and Smith (2007) to develop an explicit method that distinguishes between stress and pressure. This combination facilitates an operational move from the theoretical implications of stress and pressure to an

empirical application. The chapter is concluded with a discussion on researcher world views and their relationship to the research participants.

5.1 Paradigms: The Philosophy of Science

Philosophical assumptions, logics of enquiry and strategic approaches to research design reside within the broader theoretical frameworks known as 'paradigms'. The theoretical and methodological foundation upon which social science research is based occurs as the product of these paradigms, which often reside in research traditions specific to certain domains. These traditions develop over a period of time as the result of a concerted focus by researchers into a specific domain of research. They tend to be referred to as 'research paradigms' (Blaikie 2010).

Kuhn (2012) coined the term 'paradigm' to mean the collection of beliefs, values, principles and biases adopted by a particular research community. Paradigms are characterised by a shared set of underlying values and beliefs, with collective commitments, practices, exemplars and representational generalisations in the form of models. They provide groups of researchers in specialist domains with the opportunity to solve problems by producing novel, original and ground-breaking work.

Howell (2012) differentiates between paradigms by assigning clear indicators to their ontological assumptions about the nature of reality (what exists) and their epistemological assumptions about knowledge and how knowledge of reality can be obtained. In other words, the relationship between the researcher and the phenomena under investigation.

Paradigms and the philosophy of science, in general, have become one of the most animated discussions in social scientific research (c.f. Collins and Pinch 1993; Pluckrose and Lindsay 2020; Sokal and Bricmont 1996), which complicates the literature with nuances and subtleties that are challenging to integrate. As a consequence, contemporary debate centres on whether it is possible a) to utilise the same principles, practices and methods to study the natural and social worlds,

b) whether they are inherently similar or profoundly different, and c) how to establish the validity of claims made by these social scientific studies (rigour).

That is to say, can the natural and social worlds be studied utilising the same ontological and epistemological assumptions? Moreover, can or should they be studied using the same methods?

Fundamental to the design of this PhD research project is the adoption of two paradigms (and therefore also two distinct logics of inquiry definitive of each paradigm) that provides perspective on three interrelated aspects of this study:

1. The research problem is viewed from two interrelated perspectives.

2. Each of the research questions is viewed from a distinct perspective.

3. The results of the research can be regarded from two explicit perspectives.

5.1.1 Research Paradigms Adopted in this Study

Blaikie (2007) identifies four classical and seven contemporary research paradigms in the philosophy of science. For expediency, only three will be touched upon in this chapter (see Bhaskar 2008; Blaikie and Priest 2017) (two of which were finally settled on to provide the distinct perspectives mentioned above).

The three paradigms discussed here have been examined because they are related in terms of their realist philosophical perspective. They are important for their relationships with each other within their realist philosophical perspective.

The first paradigm is Neo-Positivism, which claims that "Reality has an existence independent of the human mind. However, direct access to this reality is not possible" (Blaikie and Priest 2017:60). Neo-positivism is most concerned with causal explanations (developing new theory) for observed regularities or patterns. However, because the present research is not concerned with identifying or producing a new theory, the Neo-positivistic paradigm is set aside in favour of the following two paradigms. By contrast, these paradigms aid in the purpose of this research: to analyse the signs and symptoms (typified

descriptions) that emerge at the complex conjunction between capabilities and challenges; and the underlying mechanisms that influence people's experience of challenge.

The second, Interpretivism (Transcendental Idealism), was originally formulated by the philosopher Immanuel Kant. This position contends that "social reality is made up of shared interpretations that social actors produce and reproduce as they go about their daily lives. Idealist ontologies differ in the extent to which the existence of an independent external world is acknowledged and, if so, whether or not it contains or facilitates social activity. Mainstream Interpretivism focuses more on the degree to which social actors agree or disagree about the nature of their social reality, rather than on whether it has an independent existence" (Blaikie and Priest 2017:103–4).

The third and final paradigm, Critical Realism (Transcendental Realism), is where "Social reality is viewed as a socially constructed world in which either social episodes are the products of the cognitive recourses that the social actors bring to them (Harré) or social arrangements that are the products of material but unobservable structures of relations (Bhaskar). Unlike natural structures, social structures are less enduring and do not exist independently of the activities they influence or social actors' conceptions of what they are doing in these activities" (Blaikie and Priest 2017:182).

The underlying theme that links each of these paradigms is the assumption of the existence of a real world. What differentiates each of these paradigms is the extent to which it is possible to access and gain knowledge of that world.

5.1.2 Adopting Multiple Theoretical Perspectives as a Research Strategy

In this regard, Howell (2012:703) argues that though "approaches initially seem exclusive, when we examine them in more detail they may be considered inclusive and provide the opportunity for mixing theoretical perspectives to attain explanation and understanding of phenomenon". By mixing theoretical perspectives, Blaikie and Priest (2017) argue that it is possible to adopt a multi-paradigm approach to research that will increase the comprehensiveness of the knowledge produced.

To this end, a multi-paradigm approach has been adopted in this research. The following diagram (*Figure 5-1*) illustrates how an Interpretivist Paradigm and a Critical Realist Paradigm are used in parallel to address each research question with a logic of inquiry that is both differentiated (ensuring comprehensiveness) and integrated (ensuring cohesion).

Figure 5-1: Multi-Paradigm Design Structure
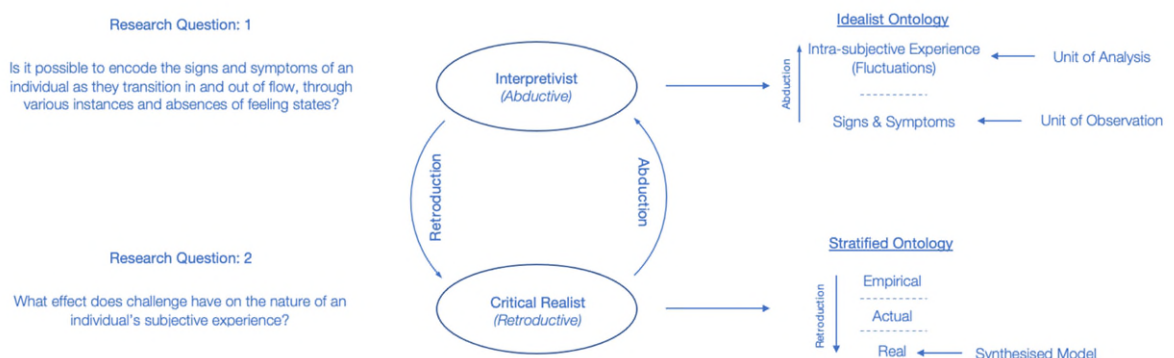
The Interpretivist and Critical Realist paradigms were chosen to facilitate this research of the three paradigms outlined above. Each of which appears in the diagram above. The relationship between these two paradigms provides an opportunity to examine each research question in a different but philosophically related way. The first research question asks, 'what ways does an individual's intra-subjective experience fluctuate with challenge?'. This question can be described as a 'what question', which seeks to establish the nature of the

relationship between a person's intra-subjective experience at a particular level of challenge. The second research question asks, 'how does challenge affect an individual's subjective experience?'. This question can be described as a 'how question', which complements the first research question and adds a level of functionality and utility to this research.

So, while the initial part of this project indicated an interpretive approach to the investigation, the development of a detailed model indicated a critical realist approach. As Blaikie and Priest (2017:187) say, "once work identifies the need to investigate a causal mechanism for an important regularity (Flow) and, perhaps, suggest how a situation or practice may change as a result of understanding what generates the regularity, then Critical Realist inquiry is, prima facie, the obvious candidate".

The relationship between these two paradigms can be seen in *Table 5-1*. The table is a breakdown of the research project's developmental phase and how the differentiated paradigmatic perspectives of the research questions map onto Blaikie and Priest's paradigm structure. The combination of paradigms provided what can be described as a research route map to develop a coherent design strategy that involved the parallel application of the two paradigms side by side.

Table 5-1: Initial Decisions and Actions

Paradigm	Interpretive	Critical Realist
Starting Point	A social phenomenon that needs to be understood. (a person's subjective experience of being in a challenge environment)	An observed regularity or pattern that needs an explanation. (the symptomatic and actual effects of challenge)
Purpose	To develop typified descriptions and interpretation-based understanding of everyday concepts and meanings. (identify and capture intra-subjective fluctuations in relation to challenge. Individuals may be unaware of differences in their actions and behaviours when experiencing differences in degree of challenge)	To establish the existence of underlying explanatory structures and mechanisms. (the effect of challenge on the fluctuations of intra-subjective experience are not directly observable. Prima Facie case exists once a model has been developed. Facilitates refined acquisition.)
Assumptions	Ontology: idealist (subtle realist). (Subjective character of experience is ontologically distinct – unit of analysis) Epistemology: constructivism.	Ontology: depth realist. (Synthesised Model describes the phenomenon (regularity) of flow at the domain of the real) Epistemology: neo-realism.
Using Extant Literature	To develop sensitising concepts and identify possible ideas to help generate understanding. (Reviewing theory and methods within extant flow literature. Chapter 4)	To help sensitise researchers' recognition and imaginative theorising to identify possible underlying mechanisms. (Model development: affective states and the conditions under which they manifest. Chapters 2 & 3.)
Design Type	Iterative	Linear and iterative research
Researcher Stance	Bottom-up; insider. Any or all of empathic observer; faithful reporter; mediator of languages. (Insider, bottom-up, reflective partner, prolonged engagement)	Both bottom-up & top-down; insider & outsider. Reflective partner. (Insider, bottom-up, reflective partner, prolonged engagement)

(Adapted from Blaikie and Priest, 2017, p.26)

This section has identified the critical element of this research project as the difficulty of capturing the subjective character of a person's experience. It was necessary to be explicit in social science terms as to precisely what the research

project would be investigating in terms of ontology and what type of relationship was necessary between the phenomena and the researcher.

5.2 Relationships and the Ontological Distinction of Subjective Experience from an Interpretivist Perspective

The research problem that this PhD investigates is grounded in the phenomenology of first-person subjective experience, specifically, the individual's lived subjective experience of being challenged. It is the unique and subtle differences in the way that each one of us interprets challenge that produces fluctuations in individual experiences of those challenges, ultimately causing that person to act, respond and interpret and experience the world around them in subtly different and nuanced ways. In order to develop an appreciation of that person's subject experience of being with challenge, the researcher must adopt a position that enables him to come to terms with the research participant (Rogers 1961).

This section has identified the individuated nature of subjective experience; the following sections review the influential philosophical perspectives of Isaac and O'Connor, Buber, Levinas and Nagel and their thoughts of approaching and coming to terms with another person.

5.2.1 Isaac and O'Conner's Conception of the Relation

Isaac and O'Connor (1978) model the self and other (subject-object) relationship systemically, *Figure 5-2*. Their system is comprised of two poles: a relation and a function. In this system, priority is attributed to the relation itself such that the poles emerge as a product of the relation. This emergence describes the oscillating function of the system whereby the relation either brings the object into stark relief, or the lack of relation leads to the loss of discrimination of the object. The consequence of this relation is that each pole is defined as a function of the relation. Either as a person or a person with thing-like characteristics.

Depending on the strength of the relationship as experienced from the perspective of each pole, the corresponding pole appears either more or less like a 'person': if the relationship is strongly defined, one pole will perceive its

counterpart as a person with thing-like characteristics — in other words, fundamentally human, yet still mysterious. If the relation is poorly defined, the pole in question will perceive its counterpart as a thing with person-like characteristics (Gibson and Isaac 1978) — in other words, an object that is shaped like a person.

Figure 5-2: Relational System of Subject – Object, Self – Other
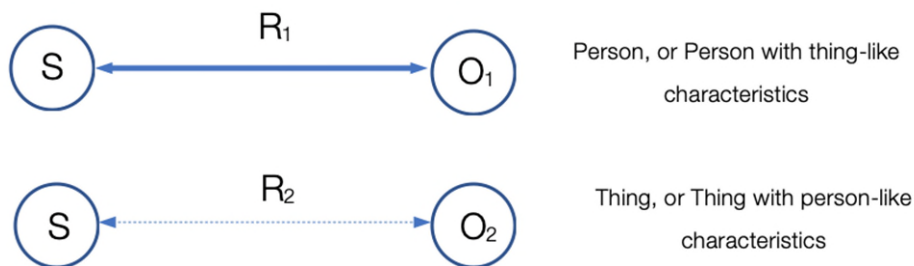
Notably, this conception of relation taking priority to the poles contrasts the more conventional view that prioritises the poles. This contrast can be seen in the differing views of Whitehead and Russell. While Whitehead posited a world of dynamic processes and events (relations), Russell posited the principle of logical atomism (Desmet and Irvine 2018).

5.2.2 Buber's Conception of the Relation

Buber (1970) also prioritised relations as definitive of poles. His approach adds conceptual depth to those of the authors mentioned immediately above.

Buber's formulation describes three derivations of the first-person relation to objects: 'I – I', 'I – It' and 'I – Thou'. It is the way in which the first-person uniquely experiences objects through their relation that the first-person experience is generated. However, it is only when the 'I – Thou' relation is realised that Buber's thesis becomes clear: the 'I – Thou' relation is a relation of 'subject-to-object', but uniquely in this relation, the subject sees the object as another subject; another sentient, individuated 'I' with its own unique thoughts, perceptions, feelings and experiences. It is through dialogue, 'thinking together' (Isaacs 1999), between the two individuated 'I's' seeing each other that Buber believed that human existence

could be described, not in its similarities or shared characteristics, but through the unique differences expressed by and experienced by each of the individuals engaged in the dialogue. For Buber, this relation is founded on mutuality and reciprocity. However, this encounter with another subject, another person, requires an effort that not everyone is ready, willing or indeed able to undertake (Kaufmann 1970).

It is this effort that generates the definition in R_1 (in *Figure 5-2*) and facilitates the transformation of the object into a human being. Conversely, when R_2 (which contrasts R_1 in *Figure 5-2*) is poorly realised, the object is perceived as the thing or thing with person-like characteristics. Kaufmann describes this relation from the perspective of the I as, "you are not recognised as an object […] you are accepted, if at all, as one to be spoken at and spoken of; but when you are spoken of, the lord of every story will be I" (1970:10).

5.2.3 Levinas's Conception of the Relation

While Buber (1970) formulated multiple relations between subject and object, self and other, Levinas (1969) communicated a single relation. A relation that he believed should take primacy over all other relations; the relation between self and Other (Levinas capitalised the word 'Other'). For Levinas, this Other was unknowable; the Other possesses the quality of alterity, which is that state of being deemed different, a state of being Other in relation to self.

To experience this Other, Levinas demands us *to **stop*** and see the other essential person standing there beside us (Kapuscinski 2008). In this stopping and seeing the Other, in this face-to-face encounter, the individual is individuated and singled out in a world of 'anOthers' (Levinas 1981). As Levinas explains, "It is the face-to-face encounter of the Other that opens me to all humanity; thus it is on the relation of the face-to-face that justice is founded" (1969:231). Through this face-to-face encounter with a dynamic Other irreducible and ultimately unknowable, an oscillation of equals occurs, where I become aware of my true self. From this self-awareness, the awareness of the individuated subjective character of experience of all Others occurs (Levinas 1981). It is in this iterative cycle as described by Isaac and O'Connor (1978:101) where "relation

172

discriminates pole (Other); discrimination of pole (Other) leads to the discrimination of relation; discriminated relation discriminates other pole (self); discrimination of this pole (self) further discriminates relation; and so on", that captures and expresses the process Levinas extols.

5.2.4 Nagel's Conception of the Relation

For Isaac and O'Connor, Buber and Levinas, a person does not exist in a vacuum. To develop an appreciation of that person, it is essential to cultivate a relationship with that person that is open to and accepting of *Otherness*. Within this conception, a distinction between the relational and the polar can be defined.

Having made this distinction, one crucial step remains to be taken for it to be valuable to us: the distinction must be operationalised.

Nagel (1974) facilitates the movement from a philosophical perspective to an empirical operationalisation of the relation expressed above by attempting to develop an appreciation of the unique ways in which people perceive, see, interpret and experience (feel) the world by asking the deceptively simple question:

'What is it like to be … ?' (Nagel 1974).

In this question, Nagel, like Levinas, identifies and acknowledges a state of being different, a unique and individuated phenomenology of subjective experience. The importance of Nagel's question does not reside in a superficial answer but in the assumption implicit in the question: the existence of a state of being Other (the quality of alterity) as a product of personal perception.

This assertion renders Nagel's question ontological, the implication being that an individuated subjective experience has its own unique phenomenology and is therefore ontologically distinct. Importantly, the ontology of the phenomenon is irreducible to the epistemology of the phenomenon; namely, our knowledge of anOther's state of being different can only ever be partial and incomplete. This is because, as Levinas previously explained, alterity acknowledges the unknowable.

An important note: In his major works, Levinas rejected the primacy of ontology in philosophy and the subsequent reduction of ontology to epistemology by the logical positivists.

By identifying the first-person phenomenology of subjective experience as being ontologically distinct and irreducible to epistemology, the investigation of the first-person phenomenology of subjective experience becomes directly amenable to realist scientific investigation. This reformulation identifies and creates conceptually meaningful links between the work of Levinas and Nagel. In this way, the first-person phenomenology of subjective experience becomes the unit of analysis of this PhD. Therefore, the Interpretive perspective adopted in this doctoral research project utilises the phenomenology of first-person subjective experience being ontologically distinct as the unit of analysis with which to approach, capture and express the intra-subjective (within-person) experiences of being with different degrees of challenge.

5.3 Mapping Flow Theory, Flow Experience, Flow Signs and Symptoms onto a Critical Realist Depth Ontology

Transcendental Realism (the philosophical position of Critical Realism) is the response of Bhaskar and others to the limitation of logical positivism: the reduction of ontology to epistemology (Bhaskar 2018; Godfrey-Smith 2003).

This philosophical position has three distinct features:

1. Ontological realism – structures and mechanisms exist independently of human activity.

2. Epistemological relativity – knowledge is socially produced, and knowledge of these structures and mechanisms can only ever be partial and incomplete.

3. Judgemental rationality – even though knowledge can only ever be partial, strong arguments can be developed in a particular context for choosing a specific theory.

By defining ontological realism and epistemological relativism, Bhaskar's version of realism differentiates between transitive and intransitive objects of science. The transitive objects (socially produced knowledge) recognise that scientific knowledge is the product of social activity. This relationship between the research and the object of the research means that researchers cannot conduct research impartially since the social, cultural, and educational background in conjunction with context all influence the way that a researcher (however conscientious) produces normative (value-laden) descriptions and interpretations of the social world. Therefore, any endeavour to develop an understanding of the social world is inevitably conceptually mediated and theoretically moderated. This philosophical position of epistemological relativity accounts for the transitive nature of scientific knowledge. In contrast, the objects of science, the structures and mechanisms are real (intransitive) (Bhaskar 2008).

Bhaskar (2018) recognised that social worlds change and evolve. Importantly, though, knowledge of the social world will not necessarily produce changes in the social world; any changes in the social world occur independently of any observation of change (which is why it is so important to take the steps towards operationalisation described in this chapter). This perspective does not negate the possibility that by researching the social world, researchers have an unintended effect on the thing being researched. The philosophical point that Bhaskar was making is that the social world changes and evolves whether or not researchers observe it.

Transcendental realism posits the conception of ontological depth as a product of the relationship between transitive and intransitive knowledge, a stratified three-layer ontology of *empirical*, *actual* and *real* existences as depicted in *Table 5-2*. The *empirical* (observable – variegated manifestations of human actions and behaviours) domain involves the actions, behaviours and statements that manifest in the actual domain. The *actual* domain comprises events or occurrences that are either not observed or are unobservable (flow, subjective experience, intra-subjective states); they arise from generative mechanisms in the real domain. Finally, the *real* domain comprises generative mechanisms and

structures (mechanisms of flow) that, under the correct conditions, can cause changes in events or occurrences, the elements of which may not be accessible or directly observable.

Table 5-2: The Overlapping Domains of Reality

	Domain of the Real	Domain of the Actual	Domain of the Empirical
Mechanisms	●		
Events	●	●	
Experiences	●	●	●

(Bhaskar 2008:56)

Critical Realism's ontological structure of overlapping domains adds to this theoretical foundation by providing an explicit structure to underpin the way we think about flow theory. The Critical realist ontological structure of overlapping domains provides an explicitly structured way to combine thinking about flow theory from a specific philosophical perspective. By utilising the overlapping domains, it becomes possible to divide flow research into three distinct elements. These are:

1. Flow theory describes the generative mechanism.

2. Flow as a phenomenon of subjective experience.

3. Flow in terms of its observable characteristics in the world.

From this perspective, we can construct a simple diagram to depict a depth ontology of flow research. *Figure 5-3* combines the overlapping domains of reality with the divisions of flow research: the mechanisms of flow, the subjective experience of the person in flow, and the potentially observable signs and symptoms of the person in flow. This structure aligns each of these three elements of flow research with the *real* mechanisms, *actual* events and *empirical* experience of *Table 5-2*.

Figure 5-3: Mechanism, Experience and Outcomes of Flow
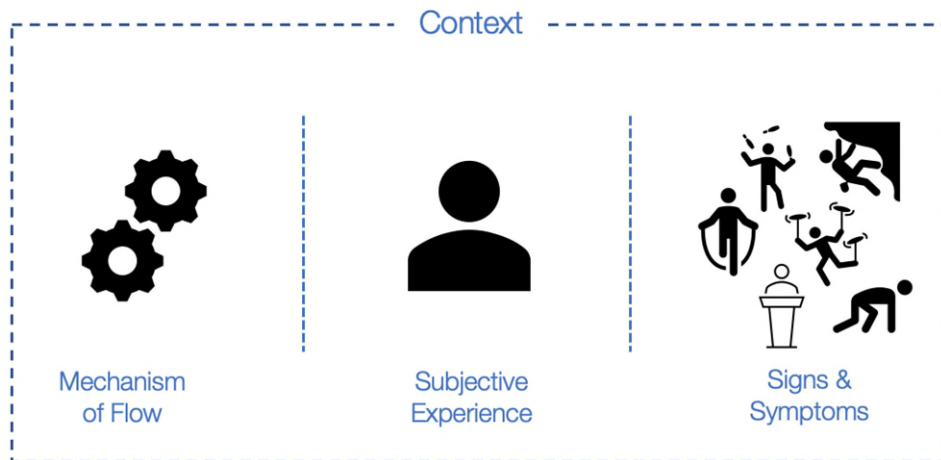
Pawson (2013:4) argues, "experiments are made by designing rather than by observing a closed system, the design being informed by theory". By differentiating flow research into the three overlapping domains of reality, the Critical Realist perspective facilitates ways to think about flow.

Firstly, the *real* mechanisms of flow can be thought of as being ever-present in an open system. However, the ability for the mechanism to function in the open system is contingent upon a variety of variables that either support the functioning of the mechanism of flow or other conflicting mechanisms that impede its functionality.

Secondly, this research seeks to associate the mechanisms of flow with the *actual* individual subjective experience of flow and the symptomatic (empirical experience) with the attributable effects of the mechanism. This approach lends itself to refined acquisition as a research design strategy. In this way, it becomes possible to identify the symptomatic effects of the mechanism in the domain of empirical experience and design a research protocol capable of collecting the symptomatic data as a product of the mechanism (Kahneman and Riis 2012) in the domain of the real. The added benefit is that the research process becomes more efficient.

However, flow and the fluctuations of intra-subjective experience present challenges to empirical investigation. These challenges arise from people's memories and their ability to recollect their experiences after the fact (Csikszentmihalyi 2000; Kahneman and Riis 2012). So, the characteristic of flow that is resistant to empirical investigation resides in people's inability to remember their experience of flow in conjunction with a person's subjective experience is known only to that person. An additional confounding factor to the problem is that people in flow may lack the appropriate language or conceptualisations with which to be able to express their experiences adequately, or the experience is so common for them that the experience is taken for granted and goes unnoticed. So, while the signs and symptoms of flow can be directly observable in the empirical world, the actual subjective experience of flow is only known to that person, and it is unobservable.

5.3.1 The Amalgamation of Flow Research and Critical Realism to Produce a Research Design Strategy

Having developed a New Synthesised Model of Experience in Chapter 3, it becomes possible to think about each of the overlapping domains of reality individually and collectively. The synthesised model contains a structure capable of directly linking the underpinning mechanisms of flow with each other and with the attributable symptomatic effects of those mechanisms of affective feeling states. Additionally, the model provides an explicit range of operation within which people should experience the phenomenon of flow. The added benefit that the new model provides is an increased resolution of the potential affective feeling states that an individual may experience at differing degrees of challenge while in optimal experience. That is to say, a person can structure the challenge through meta-cognitive skills in such a way that they experience positive affective states (see Chapter 4).

Furthermore, the Synthesised Model of Flow provides an additional ethical dimension to designing a research protocol that occurs as a direct consequence of the actual attributable effects of when the mechanism of flow ceases to operate.

5.4 The Synthesised Model of Experience and the Ethical Distinction Between Pressure and Stress

The Synthesised Model of Experience correlates challenge with the attributable effects of individual subjective experience in the domain of actual events. In many ways, challenge can be considered as a person's subjective experience of non-specific demand. One of the difficulties of studying an individual's subjective experiences of challenge is that pressure can be thought of as a special case of non-specific demand. The negative associations of challenge with pressure are known to affect people's physical and psychological well-being adversely. Moreover, the concept of pressure has become ubiquitous in people's everyday experiences, so much so that the word 'pressure' has come to be used by people to describe a particular type of negative experience and by social scientists to explain those experiences. Researchers have identified two critical features of pressure in these explanations of pressure:

1. Pressure is subjective.

2. (Consequently) pressure cannot be studied in isolation of context.

The subjective nature of pressure and its inextricability from context highlight a boundary between challenge and pressure that is both subjective and context-specific, creating difficulties for this study that are methodological, experimental and most importantly, ethical.

These difficulties can be addressed with the help of a distinction between stress and pressure made by Weisinger and Pawliw-Fry (2015), explained below.

Several authors have identified the positive effects of stress. Hans Selye, Arron Antonovsky, Nassim Taleb and Mihaly Csikszentmihalyi have all developed terms to describe beneficial aspects of stress. Selye (1974), in his work' Stress without Distress' (di-stress), coined the word eustress, literally meaning good-stress. Antonovsky (1979), in his research, developed the word 'salutogenesis', meaning the origin of health. Salutogenesis is concerned with the positive relationship between stress and health. As opposed to pathogenesis that studies the causes of diseases (dis-ease). Taleb (2012) used the word 'antifragile' to

describe the result that occurs when things benefit from the non-specific demands (stress) made upon them. Csikszentmihalyi (1977; 1988, 2004) used the word 'flow' to describe those moments when a person benefits from the stress that ensues from the harmonious relationship between the person's capabilities and the challenges they face.

These authors have identified an essential characteristic of stress as a product of non-specific challenge that Weisinger and Pawliw-Fry (2015) have distinguished from pressure. This distinction can be characterised in the following way:

1. Stress is experienced when we perceive multiple different approaches to challenge.

2. On the other hand, pressure is experienced when challenge is characterised by a single, critical (make-or-break) course of action.

Here we see that Weisinger and Pawliw-Fry provide an explicit boundary between stress and pressure: a person under stress becomes 'pressured' when their options and alternatives are reduced to a single make-or-break course of action.

Smith (2012) provides us with a mathematical means of differentiating stress from pressure and for illustrating why Weisinger and Pawliw-Fry's distinction is significant to the ethics of this doctoral research project:

Equation 5-1: Formulation of Capability

$$\text{Capability} = (\text{means}) \bullet (\text{ways}^2) \bullet (3 \text{ x will}).$$

Smith's equation (*Equation: 5.1*) captures the behaviour or dynamics of the relationship between stress and pressure that Weisinger and Pawliw-Fry (2015) predicate on the availability of options and alternatives or 'ways'. Under stress, the square function 'ways' may be set to any number equal to or higher than 2. In reality, of course, there are often more than two ways of approaching a challenge characterised by alternatives and options. Under pressure, however, the square function 'ways' must be limited to 1 (the critical make-or-break course of action mentioned above). Thus, pressure effectively eliminates what Smith

deems to be the most powerful element of capability: the square function that Smith calls 'ways' – the ways an individual has of approaching a challenge.

By adopting the formulation of Weisinger and Pawliw-Fry with Smith and amalgamating it with the New Synthesised Model of Experience, research into individuals' subjective experience of challenge can be measurably confined to the realms of 'stress without distress' (variously called eustress, salutogenesis, 'stress as opposed to pressure'), or as in the case of this study flow. The segments of arousal and relaxation correspond to the upper boundary (U_B) and the lower boundary (L_B) of unacceptable levels of challenge. These boundaries are depicted in *Figure 5-4*.

Figure 5-4: The Synthesised Model and The Threshold of Pressure
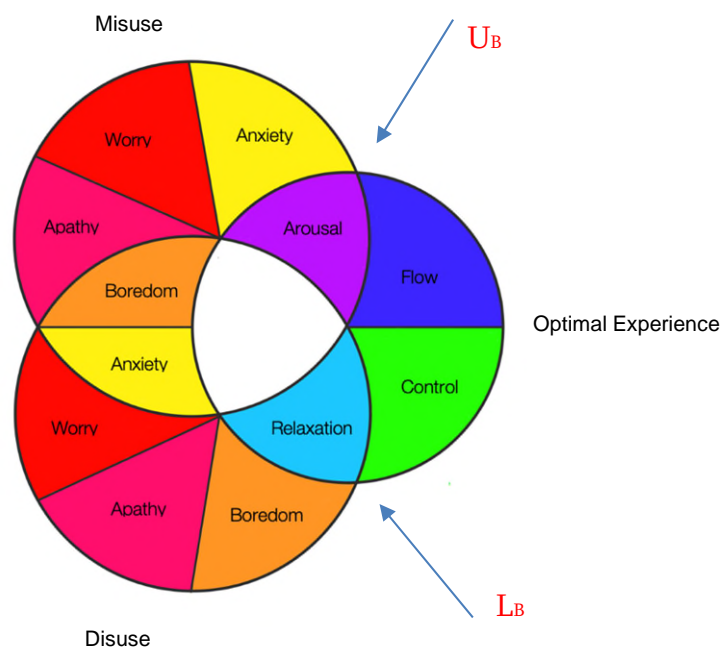
The implication is, both arousal and relaxation bifurcate from either optimal experience to misuse in the case of U_B or optimal experience to disuse in the case of L_B. This movement depends on the degree of challenge a person subjectively perceives they are experiencing. In other words, when the ways a person has to complete a challenge reduce to one, the person will move from an optimal state of experience, which is a healthy form of stress, to pressure – a transition into misuse or disuse.

Therefore, to ensure that participants in this research project do not inadvertently enter into either misuse or disuse, the study will endeavour to ensure that a wide range of resources is available to participants to address the challenges built into the research design strategy. This means that the range of resources available to participants should never be limited to such an extent that the participants in this research cross the stress-pressure boundaries. Alternatively, as in the case of disuse, reduce the level of challenge to such a level that a study participant could become bored or even apathetic.

In fact, given that the purpose of this research is (in short) to develop a means of keeping people in a subjectively optimal relationship with challenge, the strategic design of the research will benefit from providing a wide range of resources and choices (for the participants) as possible while still investigating the full range of actual individuated subjective experiences in terms of the fluctuations of intra-subjective states.

5.5 The Researcher's Relationship to The Participant

Isaac and O'Connor, Buber, Levinas and Nagel above provided the means to recognise the alterity of individuality to the extent that it is possible to recognise it as being ontologically distinct. However, it is essential to spend a little more time investigating the pole of the researcher 'S' and their relationship to the pole of the participant 'O' *Figure 5-2*: the ***subject's*** relation to object. Note how even in language with the position of the apostrophe in the word (***subject's)*** directly above, the relation is expressed in terms of something belonging to the subject. For this reason, it becomes essential for the researcher to reflect not only on their motivations and perspective but also on the potential consequences to the study participants of the researcher's motivations and perspectives. After all, social science is littered with stories of researchers that have unintentionally caused harm to study participants that have endured long after the research has concluded (see Zimbardo 2007).

As already discussed (see Chapter 4), people view and interpret the world around them and their place within the world in varied and subtle ways. A person's perspective is the product of a complex set of factors that include but is not limited

to biology, hormones, family, education, occupation, community, society and intrinsic motivations (Csikszentmihalyi 1993; Sapolsky 2017). Another aspect of the problem is that people take their world views for granted and often vehemently defend their views as objectively true and legitimate when confronted with other contrasting perspectives (Blaikie and Priest 2017). From this perspective, the researcher does not enter the research arena as the preverbal 'tabula rasa'; the researcher comes with their own values and biases.

So, while the biological, social and environmental factors provide an account of differences between people, it is too abstract and does not provide a meaningful position for a researcher to reflect on their motivations and perspective of being in the world. What is needed is a position that directly compares viewing the world and being in the world, which is where Walter Kaufmann's work becomes crucial.

Kaufmann (1970) presents five other ways of living in the world where anOthers (the multitude of Others) (Levinas 1981) are never seen and cannot be seen from the ontologically distinct view of individuality developed above. In Kaufman's thesis, there is: 'I – I', 'I – It', 'It – It', 'We – We' and 'Us-Them'. Each of these relations represents ways of being in the world without a 'You', and each of these ways of being in the world directly impacts the researched and the results of a research project.

Some of these relations were touched on above. However, the relation of the 'It – It' is a particularly salient 'intuition pump' (see Dennett 2013) when thinking about the world views of the researcher. Kaufman (1970:11) writes,

"There are men who hardly have an I at all. Nor are all of them of one kind.

Some inhabit worlds in which objects loom large. They are not merely interested in some thing or subject, but the object of their interest dominates their lives. They are apt to be great scholars of extraordinary erudition, with no time for themselves, with no time to have a self.

They study without experiencing: they have no time for experience, which would smack of subjectivity if not frivolity. They are objective and immensely serious. They have no time for humour. […]

For all that, their "subject" is no subject in its own right, like a person. It has no subjectivity. It does not speak to them. It is a subject one has chosen to study […] and one respects them insofar as they, too, have no selves and are objective. Here we have a community of solid scholars – so solid that there is no room at the centre for any core. Theirs is the world of It – It".

To this end, researchers are people, and being people, they are not resistant to these tendencies, especially when certain branches of science insist that an objective standpoint is the only standpoint. Indeed, some feel that the only way a researcher can conduct research is by reaching an objective (indifferent) standpoint from which to commence research – "finding some moral high ground from which to sustain a critical edge" (Pawson 2006:19). There is a danger that this level of objectification could amount to indifference to research participants' thoughts, needs, welfare and well-being. These are as essential to this study's unit of analysis as organs are to a living organism, so to remove them by adopting an objective and indifferent relationship to the research participants invalidates the unit of analysis – the individual.

The strategy employed by this study to overcome the problem of objectification of the study participant is prolonged engagement (Tracy 2010). By deliberately locating themselves with the study participants in a given context, the researcher is afforded the opportunity to come to terms with the study participant over a period of time. In Levinasian terms, the researcher will attempt to engage in a face-to-face encounter with the study participants.

The argument for adopting a position of prolonged engagement extends into the idea of a common shared experience. Shared language characterises that shared experience: people within a group tend to have a shared language which

includes (but is not limited to) colloquialisms, metaphors and patterns of speech (Hofstadter and Sander 2013). In this way, prolonged engagement acts as a device to support the researcher's ability to project participants' subjective experiences onto a shared social scientific landscape.

5.6 Chapter Summary

This chapter has provided a detailed discussion of the philosophical perspectives used in this PhD. Firstly, the research problem is contextualised and located within the broader research traditions. The research is grounded in a realist philosophical perspective and utilises two contrasting yet complementary research paradigms to view the research problem. With respect to the ontological view of reality, the philosophical position has been explained thoroughly as part of the broader realist paradigms between the shared characteristics of Interpretivism and Critical Realism (Blaikie and Priest 2017). This has included a detailed analysis of the works of Isaac and O'Connor (1978), Buber (1970), Levinas (1969) and Nagel (1974) as a means of not only identifying the nature of subjective experience as being ontologically distinct and irreducible to epistemology, and as a necessary means of the researcher coming to terms with the study participants. The chapter also differentiates three distinct elements of flow literature. It maps them onto the Critical Realist overlapping domains of reality, providing a structured way of developing a research protocol utilising refined acquisition. Then applying the New Synthesised Model and drawing together the work of Weisinger and Pawliw-Fry (2015) and Smith (2007), an explicit method was developed that distinguished between stress and pressure. This combination facilitates an operational move from the theoretical implications of stress and pressure to an empirical application. The chapter is concluded with a discussion on researcher world views and their relationship to the research participants.

Therefore, this chapter completes the series of four chapters that generate the theoretical foundation upon which this doctoral research project is based. In so doing, this chapter realises objective three (Chapter 1, *Table 1-1*).

The findings and conclusions from these four chapters form the basis for the empirical portion of this PhD. The following chapter (Chapter 6) will discuss the empirical research objectives—the design of the quasi-experimental protocol, the construct elicitation interview method and the data management plan (*Appendix A6*).

Chapter Six

Design of Empirical Research

We do not get to know people when they come to us; we must go to them to find out what they are like.

Johann Wolfgang Von Goethe 'Elective Affinities' (1809)

6 Introduction – Design of Empirical Research

This chapter directly follows the series of four chapters that discuss this doctoral research's theoretical foundations. This chapter discusses the design and development of the quasi-experimental protocol and the construct elicitation method applied in this doctoral research project's empirical phase. The chapter explicitly utilises the philosophical principles derived in Chapter 5 as an overarching framework to guide the PhD research project's design and development. To this end, this chapter begins with a clear statement of the research objectives. Next, the chapter identifies and selects an appropriate activity and context to conduct the study, including selecting the most suitable participants to engage in the research project. Finally, the chapter moves on to the design and methods selection. The overarching principles are utilised to transition from the selection of general research methods to a crafted application capable of realising the research objectives and gathering the requisite data necessary for addressing the research problem.

6.1 Research Objectives

As described in Chapter 5, as a product of the research questions, the expressed purpose of this research project is twofold. This methodology is adopted because the research problem is approached from two distinct yet interrelated perspectives.

The purpose of the Interpretivist perspective:

1. Identify and capture intra-subjective fluctuations in relation to challenge in terms of the observable actions and behaviours (typified descriptions) that individuals may exhibit when experiencing differences in the degree of challenge.

The purpose of the Critical Realist perspective:

2. To investigate people's subjective experience of being with challenge, where the effect of challenge on intra-subjective fluctuations is not directly observable.

By combining the two research perspectives and incorporating the actual and symptomatic attributable effects depicted in the new synthesised model of experience, it is possible to generate an array of theory-driven research objectives:

1. Develop a research protocol where a study participant is exposed to a range of challenges that will generate the full range of affective feeling states depicted in the new synthesised model of experience.

2. Identify and generate the salient conditions to limit the transition to unacceptable stress levels as depicted in the new synthesised model of experience.

3. Gather the requisite data in terms of observable actions and behaviours of the study participants as they engage in the challenge activity.

These research objectives are expressed by the qualitative formulation below. The formulation encapsulates and describes these objectives and shows how the objectives can be crafted into a single coherent research protocol.

Equation: 6-1: Formulation of the Research Objectives

$$Subjective\ Experience\ is\ the\ complex \sum_{Relaxation}^{Arousal} of\ (Challenge, Capability)$$

The formulation (*Equation 6-1*) shows all the elements of the research objectives and the relationships between these elements. Included within the formulation are limits between which the protocol is to operate. The symbol sigma represents the upper and lower limits of arousal and relaxation. The formulation says that subjective experience is the complex product of the relationship between challenge and capability that occurs between the limits of arousal and relaxation in this PhD research project. That is to say, participants should not be overly exposed to unacceptable levels of challenge (see Chapter 5, *Section 5.5*).

Accordingly, the first objective requires the participants to be exposed to a range of challenges in relation to their capabilities that will cause the feeling states of arousal, flow, control and relaxation to ensue for the study participants.

The second objective prescribes that the study participants should not be exposed to challenges in relation to their capabilities that cause the study participants to experience prolonged exposure to challenges that will potentially produce feelings of anxiety, worry, apathy or boredom.

Finally, the third objective necessitates a data collection system that can accurately capture the observable signs and symptoms of the participants' actions and behaviours while the participants engage in a challenging activity.

This section has discussed the theory-driven research objectives based on the overarching principles developed in Chapter 5. Consequently, it becomes possible to design an experimental research protocol supported by theory and seeks to capture a very specific form of data that occurs within an expressly defined set of limits. The following sections will discuss the context and activity within which the protocol will gather is data, the appropriate selection of study participants, and finally, the crafting of general methods guided by the principles discussed in Chapter 5 into a coherent research protocol.

6.2 The Studies Context

The problematical situation this doctoral research project investigates is how differing degrees of challenge can affect different people's experience of that challenge and how that challenge may also influence how they feel. As previously discussed in Chapters 2 and 4, the dynamic nature of the relationship between the fluctuations in a person's subjective experience of challenge in relation to changes in the relationship between challenges and capabilities as depicted in the various models of flow and the new synthesised model of experience and the literature is fleeting and subjective (known only to that person). Moreover, as discussed in Chapter 4, methods for accurately capturing intra-subjective experience either interrupt the person in flow or rely on the person remembering the experience and rely on the study participant's subjective interpretation of the degree of challenge that the person might be experiencing. These features make studying the dynamic nature of subjective experience challenging, complex and nuanced.

To overcome these issues and develop an appreciation of how intra-subjective experience fluctuates in relation to varying degrees of challenge, it will be necessary to be explicit about varying the degree of challenge experienced by a specific individual. Multiple scenarios were explored where it was thought that challenge could, to some extent, be explicitly controlled. *Table 6-1* shows all of the contexts considered with their associated benefits and limitations pertaining to this investigation and the research objectives.

Table 6-1: Possible Contexts and Activities

Context	Benefits	Limitations
Book Club	Offered a group of like-minded individuals who were already reading the same books in a set period of time. A books objective difficulty over time is stable Reading is the most widely reported Flow activity Methods exist for measuring flow while reading Reading is an intrinsically motivating activity	Reading a book takes a lengthy period of time A study participant would need to read at least three books, All participants would need to read all of the books. Observing all participants reading all the books would be impractical at best Objectively measuring the level of challenge that each book represented to the individual was also a problem Inability to observe
Simple Puzzles, e.g., sudoku, crosswords	Quasi-experimental approach. Control over extraneous variables. Shorter time period. Ability to closely observe all study participants The experiment can be filmed	While crosswords can be objectively measured, crosswords can take anything from minutes to days to complete. Finding participants that were intrinsically motivated with such puzzles presented a significant problem Puzzles do not require 'skin in the game'.
Indoor Rock Climbing	Climbing is an intrinsically motivating activity where all characteristics of flow are apparent Climbing has an objective scale of challenge An indoor climbing centre provides a stable environment. Each climb can be completed in a matter of minutes allowing participants to do multiple climbs in a single session An investigation can be designed to closely follow a person's typical climbing session	Climbing centres are inherently open systems with uncontrollable variables

The contexts and activities reviewed to see if they would accommodate the objectives above included a book club, solving simple puzzles (sudoku, crosswords) and finally, indoor rock climbing. While these contexts and activities are vastly different from working environments and are considered leisure activities, they were explored because, as Csikszentmihalyi (1975:5) asserts, "there is no unbridgeable gap between 'work' and 'leisure'".

Following a detailed review of the contexts and activities, indoor rock climbing offered the broadest range of opportunities to address and overcome this empirical study's difficulties with the fewest limitations. Climbing directly offers an unambiguous method of objectively and explicitly delineating the degree of challenge experienced by any study participants. Moreover, indoor rock climbing takes place in a stable and consistent environment where it is possible to openly observe a climber without interfering in the naturalistic activity of climbing. Using indoor climbing as the preferred activity, it is possible to design a protocol that closely follows the typical pattern of activity that constitutes an indoor climbing session and realises the research objectives.

An additional benefit to choosing this activity resides in the fact that the principal researcher in this research project is a rock climber and has a professional climbing qualification, so has the requisite level of prolonged engagement necessary for a qualitative study of this genre.

6.3 Participant Selection

Having selected an appropriate context within which to conduct the study, it was then necessary to select the most appropriate people to participate in the study. The 'Purposeful Sampling' method provided the most appropriate criteria for selecting study participants (Jackson and Marsh 1996). This study adopted this practice to deliberately and coherently select participants. The participants chosen for this study were professional rock-climbing instructors. The rationale for choosing professional climbing instructors was:

1. Climbing is associated with an inherent risk. Choosing only professional climbing instructors provided a straightforward way of mitigating this risk.

2. Each of the climbing instructors had to be a full-time professional climbing instructor.

3. All the participants had to have a current climbing qualification recognised by Mountain Training UK and Ireland.

4. *Lead climbing* (a specific way of climbing, where the climber clips the rope into a series of carabiners placed at uniform distances up the climb) will be used as the primary method of climbing for this study. Professional climbing instructors use lead climbing as the preferred method of climbing. This method of climbing increases the objective difficulty of any given climb. Additionally, if a climber fails to make a move, the resultant fall is obvious.

5. Lead rock climbing is an inherently complicated activity that requires knowledge of how to climb, plus knowledge of equipment, knots, and environmental dangers. Professional climbing instructors mitigate these objective difficulties and limit any extraneous influences on the control variable. This limits the independent variable to the degree of climbing challenge.

6. Using professional climbers limits or removes any form of leaning effect.

7. Using professional climbing instructors adds a level of rigour to the consistency of the quasi-experimental protocol.

8. Limiting the participants to a group of people of a similar standard of competency and experience makes it possible to obtain more clarity between individual subjective differences regarding each individual participant's lived experience of challenge. Allowing the study to focus specifically on the individual difference between people of a similar group.

9. Professional climbing instructors operate at a high level of competency and experience. They are exceptionally familiar with the climbing environment. They will possess a more developed and more in-depth

array of meaning and valuing constructs in the challenge environment as a product of their experience.

10. Professional climbing instructors will also have been involved in climbing for a substantial amount of time. They will have an extensive reference base of climbing experience to draw upon when thinking about their climbing experiences.

Having identified an appropriate activity, context and group of participants that was capable of realising the studies objectives, it was then necessary to select a specific research approach and craft that approach into a coherent research protocol.

6.4 Selection of Methods

As identified as a recommendation from the literature review in Chapter 4, studies investigating the interplay between systemic pressure and situational forces and their effect on the lived subjective experiences of people should use multiple methods to support and corroborate findings. Therefore, two methods of generating the requisite data and investigating the research problem were selected from the array of possible approaches:

- A quasi-experimental protocol.

- A construct elicitation method.

This choice of methods was the product of this doctoral research project being theory-driven and having identified:

1. The research problem and the associated research questions.

2. The research objectives.

3. The literature on flow theory.

4. The units of analysis and observation.

5. The choice of research paradigms as a means of viewing the research problem.

6. The paths to research, as indicated by the research paradigms (Blaikie and Priest 2017).

7. The need to deliberately and explicitly vary the degree of challenge experienced by the study participants.

8. The requirement for the research protocol to be explicit and repeatable.

9. To generate two distinct yet interrelated forms of data that directly mapped onto the units of analysis and observation (triangulation).

10. To identify the actual and symptomatic attributable effects depicted in the new synthesised model of experience.

Subsequently, having selected the quasi-experimental approach as the most suitable method for investigating the research problem, it became possible to design an explicit research protocol capable of realising the research objectives. Additionally, the selection of the construct elicitation method facilitated mapping of the participants' value and meaning landscapes as it pertained to an indoor climbing environment. The structure of the two methods and their relationship to the unit of analysis is depicted in *Figure 6-1*.

Figure 6-1: Design and Structure of Methods
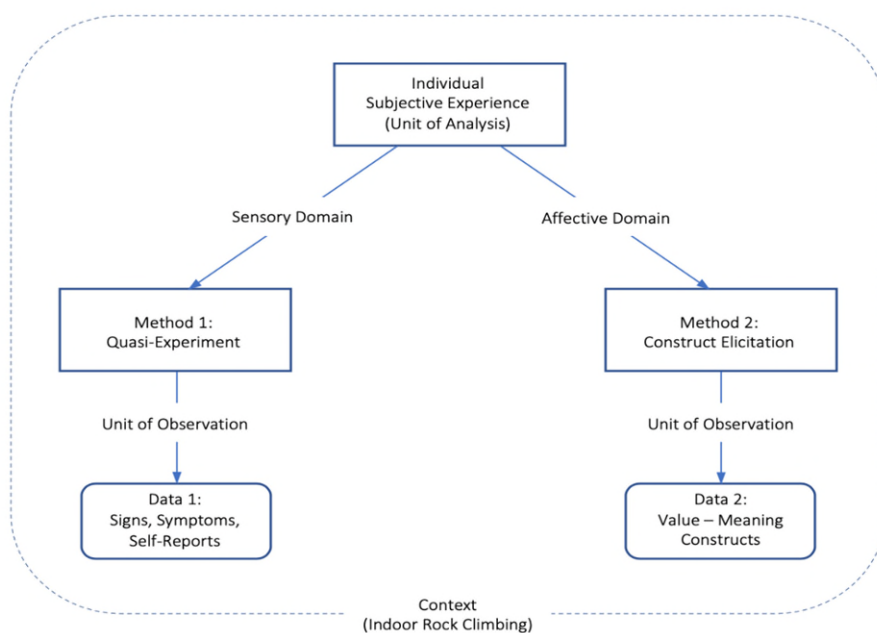
Figure 6-1 depicts the relationship between the quasi-experimental protocol and the construct elicitation method, their relationship to the unit of analysis and the forms of data that each method produces. By structuring the two methods in this way, it is possible to see that the two data sets are theoretically interrelated yet empirically distinct.

6.5 Developing the Research Protocol

Structurally, the methods and the specific forms of data they generate can be considered to exist in parallel. However, empirically they must occur in series, so they will be discussed as occurring in two distinct parts:

- Part-1 will discuss the design and application of the quasi-experimental method.

- Part-2 will discuss the design and application of the construct elicitation method.

Part 1, method 1, investigates how the participant's intra-subjective experience fluctuates in relation to varying degrees of challenge in the sensory (experimental) domain. Therefore, data set 1 is derived from part 1 of the study and comprises four distinct elements. The first three elements coalesce to form what is described as a codable moment. These three elements are:

a. Signs: the observable physical actions, behaviours and consequences.

b. Symptoms: the participant's verbal accounts of inner experiences while engaging in a challenging activity.

c. Descriptions of systemic and situational elements that directly relate to or influence the participants lived experience of the challenge.

d. Post challenge reflections: the participants self-reflections immediately post completing the activity.

Part 2, method 2, utilises a qualitative repertory grid method to investigate the participants' meaning and valuing constructs in the indoor climbing environment's affective domain. Therefore, data set 2 is derived from part 2 of the study. The

data takes the form of a verbatim account of how the participant describes how they feel, how they value and the meanings between the various elements in the contract landscape.

6.6 The Quasi-experimental Protocol – Part 1

The following section discusses the design of the quasi-experimental protocol and its application on a case study basis. The aim of the study was to go climbing with a study participant and observe the participants as they climb, noting their actions and behaviours and then recording their self-reflections pre-climb, during the climb and post-climb. So that it would be possible to gather data that would facilitate our appreciation of what is it like to be *that* person engaged in *that* activity in *that* situation at *that* time, thereby addressing the two research questions.

When people go climbing, especially in an indoor climbing centre, they tend to follow a standard format and use standard methods. Initially, people will do a few easy climbs to warm up. Then they will begin to increase the challenge level of the climbs they attempt to a maximum level of challenge (for them). This maximum level can potentially end in failure if a) the climber is working on a specific project, where they are trying to perfect a challenging move or sequence of moves, or b) if the climber is trying to climb to their maximum level of ability. After all this has been done, the climber will often do a few easier climbs to warm down and conclude their climbing session. It is common practice for professional climbing instructors to follow this format when climbing with clients or when they engage in a personal climbing session.

The preferred method for professional climbing instructors to maintain safety but mirror an outdoor climbing experience is lead climbing. It is this method of climbing that the study participants will use. Essentially, lead climbing consists of a party of two people connected by a rope. One climber takes the lead while the other climber follows. The lead climber wears a harness attached to a rope connected to a second (climber). While ascending the route, the lead climber periodically connects the rope to the rock face via protection equipment for safety in the event of a fall occurring. The protection (in the case of indoor climbing) is

197

in the form of bolts connected to the wall, to which the lead climber connects clips (quickdraws) and then clips the rope to the wall via the quickdraw. The second climber acts as the belayer. The belayer pays out rope as needed by the lead climber as they ascend the wall, but the belayer is vigilant and ready to hold the rope tightly, with the aid of a belay device to catch the leader in the event of a fall or should the leader need to rest. Importantly, the rope is not used by the climber to assist them in ascending the wall; it is utilised purely for safety.

This standard climbing format lends itself to the empirical aspect of this doctoral research project because it is possible to design a quasi-experimental protocol that directly maps onto the structure of an indoor climbing session causing minimal interference to the way a climber would usually approach an indoor climbing session. By designing a quasi-experimental protocol that follows the standard climbing structure, it becomes possible to observe and interact with the climber as they climb a series of climbs ranging from easy to hard and then listen immediately to their reflections as they lower off from the climb itself.

As stated in Chapter 1, the rationale supporting a quasi-experimental design is twofold: 1) individual experience is subjective by nature (see Chapter 5) and a control group cannot be used as a probabilistic baseline for subjective experience, and 2) in a naturalistic setting, study participants cannot be assigned to control groups. Within the quasi-experimental protocol's description, there is a detailed account of the dependent variable in direct accordance with the unit of analysis in Chapter 5. The independent variable is discussed in detail, leading to a discussion of the quasi-experimental protocol, its format, the type of data generated, and the qualitative way the data is analysed (Edmonds and Kennedy 2017). The data is treated qualitatively and analysed using 'framework analysis' (Boyatzis 1998) to identify links between the study participants actions, behaviours and self-reports (typifications) with descriptions of experiential states (typologies) identified in the literature (see Chapter 7).

This section has clearly outlined the rationale for developing a quasi-experimental framework and applying it on a case study basis. Therefore, it becomes

necessary to delineate and render explicit the dependent and independent variables explicitly.

6.6.1 Dependent Variable (Unit of Analysis)

As described above, the study participants have been purposefully chosen to be as similar as possible in terms of their knowledge, experience and interest in climbing. The purpose of choosing such similar people is to identify their intra-subjective experiences and how their intra-subjective experiences fluctuate while engaging in equivalent levels of challenge. It is the ontological distinction that separates each study participant's subjective character of experience (as described in Chapter 5, *Section 5.3*) that represents the unit of analysis that this study sets out to capture and map.

6.6.2 Independent Variable

Climbing has a range of objective climbing standards from around the world. These standards each provide an objective climbing scale that grades the difficulty of each climb. In many ways, this can be regarded as a peer-reviewed scale. As climbers climb a specific climb over a period of time, a consensus is reached by the climbers as to the overall grade that a specific climb is given. While there is a range of climbing standards worldwide, all of the standards do the same thing: to inform the climber of the objective difficulties they are about to face. The climbing standard used in this study is known as the French grading system. This internationally recognised system is widely, if not exclusively, used at indoor climbing centres throughout the UK, most of Europe and other parts of the world and is a preferred grading system used at international climbing competitions.

The French grading system is an alpha-numerical system that rates climbs on their overall technical difficulty and strenuousness. The system starts at 1 and is open-ended (because climbers are continually pushing the limits of what is possible). Each grade is subdivided by adding a letter a, b, or c as exemplified by: 4b, 6a, 7c or 9a (at time of writing, the hardest climb in the world is graded 9c, climbed by Adam Ondra November 2017). Additionally, an optional '+' can be

added to delineate the difficulty level between climbs. For example, these grades are ordered in an ascending order of difficulty: 6b, 6b+, 6c, 6c+, 7a, 7a+, 7b etc.

A climbing grading system enables climbers to choose a climb appropriate to their level of climbing proficiency in conjunction with their mood at any given time. The climber can choose a climb that will enable them to ascend the climb with little or no difficulty, or the climber can choose a climb that they know will challenge them to the very limits of their ability, with a high level of probability that they will be able to complete the climb successfully. Alternatively, the climber can choose a climb that they know is beyond their ability but will provide them with the opportunity to develop new skills, new climbing techniques, or simply to become stronger. Finally, a climbing grading system enables the climber to avoid climbs that they know will be too easy and not challenge them in any way. So, while there can be two or more climbers with very different capability levels, it is possible to challenge them in a very similar and comparative way. The direct benefit of observing a climber as they engage in a specific climbing challenge is the ability to objectively know precisely what degree of challenge a particular climber is experiencing at that moment in time.

6.6.3 Structure of Quasi-Experimental Protocol

Figure 6-2 depicts the quasi-experimental protocol in terms of the dependent variable and the independent variable. The new Synthesised Model of Experience (Chapter 3) represents a qualitative generalisation of the dependent variable. The nine segments between the upper and lower boundaries U_b and L_b represent the independent variable in terms of the degree of challenge. These segments can be thought of as propositions that related degree of challenge with the affective experiential state. Therefore, *Figure 6-2* shows the relationship between the independent and dependent variables in terms of the expected affective state in relation to a given level of challenge.

Figure 6-2: Structure of Quasi-Experimental Protocol
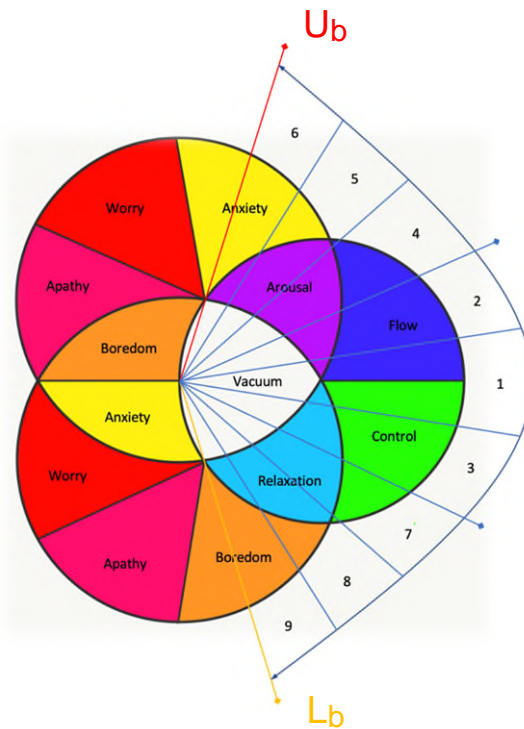
Combining the dependent and independent variables in this way makes it possible to identify and depict the structure of the quasi-experimental protocol of method 1. This structure represents an idealised climbing session that maps to a typical climbing session. The climbing session format is a warmup that progressively increases the climbing difficulty and then warms down. Therefore, in *Figure 6-2*, segments 1, 2 and 3 represent the three warmup climbs; segments 4, 5 and 6 represent the climbs that increase the climbing difficulty to a maximum. Segments 7, 8 and 9 represent the three warm down climbs. By explicitly structuring the climbing session in this way, it was possible to observe a professional climber in a natural climbing environment. At the same time, they climb a full range of climbs between their maximum and minimum climbing grade in relation to their self-selected median climbing grade as the reference point.

The median (middle) climbing grade is the participant's self-selected grade that describes the level of challenge that lies between the participants maximum and minimum climbing grades. It is the identification of the median climbing grade that acts as a reference point for each of the case studies. While each of the participants median climbing grades may be different, the identification and

inclusion of the median climbing grade means that each of the study participants can be subjectively challenged through a range of challenges in a meaningful and comparative way. This way, each of the study participants can be objectively challenged in a comparative way that is subjectively meaningful.

Table 6-2: Median, Maximum and Minimum Climbing Challenge

Participant-X	Climbing Grade	Participant-Y
	5	Min (9)
	6a	
	6a+	
	6b	
	6b+	Median (1)
	6c	
	6c+	
	7a	
	7a+	Max (6)
Min (9)	7b	
	7b+	
	7c	
	7c+	
Median (1)	8a	
	8a+	
	8b	
	8b+	
Max (6)	8c	

Table 6-2 depicts how median, maximum and minimum climbing challenges relate to each other and across participants. Hypothetically, if participant X's self-selected median climbing grade is 8a, they will attempt a maximum climbing challenge of 8c and a minimum climbing challenge of 7b. Whereas, if participant Y's median climbing is 6b+, they will attempt a maximum climbing challenge of 7a+ and a minimum climbing challenge of 5 (generally, at this level of challenge, the a, b and c is dropped from the system). The assumption is that while the climbing challenges are objectively very different for each participant, the study participants' challenges are subjectively similar.

So, in the example provided in *Table 6-2*, participant-X's minimum climbing grade is one grade harder than participant-Y's maximum. Therefore, when participant-X is climbing at the minimum, their intra-subjective experience (affective feeling state) will be very different from the intra-subjective experience of participant-Y climbing at their maximum grade. Indeed, *Figure 6-2* implies that participant-X will be experiencing states of relaxation, potentially even boredom and participant-Y will be experiencing states of arousal and potentially feelings of anxiety. Conversely, if participant-X is climbing at their maximum grade, they should also experience affective experiential states of arousal or even anxiety. Therefore, experimentally, identifying a subjectively meaningful median climbing grade as a reference point facilitated the objective equivalency of challenges across each participant.

Initially, the experiment was designed such that the participants would climb their selected climbs in the order that they are labelled in *Figure 6-2*. However, ordering the climbs in this way was a mistake. When the first study participant climbed the first climb, they suffered from what is known as 'flash pump'. This condition results from the sudden build-up of lactic acid in the forearms, which can be uncomfortable and even painful and limit a person's climbing ability. To combat this, the first participant climbed segment 3 for their second climb and then segment 2 for their third climb. Reflexively responding to this problem enabled the first participant to overcome the flash pump, continue with the protocol, and complete all the other climbs in the intended order. Unfortunately,

this was not the end of the issue. To overcome the potential of flash-pump, the second participant was asked to complete two very easy warmup climbs before starting the protocol. This approach resulted in participant 2 completing 11 climbs and becoming excessively fatigued. This problem required yet another adjustment to the climbing sequence. The third participant climbed the same range of climbs as the previous two participants; they just climbed them in a slightly different sequence. This sequence for the third participant eliminated any need for additional climbs. *Table 6-3* depicts the sequences that each of the participants completed the range of climbs.

Table 6-3: Climbing Sequence

Proposition	Warm up 1	Warm up 2	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Participant 1			1	3	2	4	5	6	7	8	9
Participant 2	*	*	1	2	3	4	5	6	7	8	9
Participant 3			8	3	1	2	4	5	6	7	9

The first row of *Table 6-3* depicts the climbs in the order that they were originally intended to be climbed. The subsequent three rows show the actual order that the participants climbed all of their climbing challenges.

Due to the climbing grading system's uniformity and the wide range of climbing abilities within the domain of professional climbing instructors, no attempt was made to limit the climbers to climbing the same climbs. For this reason, each of the study participants was free to choose the climbs they wished to climb. This decision is in keeping with the study's central premise – go climbing with a study participant with as minimal interference as possible.

6.7 Construct Elicitation – A Repertory Grid (part 2)

This section discusses the construct elicitation method developed for this study. The section begins with a discussion of constructs, their history and the

underlying theory. Following this, a discussion ensues regarding the development of the repertory grid method used in this study.

Kelly (1955), in his theory of constructs, posited the idea that people generate and create transparent models (constructs). These act as a transparent filter through which people view and interpret the world. George Kelly argues that without such mental models, the world appears as an indistinguishable conglomeration that a person cannot make sense of or interact with in a meaningful way. Therefore, any mental model (construct), even a flawed model, is better than no model at all. In many ways, how people view, interpret, act and interact in the world is dependent upon the mental model through which they filter the world. The implication being: what people perceive depends upon the models they use to construe their worlds—a form of personal model-dependent realism.

The theory being people's brains interpret the inputs from their sensory organs and then make and generate models of the world. When such a model successfully explains events in the world, people tend to attribute those elements and concepts that they believe constitute the quality of reality. The critical implication is that there are many different ways people can and do model the same physical situation, each employing different fundamental elements and concepts. Therefore, if two such mental models accurately predict the same events, allowing two different people to seamlessly negotiate the world using a different model, one model or construct cannot be said to be more real or accurate than the other model (Burr 2018). This theoretical perspective provides an account of pluralism and relativism. It provides an explanation for when people interact well with the world and why people can struggle with new and unusual situations.

While some mental models enable a person to interpret, act and interact with the world in an engaging and competent manner, those same models are entirely inappropriate in other contexts. To this end, from a mental constructs perspective, people are thought to interpret their world with an array of mental constructs. In other words, people have arrays of mental constructs, each of which is a good description of observations only in some limited range of physical situations. This

structure is described as "the range of convenience of the construct" (Kelly 1955:108). It is a bit like a map. As cartographers have long understood, it is not possible to show the whole world in the form of a map on a flat surface. The usual solution is to apply some form of projection where the far north and the far south appear far more extensive than they actually are, distorting the view of the North and South Poles. Therefore, to faithfully represent (map) the entire earth, it is necessary to use a collection of maps, each one representing a different area. The maps themselves overlap each other, and where they do overlap, they show the same landscape.

In many ways, the practice of mapping is analogous to mental constructs; there are constructs that are applicable only in a limited range of contexts (range of convenience). For example, the mental constructs that a person utilises in an indoor climbing centre when applied to an outdoor climbing experience could get that person seriously injured or even killed.

6.7.1 The Structure of a Construct

A construct "is a way in which some things are construed as being alike and yet different from others" (Kelly 1955:105). In its most constrained conceptualisation, a construct is the product of the way two things are similar and different from a third, as depicted in *Figure 6-3*. How "two things are similar and different from a third" is regarded as Kelly's definition of a construct (Burr and King 2017:211).

Figure 6-3: Model of Personal Construct
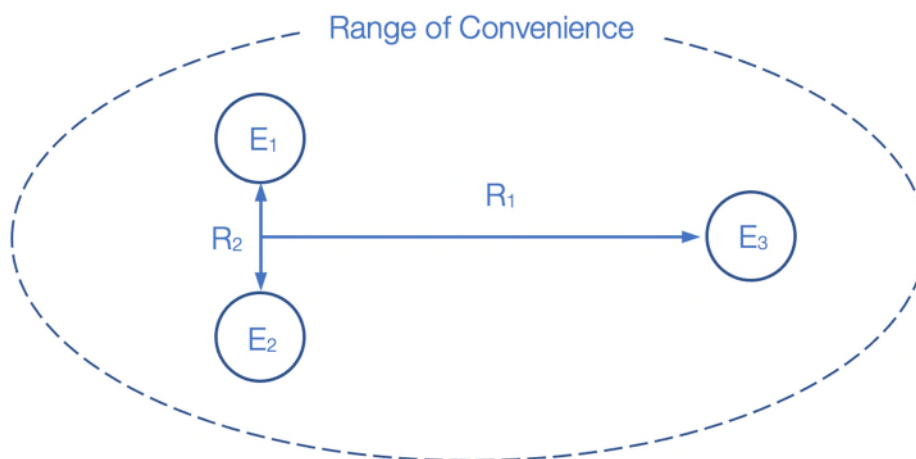
The critical feature of personal constructs theory is the significance of the relation between the elements. In *Figure 6-3*, R_2 distinguishes the similar relationship between the elements E_1 and E_2, and R_1 differentiates the difference of E_3 with E_1 and E_2. Significantly, constructs are not the product of a person arbitrarily placing or ordering the elements in some convenient taxonomic structure. That is to say, it is not the accumulation of the elements in the context that constitutes the construct; neither is it the differential grouping of the elements that constitute a construct. The elements are understood based on their relationships; it is the structure of relationships and elements that generate the construct. The way a person construes the relationships between the elements provides the meaning that enables the person to deal with the elements in direct relation to each other within the constructs range of convenience (Kelly 1955). That is to say, the person can orientate themselves in the world through their preferences in terms of relationships between the elements of the construct.

However, while big-Q (highly qualitative) research projects depend on the truthful responses to open-ended questions from authentic participants (Kidder and Fine 1987), the utility of these methods can be problematic. Firstly, due to their reliance on the verbal fluency of participants'; and secondly, the participants' ability to reflect on and explain the meaning of what they have produced (Burr et al. 2014)

Personal construct theory identifies the limitations of people's ability to adequately express meaning. The problem resides in the fact that people may not possess the appropriate words or symbols to adequately express certain elements within their constructed landscapes. This limitation means that constructs can be difficult for researchers to grasp (especially when they adopt an objective remote position) and subsume an individual participant's values, beliefs, experiences and perspectives within their own system of appreciation. Moreover, the constructs can be difficult for the person themselves to articulate within a structure limited to verbal communication; or, when the construct itself is not the product of verbal communication. The construct may be grounded in some form of incommunicable experience. In this way, it may be impossible for the person to adequately express certain features, characteristics or nuances of their

construct landscape. Therefore, it may be impossible for a person to effectively express certain constructs in such a way that researchers can capture those constructs within their own systems without misrepresenting the person (Kelly 1955).

This analysis captures and expresses two connected and interdependent limitations:

- people's ability to adequately express certain aspects of their construct landscapes,
- a researcher's inability to adequately capture those nuances of description and explanation.

These limitations directly link to the ontological and epistemological distinctions discussed in chapter 5: the irreducibility of ontology to epistemology. A final factor in this section's analysis is how the ontological distinction of subjective experience (Chapter 5) directly links to and is supported by personal construct theory.

6.7.2 Developing the Construct Elicitation Method

There are as many methods for eliciting personal constructs as there are personal construct researchers (Burr, Personal Correspondence, 2017). To this end, it is both necessary and common practice for researchers to adapt a general method for a specific research project.

Therefore, the general method adapted to this study was the 'Role Construct Repertory Test'. Despite its name, this method is not a test but a way of encouraging research participants to reflect on their experiences within a specific context. This powerful qualitative method produces a different kind of structured interview from the more traditional semi-structured interview formats. This repertory test enables the study participant to quickly focus on critical elements of their experience that may otherwise be difficult for them to articulate and express in a semi-structured interview format. Additionally, this method does not rely on research participants' verbal fluency as other forms of interview do; by

asking the participants to reflect on and explain the meaning of what they have produced (Burr et al. 2014).

Having discussed the theoretical foundations of personal construct theory and mapped those with the overarching principals of this PhD research project, The 'Role Construct Repertory Rest was then identified as an appropriate repertory method to adapt. From this point, it becomes possible to develop the explicit elicitation method for this research project.

6.7.3 The Construct Elicitation Method Developed for This Research Project

Firstly, the study participant is asked to think about a number of critical elements in the indoor climbing environment. From these elements, the participant is asked to choose eight, some of them positive, others negative. Each element is recorded onto individual cards, where each element begins with the statement, 'Me when I'm…'. A ninth reference element is added – 'me when I'm on my ideal climb'. The relationship between the elements and the climbing sessions can be seen in *Figure 6-4*.

Figure 6-4: Elements and Their Occurrence in Climbing Sessions
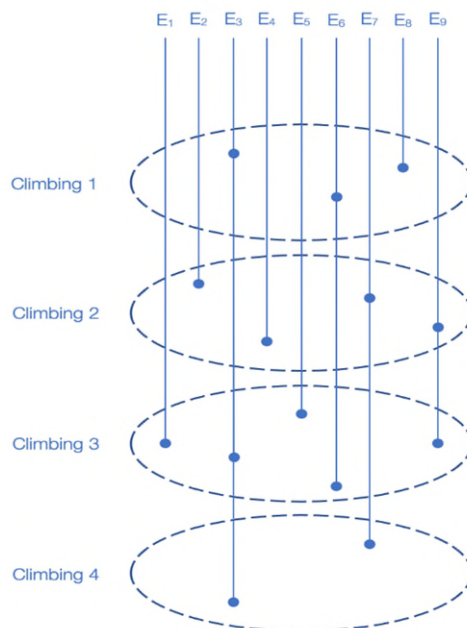
Theoretically, the climbing sessions are not considered in series but parallel. This choice of method is one of the reasons for purposefully choosing professional climbing instructors as study participants. The depth of the diagram reflects the depth of the study participants climbing experience. Additionally, what is significant about *Figure 6-4* is that all the elements E_1 to E_9 do not appear in all the climbing sessions Climbing 1 to Climbing 4. This is because every possible experience associated with an indoor climbing session does not occur in every climbing session.

The research participant is then presented with three of the cards and asked to consider the ways in which two of the cards are similar and different from a third (Kelly's operational definition of a construct). The participant's responses were then written down with one pole of the construct on the left and the other on the right. A template sheet was developed for this purpose to aid with the smooth administration of the interview. This process of comparing the elements and recording the emerging constructs continued until all the combinations had been exhausted (the combination of 9 elements generated 19 construct combinations). Importantly, the constructs are labelled using the participant's own words. This principle is applied because the method focuses on the 'research participant's voice' in developing the constructs. The researcher achieves this by being careful to describe events with the words, phrases and terminology used by the participants themselves. Additionally, when giving labels to the constructs, care is taken to use the terminology of the study participants to privilege the voice of the participant in the findings and to ensure that the interpretive process remains in the control of the study participant and is not taken over by the researcher (Burr et al. 2014).

Generating the constructs is a joint interactive endeavour between the study participant and the researcher. Burr King and Butt (2014:344) explain that the interview is a "'democratic' process in which the researcher's suggestions are just that — they are not privileged interpretations". To this end, the researcher encourages the study participant to reflect on their experiences, their experiences are recorded, and their perceptions of the emerging constructs are continually

fed back into the process of developing the constructs. During this generative process, hand-written notes on the emerging constructs were taken. In addition to this, all the interviews were recorded with the permission of the study participants.

6.8 Conducting the Protocol

Before conducting the protocol, a complete experimental protocol was submitted to ethical review at Cranfield University. This experimental protocol can be seen in *Appendix A*. Included within the protocol:

1. Participant Information Sheet: *Appendix A1*
2. An Informed Consent Form: *Appendix A2*
3. A Personal Information Sheet: *Appendix A3*
4. A Construct Landscape Grid: *Appendix A4*

In addition to this, a formal email was received from Cranfield University giving permission to commence the research project. This email can be seen in *Appendix A5*. *Appendix B* concludes with the data management plan (*Appendix A6*).

6.9 Chapter Summary

This chapter has been broken down into five distinct sections: the research objectives, choice of activity and context, choice of study participants, quasi-experimental design and the construct elicitation method.

The chapter begins with a detailed discussion of the research objectives and how they are derived from the perspectives from which the research problem is viewed. After generating the objectives, it was necessary to identify an activity and context to orchestrate the study to realise the research objectives. To this end, rock climbing in an indoor rock-climbing centre was selected as the most suitable activity and context. Furthermore, the method of 'purposeful selection' (Jackson and Marsh 1996) was used to generate a specification for the ideal choice of study participant; to this end, professional rock-climbing instructors were identified as the most suitable participants for this study.

As a product of the overarching principles developed in Chapter 5, the selection of an activity, a context and study participants, a quasi-experimental approach was identified as the most suitable way of realising the research objectives. Within the quasi-experimental protocol's description, there is an explicit description of the dependent variable in direct accordance with the unit of analysis in Chapter 5. The independent variable is discussed in detail leading to a discussion of the quasi-experimental protocol, its format and the type of data it should produce.

The chapter then concludes with the selection of the triangulation method – construct elicitation. The methods theoretical foundations are discussed and aligned with the philosophical perspective of this doctoral research project. Then the section moves on to describe the transformation of a general method 'Role Construct Repertory Test' to the crafted application of the method used in this doctoral research project.

The following chapter (Chapter 7) presents the analysis method used in this study. The chapter briefly discusses qualitative analysis methods within the broader domain of social science research. It then links the method (framework analysis) to the philosophical principles of this doctoral research project and then crafts that method into a suitable application for this project.

Chapter Seven

Development of Analysis Method: A Codebook

What is it like to be …?

Thomas Nagel 'What is it Like to a Bat' (1974)

7 Introduction – Development of Analysis Method

This chapter directly follows the empirical research design – the research protocol. It is the first of two chapters that analyse and present the results. This chapter focuses exclusively on crafting a general analysis method into a bespoke application.

This chapter identifies and describes the method of data analysis utilised in this PhD research project. The chapter begins by situating qualitative research methods into a broader historical perspective of social scientific enquiry. The chapter then discusses the utilisation of Kidder and Fine's (1987) framework to aid in the appropriate selection of an analysis method. Following this, the elected method of framework analysis in the form of a codebook is described in detail. The chapter then proceeds to align the general framework analysis method to the philosophical perspective that this study utilises to view the problematic situation under investigation (people's subjective experience of being with challenge). The alignment of the analysis method with philosophical perspectives is then used as a vehicle to facilitate the movement from a general method to a crafted application.

The chapter then describes the data analysis process that generated the codebook linking feeling states (typologies) to the observable actions and behaviours (typifications) of the study participants.

Finally, consistent with findings in the literature review (Chapter 4) and the qualitative nature of this doctoral research project, an additional independent layer of structure was applied to the overall research project. The intention is to ensure the quality, credibility and rigour utilised in this project (Tracy 2010).

7.1 Thematic Analysis

Qualitative research has been a feature of social-scientific investigation since its beginning. Gregen Josselson and Freeman (2015) point out that qualitative methods have been used by Freud, Piaget, Bartlett, Lorenz, and Vygotsky. Furthermore, in more recent times, researchers such as Festinger, Milgram, Zimbardo, and Gilligan have extensively relied on qualitative approaches making ground-breaking contributions to science. These applications of qualitative methods demonstrate that qualitative methods offer a complementary way of exploring people's thoughts, feelings, and values and offers ways to investigate people's personal experiences as

they act and interreact with the world (Rich 2017). Despite the continued use of qualitative methods in social science research, the British Psychological Society (BPS) and the American Psychological Association (APA) have been slow to acknowledge and accept qualitative methods. The BPS now has a section for qualitative methods, which held its first conference in 2008. The APA has been a little slower in its acceptance of qualitative methods, with qualitative methods being included in its methods section in 2011 (Biggerstaff 2012).

Thematic analysis comes under the umbrella of qualitative research methods. It is an umbrella term that describes a broad range of research strategies and methods that seek to extract and identify new insights from qualitative data (Braun and Clarke 2013). Merton (1975) first discussed Holton's thematic approach as a scientific analysis method in the 1970s. Merton's interpretation of Holton's approach posited the existence of underlying elements in human action and behaviour. These elements operate as tacit themes that stimulate or restrain individuals in their cognitive formulations, thereby either strengthening or dividing people's judgements. Since Merton, Boyatzis (1998) has argued that thematic analysis has descended into a poorly defined and rarely acknowledged, yet widely used analytic method to gain and develop our appreciation of the social world. The widespread use of thematic techniques is exemplified by Braun and Clarke's (2006) paper (at the time of writing this dissertation, Scopus analytics shows that Braun and Clarke's paper has received very nearly 40K citations, making it the most cited paper of 2006).

Braun and Clarke (2013) identify qualitative research as a paradigm in its own right. However, as specified in Chapter 5, this dissertation's perspective sees the choice of either working with words (qualitative research) or working with numbers (quantitative research) as being secondary to the perspective adopted from which to view the research problem. As (Blaikie and Priest 2017:20) argue, "this trend […] elevates to a fundamental level a feature of data collection and analysis that is secondary when compared with the fundamental choice between research paradigms, between ontological and epistemological assumptions and logics of inquiry". To this end, this PhD adopts the framework proposed by Kidder and Fine (1987) as an appropriate way of selecting a thematic approach to analysing the research data that is consistent with the philosophical positions outlined in Chapter 5.

7.1.1 Selection of an Appropriate Thematic Method

Over the years, a variety of thematic methods have been developed, each with its benefits, features and limitations. This study utilised the small-q and big-Q distinction proposed by Kidder and Fine (1987) to identify and select the most appropriate method to analyse the data produced by the quasi-experimental protocol and the construct elicitation method. Kidder and Fine's distinction provides a way of selectively differentiating between and choosing the most appropriate method of data analysis. Essentially, Kidder and Fine place qualitative research on a continuum that ranges from big-Q on the right of the scale to small-q on the left of the scale. Big-Q, qualitative research can be characterised as a spiral that gravitates around a centre, with each stage evolving out of the previous iteration of the research cycle. Researchers utilising big-Q techniques rely on authentic participants and their own personal hunches about what questions to ask. The questions asked by the researcher evolve and develop as a product of the research process.

Conversely, small-q qualitative research tends to be presented in a linear series of steps. It often begins a predetermined hypothesis with embedded questionnaires that can have either have open or closed questions or a combination of both types of questions. A feature of small-q research is that the same questions are asked of all participants. Another distinction that differentiates the spectrum between big-Q and small-q is the types of logic utilised to draw conclusions. In contrast, big-Q is most strongly associated with applying inductive and abductive logic; small-q is generally associated with deductive and inductive logic.

Embedded within these big-Q and small-q approaches are methods of analysis that the researcher needs to reflect upon concerning:

a) their underlying logic of inference, and
b) the relationship between underlying logic and various ontological and epistemological perspectives.

Viewing research from this perspective facilitates a systematic analysis of methods across the spectrum of big-Q to small-q providing a strategic approach to the selection of analysis methods. The first group (big-Q) include such methods as Codebook

Thematic Analysis (Boyatzis 1998) and Reflexive Thematic Analysis (Braun and Clarke 2006). The second group (small-q) include Grounded Theory (Charmaz and Belgrave 2015) and Interpretive Phenomenological Analysis (Smith, Flowers, and Larkin 2009)

7.1.2 Applying Kidder and Fine's Framework

Having already located the study's philosophical position and selected an appropriate research design strategy, it was possible to reject approaches such as Grounded Theory and IPA. The requisite method would need to fulfil all of the requirements of the study:

1. Strike a balance between big-Q and small-q approaches. This is because while a quasi-experimental protocol in Kidder and Fine's definition would reside on the small-q side of the spectrum, the construct elicitation method resides on the big-Q side of the spectrum.

2. A mid-range method facilitates the opportunity to produce results that researchers on both sides of the spectrum will understand and appreciate.

3. Apply an explicit and recognised method consistent with the philosophical perspective and research design strategy.

4. The analysis method should be capable of incorporating elements of the new synthesised model of experience.

5. The analysis method should be capable of identifying the symptomatic attributable effects of the mechanism of flow when it is operating and when it is rendered inert, employing the logic of inference associated with the research design strategy (Chapter 5).

The method of analysis that satisfied all of the requirements immediately above was a form of framework analysis – a codebook (Boyatzis 1998).

7.2 Process for Developing a Codebook

Boyatzis (1998) provides a staged process to help researchers develop a robust approach to thematically analysing data. The stages are:

1. Sensing Themes: a theme is a pattern that exists within the data. The recognition of a theme is described as a codable moment.

2. Coding: the ability to recognise a codable moment and code it consistently. Boyatzis (1998:13) states, "consistency of judgement, is reliability".

3. Developing Codes: developing a good code enables the researcher to capture the essence of the observations.

4. Interpreting Information: interpretation of the themes is only meaningful if it is considered in relation to previous research and/or theory. This interpretation of information facilitates a direct contribution to the development of knowledge.

Each of the above four stages are concerned with the identification, classification and consistency with which coding is achieved. The final stage describes the importance of how these codes should be coherent with previous research. Additionally, this final step provides another critical factor in choosing a codebook to analyse the data. As the new synthesised experience model already possesses a group of predefined themes and codes, namely, the feeling states of flow, control, arousal, relaxation, anxiety, boredom, worry, and apathy.

This data analysis method facilitates linking the Interpretivist and Critical Realist perspectives through distinct logics of inference (see Chapter 5, *Figure 5-1*).

Figure 7-1: Analysis Methods Relationship to Parallel Paradigms
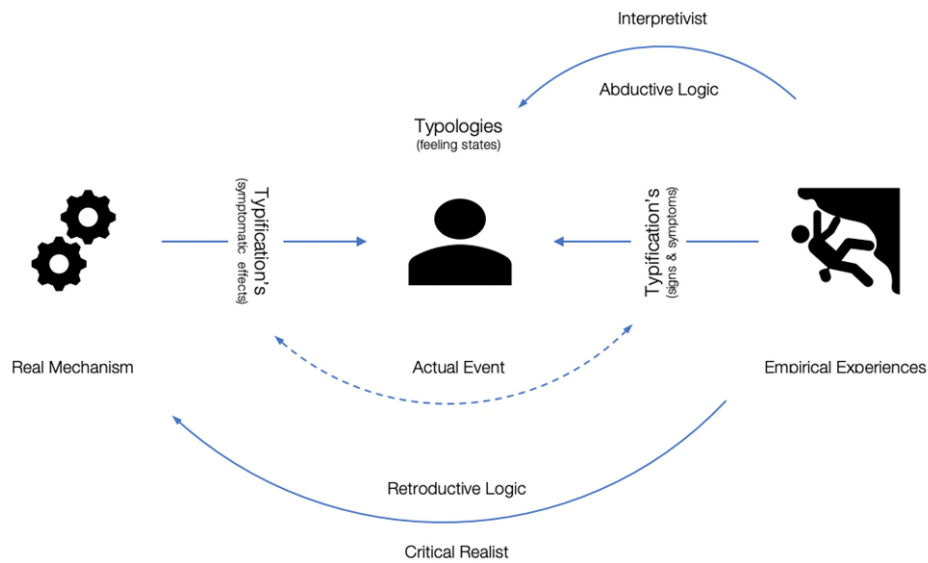
On the right-hand side of *Figure 7-1*, the Interpretivist paradigm links typifications to typologies (Blaikie and Priest 2017). That is to say, it links everyday actions and behaviours (signs and symptoms – typifications) of study participants in the empirical domain with social scientific definitions/descriptions of actual events in the affective domain. This approach intends to progressively produce abstract and compact meaning structures (the feeling states – typologies).

This process is achieved using a combination of abductive and inductive logic. On the left-hand side of *Figure 7-1* (from the Critical Realist perspective), the analysis method links the symptomatic attributable effects (signs and symptoms – typifications) of when the mechanism is operating and on the limits of operation (synthesised model thresholds). In other words, the analysis method facilitates through retroductive logic the signs and symptoms of study participants in the *empirical* domain with the individual's intra-subjective fluctuations in the domain of the *actual* (the feeling states – typologies).

This section has explicitly linked the analysis method with the philosophical perspectives in *Figure 7-1*. From this point, it becomes possible to think about the practicalities of operationalising the method in relation to the synthesised model of experience and the data produced by the experimental protocol and the construct elicitation method.

7.2.1 Operationalising the Codebook

Figure 7-2 is the operationalisation of *Figure 7-1* – the movement from general theory and method to a novel application of analysis. *Figures 7-2* and *7-1* have been deliberately designed to be overlayed and, therefore, easily visualised in direct relationship to each other. Placing *Figure 7-2* over *Figure 7-1* illustrates that by explicitly identifying the philosophical perspective from which to investigate the research problem, it is possible to craft a unique application of a general method without sacrificing the integrity of the study's overarching principles in the application of the method to analyse a specific set of data.

Figure 7-2 depicts how the codebook is located and developed in relation to the research questions. It also depicts the utilisation and application of the data derived from the quasi-experimental protocol. Each side of *Figure 7-2* provides a distinct perspective from which the research problem is viewed. In the middle of the diagram, the feeling states (apathy, worry, anxiety, arousal, flow, control, relaxation, boredom) are labels representing the actual events of individual subjective experience (typologies). On the right of the diagram, the quasi-experimental protocol provides the opportunity to directly observe study participants as they engage in a range of climbs of varying degrees of challenge. It is the observations of people as they engage in a range of climbing challenges that provides one of the study data sets. Finally, the new synthesised model depicts a landscape of intra-subjective experience of states and their relation to challenge, with the underlying mechanism embedded within its structure. By depicting the method's crafted application in this way, the two perspectives from which the research problem is viewed and their relationship to both research questions can be seen.

Figure 7-2: Aggregation of Codebook with Quasi-experimental Protocol
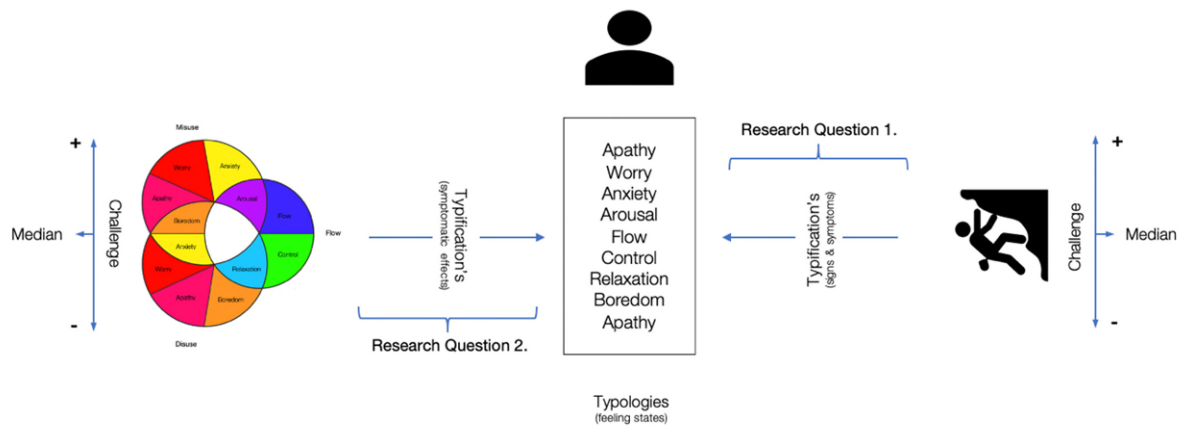
Therefore, the right-hand side of *Figure 7-2* sets out to see if it is possible to link people's observable signs and symptoms as they engage in a range of climbing challenges. That is to say, is it possible to observe people being moved in and out of flow through the various instances and absences of states – research question 1.

Then the left-hand side of *Figure 7-2* sets out to develop our appreciation of the effects of that challenge on people's subjective experience. In other words, how does challenge cause people intra-subjective experiences to fluctuate in relation to challenge – research question 2

7.2.2 The Initial Development Phase of the Codebook

A good thematic code is theory-driven and captures the qualitative richness of the phenomena. Importantly, these codes must be usable in the analysis, interpretation and presentation of the research (Boyatzis 1998). To this end, the typologies of feeling states are predefined within the structure of the new synthesised model. Therefore, in this theory-driven PhD study, the descriptions of the feeling states in *Table 7-1* were developed from the root descriptions previously identified in Chapter 3 that were originally used to develop the new synthesised model. These descriptions of feeling states (typology) and their associated references can be seen in *Appendix B*.

While each of the codes and their associated descriptions is a direct product of the theory derived from the literature on flow, they are initially standalone — they are void of context. The next stage of developing the codebook necessitated the orientation of the codes to an explicit context, namely, the context of climbing. This orientation of

codes and descriptions was achieved by reviewing the many climbing books, documentaries, and interviews to identify examples of the codes (typology) in context.

An example of the orientation of a code (arousal) to the climbing context comes from Dave McLeod (Diffley 2019) when discussing 'The Indian Face' (at the time of its first ascent, this climb represented one of the most challenging and serious rock climbs in the world).

> *"but on Indian Face like you are just clawing at these tiny little edges so*
> *you feel kinda of you just have that feeling that you can't really get that*
> *much purchase on the wall you've got nothing really good to hold on to*
> *and so you have to be totally cool in your head and you're just aware*
> *that the whole time for 20 minutes you are on the edge of panicking"*

Finding examples of all typologies in terms of feeling states represented in the codebook presented a specific problem – professional climbers do not climb to experience boredom or apathy, and, as a rule, they tend to mitigate worry. To this end, the principal researcher drew on their own experience to identify examples that would potentially orientate these typologies to the context of climbing.

Table 7-1: Typologies of Feeling States

Label	Definition
Arousal	A psychological state of heightened wakefulness that can be split between focus and alertness. On the one hand, arousal reduces the number of cues an individual is capable of utilising (the elimination of irrelevant cues). In some situations, this can be advantageous. On the other hand, such a reduction often begins to reduce individual performance. This state is characterised by high cognitive and or physical investment, involvement and goals in the face of discrepancies between above-average challenges and around-average skill.
Flow	Known as '*being in the zone', 'in flow* or '*in the groove*' (look for similes or metaphors in character with descriptors). The participant is intrinsically motivated and fully immersed in the activity, experiencing feelings of energised focus, full involvement in the task, with a deep sense of enjoyment, often described as an optimally positive experience. This state is realised when arousal levels and individual capability complement the activity's challenge, creating a harmonic resonance between the participant and the activity.
Control	Corresponds to an individual's passive experience of control and happiness in the face of around-average challenges and above-average skill. The individual can achieve their preferred outcomes, self-manage or regulate their attitudes and feelings towards a specific task and avoid undesired outcomes.
Relaxation	Characterised by positive mood and intrinsic motivation, as well as low cognitive investment; it is primarily connected with energy restoration and low-challenging tasks, where the participant can positively influence and regulate their response to those activities that affect them in such a way that they experience mild pleasure and are free from tension.
Boredom	When challenges are below average and skills are around average. It is characterised by low levels of cognitive investment and a lack of clear goals. The individual is not interested in their surroundings or feels that a day or activity is dull or tedious. It is a mental state that people experience an unpleasant lack of stimulation that leaves them craving relief.
Apathy	The predominance of apathy in daily life hampers mental health and personal growth. It can be identified by a lack of interest or concern. The individual may feel they lack a sense of purpose, worth or meaning in their lives.
Worry	A response to a difficult challenge for which the participant has a below-average capability. Engendering uncontrollable adverse feelings from the anticipation and the negative consequences of potential threats, creating images or emotions of a negative repetitive uncontrollable nature, resulting from a proactive cognitive risk analysis made to avoid or solve anticipated potential threats and their potential negative consequences.
Anxiety	Individuals do not feel able to cope with the situation, and they report high cognitive investment, *negative affect*, and low intrinsic motivation. Negative affect signals a problematic environment, which directly triggers a bottom-up (microanalysis), local, systematic, and detailed processing style.

Having organised and developed the descriptions of the typology of themes and then orientated those themes to the activity and context, it becomes necessary to move onto the next stage in developing the codebook. In this next stage, linking the participants' observable signs and symptoms to the various descriptions is necessary – linking typification (signs and symptoms) to typologies (descriptions of feeling states).

7.2.3 Linking Typifications to Typologies

This part of the development process is depicted on the right-hand sides of *Figures 7-1 & 7-2* and utilises the interpretive standpoint to generate the codebook. Developing the codebook and linking the typified signs to the typologies of feeling states is an iterative cycle of data analysis. The primary data is the participant's observable actions and behaviours (signs) as they engage in the activity.

However, in this generative process of codebook development, the researcher does not rely solely on the primary data set to develop the codebook. Built into the overall research protocol was the development and gathering of other forms of data that would provide additional resources for the research to draw upon while developing the codebook. These other data recourses provide ways of supporting the analysis of the primary data and corroborating the conclusions of the development process.

So, two forms of data were utilised in the development of the codebook:

1. The observable actions and behaviours (signs – typifications) of the participants as they engage in the activity.

2. The participants' self-reported expressed experiences of the activity immediately after completing the climb (symptoms – typifications). That is to say, descriptions of their experiences in the sensory empirical domain

The participants' constructs (developed in the construct elicitation interview – Chapter 6) were used to support analysis of the data sets above and to triangulate

the way participant's construe the relationships between various elements of the challenging environment in the affective domain.

7.2.4 Identification of The Coding Variables

Properly linking typifications to their typologies requires the researcher to explicitly define the unit of coding and the unit of analysis before commencing the coding process.

- *The unit of coding* – is the participant's subjective experience as they engage in the activity in terms of feeling states: typologies.

- *The unit of scrutiny* – is the participant's actions and behaviours as they engage in the activity (signs): typifications.

Note: the unit of scrutiny is normally called the unit of analysis within the literature on codebook development. However, this PhD research project has already utilised the term the 'unit of analysis' to define the focus of this doctoral dissertation.

Having identified the unit of coding and the unit of scrutiny, it becomes possible to begin the generative iterative cycle of codebook development. That is the identification of a codable moment, where it becomes possible to link the description of a feeling state to an explicit observable action or behaviour.

7.2.5 Identifying a Codable Moment

As alluded to previously, the development of the codebook and the identification of codable moments is an iterative process. Traditionally, in thematic research, the researcher must engage and work with the data to facilitate the development of rich descriptive codes (Braun and Clarke 2013). To begin developing codes and sensing codable moments, the researcher must be open and receptive. The researcher should be ready and able (prolonged engagement) to proactively engage and work with the data to facilitate the sensing and identification of a codable moment (Boyatzis 1998).

In this research project, this process was achieved by the researcher's prolonged engagement in the climbing environment and by designing the research protocol and conducting the empirical portion of the research project to gather the raw data.

Figure 7-3 depicts the cycle of data analysis and the identification of codable moments. This sequence was repeated across all three case studies. The sequence began with the generation of the construct landscape from the construct elicitation interviews. A verbatim transcription method was applied to preserve the voice of the participants (Braun and Clarke 2013). This approach enabled the researcher to work with the data in a constructive way, allowing the researcher to develop a deeper appreciation of the research participants construct landscape (the construct landscapes of the participants can be seen in *Appendix C*).

Additionally, the researcher's appreciation of the participants' construct landscapes was enhanced when the researcher developed and built simple three-dimensional pipe-cleaner models of the participants construct landscapes. This modelling approach allowed the researcher to develop an appreciation of the participant's constructs in relation to each other, in the ways that they bifurcated, looped and feedback into each other.

Figure 7-3: Iterative Cycle of Codebook Development
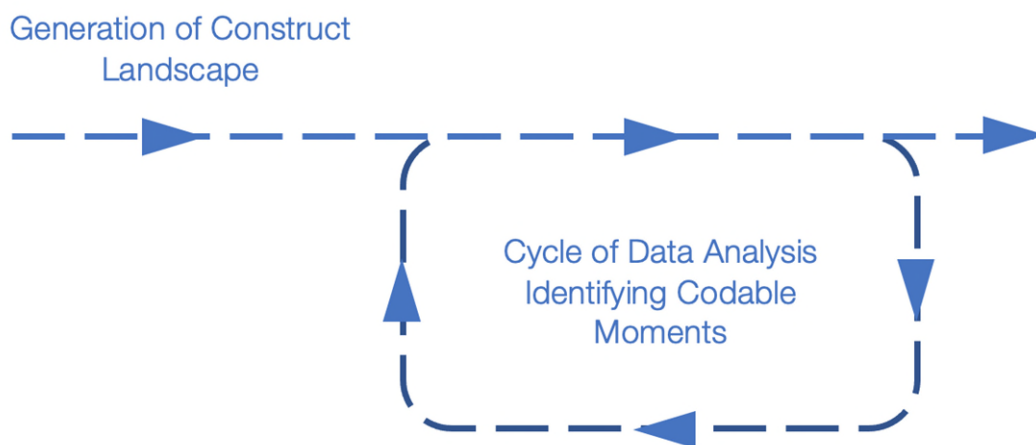
The next iterative phase of the data analysis (as signified by the loop in *Figure 7-3*) began with watching the climbing session's complete video footage. Once this was completed, the process of analysing the data began. In this stage of the data analysis, a verbatim transcription method was applied throughout the analysis to preserve the voice of the participants (Braun and Clarke 2013). The researcher utilised two different tools to facilitate the identification of a codable moment:

1. The descriptions of feeling states (typologies) are in *Table 7-1*.

2. The system of Boolean equations that were developed in Chapter 3. The equations orientated the researcher to what potential actions and behaviours may be present and those actions and behaviours that may be missing. This approach is consistent with Boyatzis (1998), who discusses how analysis of both the presence and absence of particular behaviours can be analysed.

Several different layers of information were recorded in the iterative analysis phase of the data analysis. The initial layer of information concerned the climb that the participant was about to climb:

1. The order of the climb in the sequence of overall climbs.

2. The technical difficulty of the climb and its relationship to the participants median climbing grade.

3. A description of the climb itself (slabby, steep, overhanging, crimpy, juggy (large holds)).

4. Any commentary the participant made about the climb, their mood, actions and behaviours.

The next layer of information that was recorded concerned the identification of codable moments:

      i.   The time on the video when the codable moment occurred.

     ii.   A detailed description of the observed sign.

<blockquote>
iii. A description of the immediate situation experienced by the participant.

iv. The associated feeling state.
</blockquote>

When a codable moment was identified, the moment was reviewed multiple times to capture every piece of salient information associated with the codable moment. This information was then used in conjunction with the tools above to assign the action/behaviour to a specific typology. All of this information was recorded in a structured and coherent manner for each of the three case studies. The results can be seen in *Appendix D.*

An additional level of confirmation was applied to the analysis by using the participant's thoughts and self-reflections immediately after the climb. This process was completed for the case studies.

7.3 The Quality of Qualitative Research

The literature review (Chapter 4) revealed the importance of using qualitative checks to evaluate any research project's rigour. Lincoln and Guber (1985) propose six different elements that contribute to the quality of qualitative research:

1. Thick description

2. Prolonged engagement

3. Member checks

4. Triangulation

5. Audit trail

6. Peer review

These principles are essential because they support the researcher in orchestrating the research project.

Positivist approaches to research rely heavily on factors that can be weighed, measured, assessed or otherwise quantified and falsified. Interpretivist

(constructivist) approaches to research focus on different non-quantifiable aspects of human experience and social life (Tracy 2010). Qualitative inquiry balances the focus of quantification by moving beyond tangible or measurable variables to focus on people's social constructions, actions, and behaviours. This research perspective does not reject the value of investigating the physical realities of the social world. However, it seeks to capture the emergent phenomenological experiences and socially generated structures of people's actions and interactions with other people and their environment (Burr et al. 2014; Lincoln 2007).

Therefore, this PhD research project has overlayed a qualitative best practice framework and applied it as a qualitative appraisal tool to test the various elements of this research project. Tracy (2010) has developed an 8-point conceptualisation: worthy topic, rigour, sincerity, credibility, resonance, significant contribution, ethical and meaningful coherence. These elements can be seen in *Figure 7-4*.

Figure 7-4: Principals of Qualitative Research

The inner blue ring directly above represents Tracy's principles, and the orange ring depicts a brief description of those primary principles. What can be seen is that the credibility and trustworthiness of the study include the elements from Lincoln and Guber (1985). This shows the individual elements that give credibility to a qualitative phenomenological study. These elements can be fitted into a broader and more comprehensive strategic set of guiding principles to develop and design a research project.

Tracy's comprehensive framework will be used as an additional tool in Chapter 10 to support this doctoral research project's evaluation.

7.4 Chapter Summary

This chapter has explicitly set out the method of data analysis utilised in this doctoral research project. The chapter begins by discussing qualitative research and its application to social science from a historical perspective (Biggerstaff 2012; Gergen et al. 2015; Rich 2017). Next, the various methods and methodologies of qualitative research are assessed in terms of their Kidder and Fine's (1987) continuum of qualitative research.

The next section of the chapter is concerned with aligning the chosen analysis method (framework analysis) with the philosophical perspective of this PhD research project. The chapter then proceeds to craft the analysis method into a specific application suited to analysing the research data (*Figures 7-1 & 7-2*). Following this, a comprehensive group of typologies of feeling states are collated with appropriate labels, compact descriptions, and examples orientating them to the context under investigation (*Table 7-1*). This section concludes with a detailed description of the data analysis process and the multifaceted approach to the identification and corroboration of the codable moments that link the typifications to typologies.

The chapter's final section is dedicated to viewing this doctoral research project through a best practice framework (Tracy 2010). This framework will be used in the final chapter to assess the overall quality of the project.

The following chapter presents the research protocol results and presents them in terms of the two research questions.

Chapter Eight

Results

The fact is worth remembering because it is often neglected that the words animal and environment make and inseparable pair. Each term implies the other. No animal could exist without an environment surrounding it.

James J Gibson. The Ecological Approach to Visual Perception (1986)

8 Introduction – Results

This chapter builds on the analytical foundations developed in Chapter 7 and presents the results of this PhD research project in terms of the research questions:

Research Question 1:

- Is it possible to encode the signs and symptoms of an individual as they transition in and out of flow through the various instances and absences of feeling states?

Research Question 2:

- What effect does challenge have on the nature of an individual's subjective experience?

In the first section of this chapter, as described in Chapter 5, RQ-1 is investigated from an Interpretivist perspective. In this way, the unit of observation (a person's actions and behaviours – signs and symptoms) are linked through the logic of abduction to the units of analysis (intra-subjective fluctuation). The relationship between the observable signs and symptoms and an individual's intra-subjective experience of being with various levels of challenge is presented in the form of the codebook, as discussed in Chapter 7.

The second section of this chapter addresses RQ-2. As described in Chapter 5, this research question is addressed from a Critical Realist perspective. In this second section, the links between typifications and typologies developed in the first section are used to identify how an individual's subjective experience fluctuates in relation to varying levels of challenge.

Each of the sections was derived from the analysis of the research data. In line with Gibson's quote above, the participants' observed actions and behaviours were always recorded in conjunction with the participants' Opportunities for Action (level 1), Manifest Level (level 2) and the Encodable Moment (level 3). The diagram (*Figure 8-1*) below depicts the way each proposition in the results section is structured, and the language adopted

Figure 8-1: Structure of Data Analysis
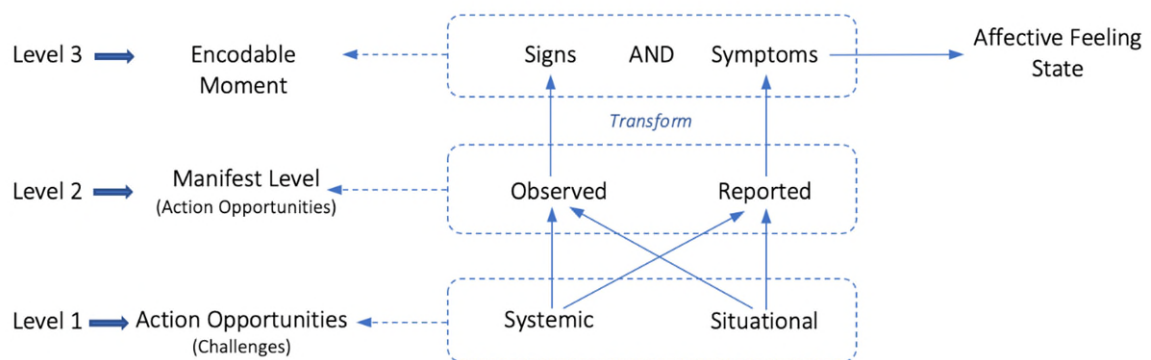
1. Level 1 – Action Opportunities: This is the level at which it is possible to describe systemic factors (see protocol), situational factors, and physical phenomena that can be identified.

2. Level 2 – Manifest level: Is the identification of action capabilities in terms of observations, objective evidence of behaviours and actions (for example, inability to make a move); and self-reports – participants subjective verbal responses pre, post and during the climb (for example, expressing enjoyment).

3. Level 3 – Codable moment: The differential analysis in terms of signs and symptoms as they correlate with observations and self-reports leading to affective experiential state.

Importantly, codable moments that were only displayed by a single participant are not included in the codebook.

The unabridged data (thick description) can be seen in *Appendix E*. This data is organised by participant and the order in which they attempted each of their climbs.

8.1 Section 1: Linking Typifications and Typologies

In this first section of the results chapter, a codebook is developed from the experimental protocol, construct elicitation interview, participant self-reflection

and review carried out by the study participants once the codebook was developed.

Moreover, an audit of the codebook was carried out by Jeremy Hilton and Dr Lorraine Dodd (the supervisors of this doctoral research project) to check for the coding consistency (Boyatzis 1998). Therefore, this section of the results is aimed at answering the RQ-1:

- Is it possible to encode the signs and symptoms of an individual as they transition in and out of flow through the various instances and absences of feeling states?

8.1.1 The Structure and Format of the Codebook

In the following pages, each of the experiential states, as seen in the New Synthesised Model of Experience, are tabulated in typologies. Each table describes the experiential state (typology) and includes a list of associated typifications (signs and symptoms). Following each table are descriptions of the typologies and how they were developed from the thick description (*Appendix E*). The typologies of experiential states are ordered in the following sequence: worry, anxiety, arousal, flow, control, relaxation, boredom and apathy. The reason for presenting the results in this order is a product of how the experiential states appear when viewing the synthesised model. Worry can be seen at the top of the model in misuse, and apathy can be seen at the bottom of the model in disuse.

For a typification to be regarded as applicable and included in the codebook (typologies of feeling states), the typification must be observable from at least two study participants. Codable moments that were only observed from an individual participant were not included.

In this way, the codebook synthesises all of the study participants' experiences when engaging in the various climbing challenges into a single codebook. In the tables below:

- Participant-1 is referred to as Case Study-1 (CS1).
- Participant-2 is referred to as Case Study-2 (CS2).

- Participant-3 is referred to as Case Study-3 (CS3).

As an example, in the worry table directly below: the first typification is described as:

- Identification (consequences) of specific problem. CS1 – T26. CS3 – T5, T34, T35, T39

This codable moment is the product of participant-1 and participant-3's experiences at a specific moment(s) in time. The typification should be read as Case Study-1 (CS1) at time interval T26 (T for time) and Case Study-3 (CS3) at time intervals T5, T34, T35 and T39. Then directly below the table, a complete description of the typification is provided, directly linking the typification to the thick description (*Appendix E*). Moreover, the time indexes labelled with a 'T' directly link to the case studies and the specific time indexes in the thick description (*Appendix E*).

What can also be seen is an asymmetry in the number of typifications associated with each of the typologies:

1. Worry has two signs and zero symptoms.

2. Anxiety has eight signs and four symptoms.

3. Arousal has eleven signs and four symptoms.

4. Flow has six signs and two symptoms.

5. Control has six signs and three symptoms.

6. Relaxation has seven signs and two symptoms.

7. Boredom has five signs and four symptoms.

8. Anxiety has zero signs and zero symptoms.

The purpose of developing a codebook is to facilitate the identification of typifications in terms of people's observable actional and behaviours and related those typifications to the descriptions of experiential states (typologies).

8.1.1.1 Worry

Importantly, worry only has two signs because the protocol was designed to stop the study participants from experiencing worry. To this end, only two of the study participants were observed to experienced worry.

Typology (Label)	Worry – (Wo)
Description	A response to a difficult challenge for which the participant has below-average capability. Engendering uncontrollable adverse feelings from the anticipation and the negative consequences of potential threats, creating images or emotions of a negative repetitive uncontrollable nature, resulting from a proactive cognitive risk analysis made to avoid or solve anticipated potential threats and their potential negative consequences.
Typification (Signs and Symptoms)	Signs 1. Identification (consequences) of specific problem. CS1 – T26. CS3 – T5, T34, T35, T39. 2. Attempts to mitigate demands of challenge. CS1 – T26. CS3 – T5 Symptoms NA

Signs

Typification 1: <u>Identification (consequences) of specific problem</u>. In all three instances, the participants were able to identify a specific problem. In two instances, the problems were identified before the participants started to climb. In the first instance, participant 1 identified the possibility of a ground fall due to the climb's difficulty. In the next instance, participant 3 identified the possibility of taking a swing if they were to fall due to the proximity of the climb in relation to the placement of the quickdraws, where participant 3 said, "if I fall it could be a big swing". These instances are recorded at CS1 – T26 and CS3 – T34.

Additionally, participant 3 identified at T5 the effect that being watched had on their performance when engaging in their first climb. Participant 3 said, "wasn't comfortable at all I know I'm being watched".

Typification 2: <u>Attempts to mitigate demands of challenge</u>. Having identified the possibility of a ground fall, participant 1 at T26, before commencing the climb, used any holds just to be able to make the first clip to reduce the risk to avoid an unnecessary ground fall, then lowered straight to the floor. Then at T5, participant 3 said, "I had to try to keep in mind this was only a warm-up". This was participant 3's attempt at mitigating the worry they experienced when climbing.

Note: when participant 3 identified the potential problem of taking a swing if they fell during their fifth climb, they did not attempt any form of mitigating action to address the problem.

8.1.1.2 Anxiety

Typology (Label)	Anxiety – (An)
Description	Individuals do not feel able to cope with the situation. They report high cognitive investment, *negative affect*, and low intrinsic motivation. Negative affect signals a problematic environment, which directly triggers a bottom-up (microanalysis), local, systematic, and detailed processing style.
Typification (Signs and Symptoms)	Signs 1. Physically struggling. CS1 – T29. CS2 – T33, T39, T43, T45, T46, T47. CS3 – T28, T38. 2. Seeking reassurance from belayer. CS1 – T22. CS2 – T27. 3. Failure to identify critical cues. CS2 – T44. CS3 – T2 to T3, T4, T38. Symptoms 4. Identifying problematic situation. CS1 – T22, T29, T30. CS2 – T27, T36, T43, T48, T50. CS3 – NT2 5. Expressing negative feelings. CS1 – T29. CS2 – T43, T50. CS3 – NT2, 6. An acute sharp expiration type of breath (grunting). CS2 – T46, T47. CS3 – T37,

Signs

Typification 1: <u>Physically struggling</u>. All of the codable moments of this typification occur at the limit of the participants' capability at that moment. All of the examples can be characterised in three ways:

1. At the limit of being able to hold on when pulling up rope and trying to clip.

2. Attempting to make a crux move but falling off the climb.

3. Physically/psychologically unable to make a crux move and then lowering off to the ground and forgetting to do procedural elements.

Typification 2: <u>Seeking reassurance from belayer</u>. In each of these examples, the participants identify a specific insistence where they feel they may take a fall. Participant 1 says, "Keep me close", and participant 2 says, "watch me". Their concern is an attempt to avoid an undesirable outcome – taking a long fall.

Typification 3: <u>Failure to identify critical cues</u>. This typification was observed five times. It occurred either when the participant failed to identify a critical hold (hand or foot) or failed to carry out a critical and necessary procedural action, for example, clipping the rope into both lower offs at the top of a climb.

Symptoms

Typification 4: <u>Identifying problematic situation</u>. All of the codable moments associated with this typification were concerned with the participant's verbal identification of the crux problem. These verbalisations were not always directed to any one specific person. They were just the participant's verbal expressions of the situation. One interesting exception to this trend was participant 3's description of climbing their easiest climb; they said, "there were levels of stress because I was going above the grade". Post protocol, the participant explained that they meant the climb was too easy, and they inadvertently were trying to make it more difficult for themselves creating their own ambiguity.

Typification 5: <u>Expressing negative feelings</u>. For participants 2 & 3, expressing their negative feelings extended beyond the climb; their negative feelings were not about a single instance of struggling but about the entirety of the climb. Interestingly, while participant 2's verbalisation was associated with their most challenging climb, participant 3's statement was about their easiest climb.

Typification 6: <u>An acute sharp expiration type of breath (grunting)</u>. This occurred due to the surprise participants 2 and 3 experienced when their foot slipped off a hold.

8.1.1.3 Arousal

Typology (Label)	Arousal – (Ar)
Description	It is a psychological state of heightened wakefulness. That can be split between focus and alertness. On the one hand, arousal reduces the number of cues an individual is capable of utilising (the elimination of irrelevant cues) that, in some situations, can be advantageous. However, on the other hand, such a reduction often begins to reduce individual performance. This state is characterised by high cognitive and or physical investment, involvement and goals in the face of discrepancies between above-average challenges and around-average skill.
Typification (Signs and Symptoms)	Signs 1. Unable to communicate other than in single words – grunts of effort. CS1 – T28, T31. CS2 – T46, T47. CS3 – T27, T37. 2. Identification of problems (critical/crux). CS1 – T12. CS2 – T8 to T11, T34, T37. CS3 – T24, T27, T36. 3. Movement becomes stunted. CS1 – T12. CS2 – T8 to T11, T14, T26 to T29. CS3 – T30. 4. May stop to identify holds. CS2 – T34, T38. CS3 – T24, T29. 5. High levels of cognitive and/or physical effort. CS1 – T12, T14, T27, T32. CS2 – T26 to T29, T28, T30, T31, T46, T47. CS3 – T4, T5, T36. Symptoms: 6. Detailed descriptions. CS2 – T48. CS3 – T32, T43. 7. Expressing great effort. CS1 – T14, T24. CS2 – T13, T31, T32. CS3 – T32.

Signs

Typification 1: <u>Unable to communicate other than in single words – grunts of effort.</u> All three participants at various times displayed this particular behaviour when they were working at the limits of their capability. This occurred when the challenge they were experiencing was acute and proximal.

Typification 2: <u>Identification of problems (critical/crux).</u> Two of the participants were able to identify the crux moves when they encountered them and were able

to mobilise their capability and negotiate the crux move. However, participant 3's approach to negotiating the crux move was to move onto larger holds.

Typification 3: <u>Movement becomes stunted</u>. This codable moment occurs when participants are close to the limits of their usable capability.

Typification 4: <u>May stop to identify holds.</u> The participant is at the limit of capability, so has to stop and reduce the challenge so that they can apply their cognitive recourses to identify the correct route.

Typification 5: <u>High levels of cognitive and/or physical effort</u>. This codable moment occurs when the participants have to deal with sequences of hard moves at the upper limits of their capability. Certain tell-tale signs indicate this level of effort, such as:

1. Elbows are sticking out.

2. Shaking out arms.

3. Reversing moves to a rest position.

4. Reduced points of contact.

Symptoms

Typification 6: <u>Detailed descriptions</u>. The level of focus on the task enables the participant to be able to recall detailed elements of the activity.

Typification 7: <u>Expressing great effort</u>. This codable moment occurs when the participant is either engaging in a problem that is acute and proximal or has just engaged in a demanding challenge. This is a product of being able to maintain focus.

8.1.1.4 Flow

Typology (Label)	Flow – (FI)
Description	Known as being in the zone, in flow or in the groove (look for similes or metaphors in character with descriptors). The participant is intrinsically motivated and fully immersed in the activity, experiencing feelings of energised focus, full involvement in the task, with a deep sense of enjoyment, often described as an optimally positive experience. This state is realised when levels of arousal and individual capability compliment the challenge of the activity, creating a harmonic resonance between the participant and the activity.
Typification (Signs and Symptoms)	Signs 1. Focus is complete. CS1 – T16 to T17, T19. CS3 – T14 to T15, T21 to T23, T40. 2. Limited or no conversation while climbing. CS1 – T16 to T17, T19. CS3 – T14 to T15. 3. Fully absorbed in the activity. CS1 – T19, T21. CS2 – T37. CS3 – T16 to T17, T21 to T23, T40. 4. Smoothness of movement. CS1 – T16 to T17, T19. CS2 – T5 to T7, T17 to T21. CS3 – T14 to T15, T21 to T23. 5. Innately knowing what needs to be done. CS1 – T19, T21. CS2 – T5 to T7, T17 to T21. CS3 – T22, 6. Task focused, not outcome-focused. CS1 – T34. CS2 – T19. CS3 – T21 to T23. Symptoms 7. Expressing enjoyment/pleasure after the climb. CS1 – T16 to T17, T18, T25, T34. CS3 – T19, T40

Signs

Typification 1: <u>Focus is complete</u>. Participants become so involved in the activity nothing else exists. The distinction between the participant and the activity vanishes two become one. Participant 3 described it as, "there was nothing else in the room".

Typification 2: <u>Limited or no conversation while climbing</u>. This codable moment is a product of typification 1. The participants are so absorbed in the activity that there is no one to talk to unless they are a direct integral feature of the activity. At

T16 to T17, Participant 1 is heard to laugh (giggle) to themselves as they pull through a large roof – pure enjoyment.

Typification 3: <u>Fully absorbed in the activity</u>. The relationship between the participant and the activity and the wider environment is harmonious. This manifests in the participants' behaviours and actions. Nothing distracts or detracts the participant from what they are doing. Even reaching the top is an inconvenience. For example, Participant 1, on reflection at T25, said, "wish it was a bit longer".

Typification 4: <u>Smoothness of movement</u>. This codable moment is a product of typification 3. The Participants' actions are completely synchronised with all of the subtle and intricate elements of the climb. Feet and hands are perfectly placed; the body is always in the correct position and in balance. Movement is fluid.

Typification 5: <u>Innately knowing what needs to be done</u>. The climb is an unbroken stream of movement and thought. There is no stopping, pausing, hesitation or questioning.

Typification 6: <u>Task focused, not outcome-focused</u>. Anything that distracts the participants from the activity is an inconvenience, even reaching the top. The participant can express surprise when a move unfolds, as Participant 2 said after completing the climb (T18), "it's nice but one of those you're not quite sure if it's there".

Symptoms

Typification 7: <u>Expressing enjoyment/pleasure after the climb</u>. This symptom is not just about what is said but how it is said. There is an element of rapture about what is said. This typification is exemplified in a statement from participant 1. At T24, participant 1 said, "fucking hell, I thought I was going to die – I'm fucking knackered (laughter)". This comment was immediately followed at T25 with, "that's the best I've climbed all year". The participant, at this point, was referring to the entirety of the climbs they had done this far.

8.1.1.5 Control

Typology (Label)	Control – (Co)
Description	Corresponds to an individual's passive experience of control and happiness in the face of around-average challenges and above-average skill. The individual is able to achieve their preferred outcomes, self-manage or regulate their attitudes and feelings towards a specific task and avoid undesired outcomes.
Typification (Signs and Symptoms)	Signs 1. Smoothness of actions. CS1 – T1 to T2, T4 to T6, T35. CS2 – T1 to T2, T12. CS3 – T11 to T12, T14 to T15. 2. Confidence of movement and decisions. CS1 – T1 to T2, T4 to T6, T9 to T11, T35. CS2 – T1 to T2, T9, T12. CS3 – T11 to T12, T14 to T15, T41. 3. Able to climb and respond to questions. CS1 – T1 to T2, T4 to T6, T35. CS2 – T10, T18, T19. CS3 – T6. 4. Directing attention to where it is needed. CS1 – T10. CS3 – T1, T11 to T12, T16 to T17, T34. 5. Achieve their preferred outcomes and regulate tasks and avoid undesired outcomes. CS1 – T26, T41. CS2 – T25. 6. Regulation of attitudes and behaviours. CS1 – T9 to T11. CS2 – T4, T25. CS3 – T25, T26, T31, T34, T41. Symptoms 7. Discussing the climb. CS1 – T3, T33, T36. CS2 – T15, T25. CS3 – T13. 8. Positive descriptions of the climb. CS1 – T1 to T2, T4 to T6, T7. CS2 – T3, T18. CS3 – T13. 9. Expressing positive emotion CS1 – T4 to T6, T7, T37. CS3 – T10, T13.

Signs

Typification 1: <u>Smoothness of actions</u>. An economy of movement characterises this, but the participant can be seen to have more to give. There is no strain on the part of the participants. All the participants were observed to climb with great accuracy using straightforward moves. Nothing is gymnastic or dynamic.

Typification 2: <u>Confidence of movement and decisions</u>. There is never a point at which the participants stop to think about what is next. The participants always know what to do and how to do it. There are no mistakes, no oversights.

Typification 3: <u>Able to climb and respond to questions</u>. This typification exemplifies the experience of control. In all instances, when the participants were in control, they were always able to respond to questions—indicating that they did not have to use the entirety of their capability. However, they did not initiate conversations.

Typification 4: <u>Directing attention to where it is needed</u>. The individual is not only in physical control; they have psychological control too. This is exemplified in two ways:

1. Participants 1 and 2 both experienced a 'flash pump' but were able to continue climbing.

2. All the participants were observed to look ahead to identify what they needed to do next and where they needed to go.

Typification 5: <u>Achieve their preferred outcomes and regulate tasks and avoid undesired outcomes</u>. The ability to control is not just about physical or psychological control. It is about recognising potential future problems and acting in a way to mitigate those problems. Both Participants 1 and 2 exhibited this typification. Allowing them to achieve the tasks they had been set successfully. They had to be given autonomy and personal discretion over their decisions to achieve this.

Typification 6: <u>Regulation of attitudes and behaviours</u>. This codable moment is linked to typification 5 and is exemplified by all the participants and their ability to manage tasks and themselves within their immediate environment. All of the participants throughout the protocol demonstrated this ability. See thick description *Appendix E.*

Symptoms

Typification 7: <u>Discussing the climb</u>. This typification exemplified the difference between the state of flow and the state of control. The participants are cognizant of what they are doing and why they are doing it. They are also able to recount what they did.

Typification 8: <u>Positive descriptions of the climb</u>. Not to be confused with how the activity felt. This typification is concerned with the activity itself and the qualities of the activity. For example, Participant 2 at T18 describes the climb as nice, and Participant 3 at T13 discusses the climb's difficulty in a positive way.

Typification 9: <u>Expressing positive emotion.</u> This typification is concerned with how the participant felt while climbing. Unlike the rapture of comments associated with flow (Flow – typification 7: <u>Expressing enjoyment/pleasure after the climb),</u> participants were not as effervescent when describing their experience of control. Participant 1 described a climb at T7 as, "It's one of the reasons you should climb indoors, it feels nice its good for the body". Participant 3 at T13 described the climb as feeling great.

8.1.1.6 Relaxation

Typology (Label)	Relaxation – (Re)
Description	Characterised by positive mood and intrinsic motivation, as well as low cognitive investment; it is primarily connected with energy restoration and low-challenging tasks, where the participant is able to positively influence and regulate their response to those activities that affect them in such a way that they experience mild pleasure and are free from tension.
Typification (Signs and Symptoms)	Signs 1. Effortless actions. CS1 – T48 to T49. CS2 – T51 to T53. CS3 – T44 to T45, 2. Ease of movement and decisions. CS1 – T38 to T43, T39, T48 to T49. CS2 – T51 to T53, T52, 3. Climbing and talking. CS1 – T39, T40, T42, T48 to T49, T51. CS3 – T44 to T45, 4. Not using all resources. CS1 – T38 to T43. CS3 – T44 to T45, 5. Comfortably responding to questions and elaboration on them. CS1 – T7, T48 to T49. CS2 – T22, T23 CS3 – T20. Symptoms 6. Discussing the climb. CS2 – T16, T22, T23, T24, T25, T54. CS3 – T20, 7. Expressing positive emotion. CS1 – T7, T44 to T45. CS2 – T16, T22, T23, T24, T54.

Signs

Typification 1: <u>Effortless actions</u>. Participant 2's refection epitomises this typification at T54 – "it's a gentle stroll". When observing the participants climbing at this level of challenge relative to their capability, they do not have to work; they simply ascend the wall despite its steepness.

Typification 2: <u>Ease of movement and decisions</u>. All the participants exhibit spare personal recourses. All participants at various points are standing up on the wall, climbing but not holding on to the wall with their hands. Participant 1 at T44 describes it as "climbing for the sake of climbing" (intrinsic motivation – autotelic activity/personality?). At T52, Participant 2 is observed to stand at 2 meters, making the second clip not using hands at all is just balancing with ease.

Typification 3: <u>Climbing and talking</u>. This codable moment links to the previous typification and indicates the occurrence of excess personal resources. The participants are able to climb and carry on a conversation, not just respond to questions. Indeed, the participants can instigate conversations. For example, Participant 1 at T44 to T45 tells a story while he was climbing about being on the RAF mountain rescue team.

Typification 4: <u>Not using all resources</u>. While the previous typification spoke of the participants having excess resources. This typification addresses external resources. The participant does not need to use all of the hand and footholds available to them. All the participants were observed ignoring holds.

Typification 5: <u>Comfortably responding to questions and elaborating on them</u>. This codable moment is exemplified with participants 1 and 3. In the early stages of the protocol, when Participant 1 was on their second climb, they were asked how the climb was feeling as they had been suffering with 'flash pump'. The participant responded by saying, "It's one of the reasons you should climb indoors; it feels nice it's good for the body".

Symptoms

Typification 6: <u>Discussing the climb</u>. This codable moment is where the participant is on the floor, either talking about the climb they wish to do or reflecting on the climb they have just completed. Participant 2 at T22 and T23 enjoyed comparing and contrasting the benefits and features of the two routes he had just climbed.

Typification 7: Expressing positive emotion. Both participants 1 and 2 demonstrated this typification. Participant 2 at T54 said, "that's just very relaxing. It's a gentle stroll. It's the opposite end of the danger scale".

8.1.1.7 Boredom

Typology (Label)	Boredom – (Bo)
Description	When challenges are below average and skills are around average. It is characterised by low levels of cognitive investment and a lack of clear goals. The individual is not interested in his or her surroundings or feels that a day or activity is dull or tedious. It is a mental state that people experience as an unpleasant lack of stimulation that leaves them craving relief.
Typification (Signs and Symptoms)	Signs 1. Missing out holds. CS2 – T55. CS3 – T44 to T45, NT4 2. Only 2 points of contact – not using hands at all. CS2 – T55. 3. Trying to do/make something harder. CS1 – T46. CS3 – NT2, NT4, NT6. Symptoms 4. Asking to do a more challenging climb. CS1 – T46, T50. CS3 – NT3, 5. Expressing negative emotion. CS2 – T55, T56, T58. CS3 – NT1, NT2, NT5, NT6. 6. Expressing a desire to be doing something else. CS1 – T46, T50. CS2 – T57. CS3 – NT2,

Signs

Typification 1: <u>Missing out holds</u>. Participants 2 and 3 at this level were missing out holds deliberately. At this level of challenge, Participant 3 at T44 to T45 said," "I didn't like it, sluggish and clumsy. There is no value to it." Moreover, the excess holds for this participant appeared to be causing them confusion.

Typification 2: <u>Only 2 points of contact – not using hands at all</u>. This codable moment indicates that the participant is finding the challenge too easy. Hand for Participant 3 were not necessary at T55.

Typification 3: <u>Trying to do/make something harder</u>. Participants 1 and 3 attempted to make the challenge harder on the easier climbs. This was even towards the end of their respective protocols. They had spent approximately 2 hours in the construct elicitation interview and had then completed all of their climbs, climbing to their maximum capability. Still, they would have preferred to do more challenging climbs.

Symptoms

Typification 4: <u>Asking to do a more challenging climb</u>. This typification is the definitive version of the typification 5 above. The participants asked to do a more engaging climb. Participant 3 said at NT3, "To get the same level of enjoyment, I have to up the stakes".

Typification 5: <u>Expressing negative emotion</u>. At this level of relative challenge, Participants 2 and 3s demeanour changed:

- Participants 2 at T56, T57 and T58 said, "this is just – I'm not going to enjoy this […] Can we just go to the pub now?"

- Participant 2 was asked, how do you think you would have felt if the entire experiment was conducted at this grade? They replied, "a lot more bored".

- Participant 3 at NT5 and 6 said, "It was all right – no it wasn't – It required more effort than something harder […] You don't need good technique, so you have to find a way of doing it with good technique".

Typification 6: <u>Expressing a desire to be doing something else</u>. All the participants at this level of relative challenge expressed a wish to be doing something more challenging. If they could not do something harder, they would have rather been doing something else entirely.

8.1.1.8 Apathy

Typology (Label)	Apathy – (Ap)
Description	The predominance of apathy in daily life hampers mental health and personal growth. A lack of interest or concern can identify it. The individual may feel they lack a sense of purpose, worth or meaning in their lives.
Typification (Signs and Symptoms)	Signs & Symptoms
	NA

There are no typifications developed in this study from apathy.

8.2 Section 2: Nonlinearity and Discontinuity of Subjective Experience

This section follows the codebook development – connecting typifications (actions, behaviours and self-reflection) to typologies (experiential states). It is the second section of the results and focuses explicitly on RQ-2:

- What effect does challenge have on the nature of an individual's subjective experience?

To answer this research question, the codebook is applied to each study participant to identify and record codable moments – those moments when the participants' observable actions, behaviours and self-reflections (typifications) can be analysed and translated into experiential states (typologies).

To analyse the participants' subjective experience of challenge and identify fluctuations in the participants' subjective experience, the results of the analysis were tabulated and presented below. The codebook was used to identify the participants' observable actions and behaviours and translate them into experiential states' typologies. Applying the codebook transforms the process of interpreting how a person is feeling into an explicit analytical process. Moreover, this method negates the need for participants to fill out questionnaires, interrupting the participant while they engage in the activity and does not rely on the participants' memory.

Each of the graphs below presents experiential states on the Y-axis and time on the X-axis. Each of the rectangles presents one of the climbs the participants' climbed and the order in which they climbed them. The graphs are presented so that the difference in climbing ability is controlled. Each of the climbs (coloured rectangles) is presented against the Y-axis in terms of the expected experiential state at that level of challenge, against the X-axis in terms of when the climb occurred. This enables the participants' experiences to be directly compared.

Figure 8-2: Case Study 1
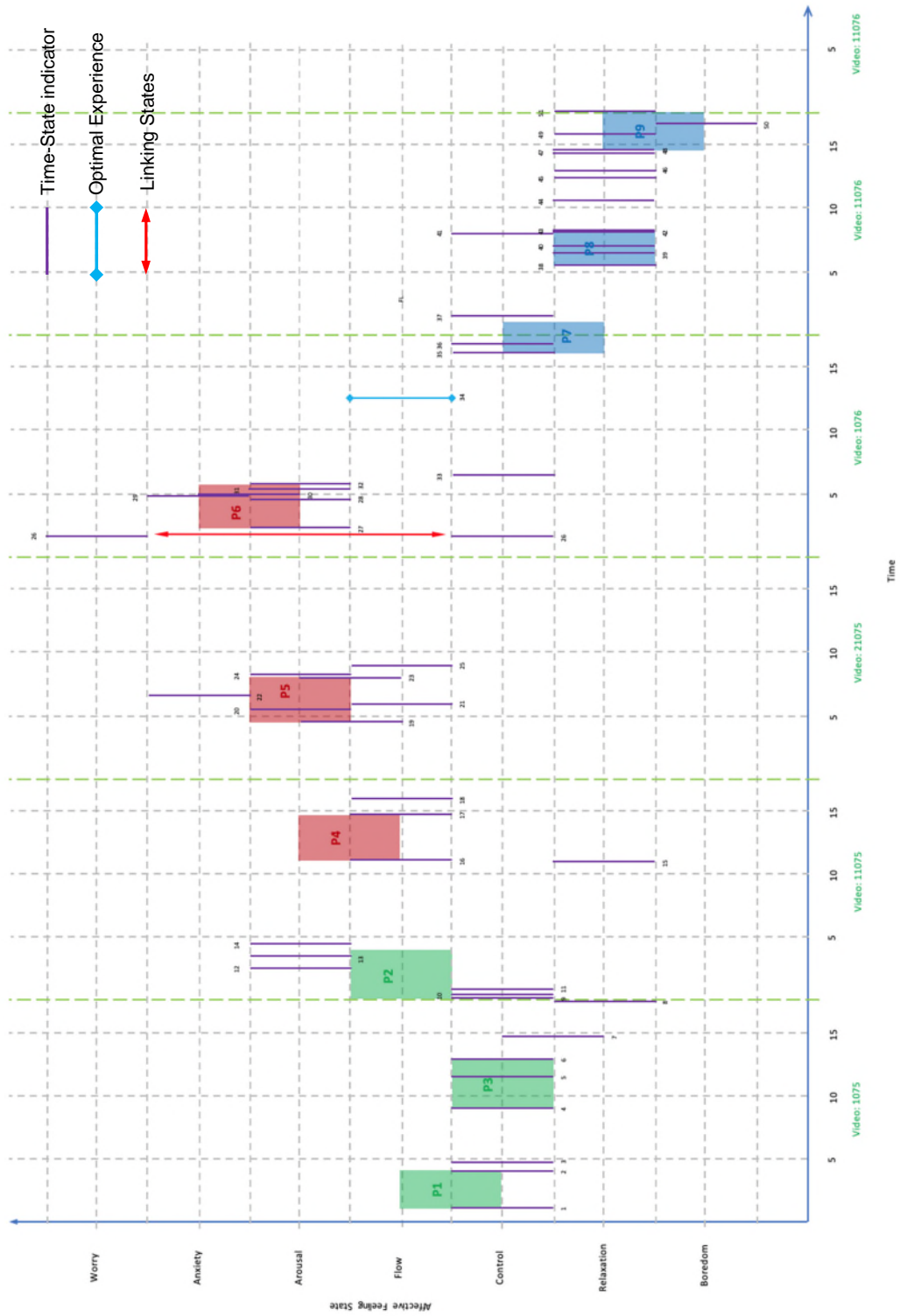
Figure 8-3: Case Study 2

253
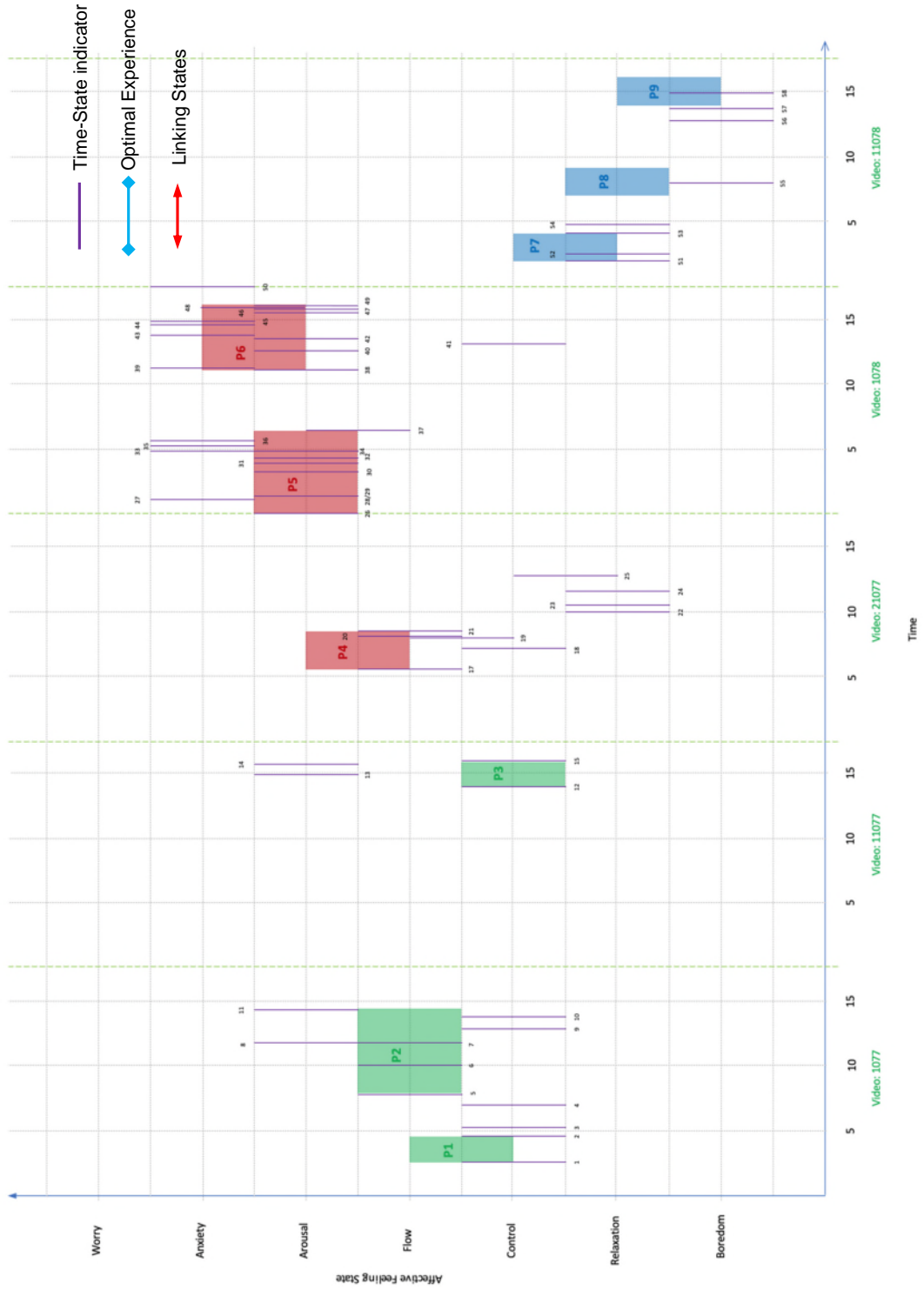
Figure 8-4: Case Study 3

254
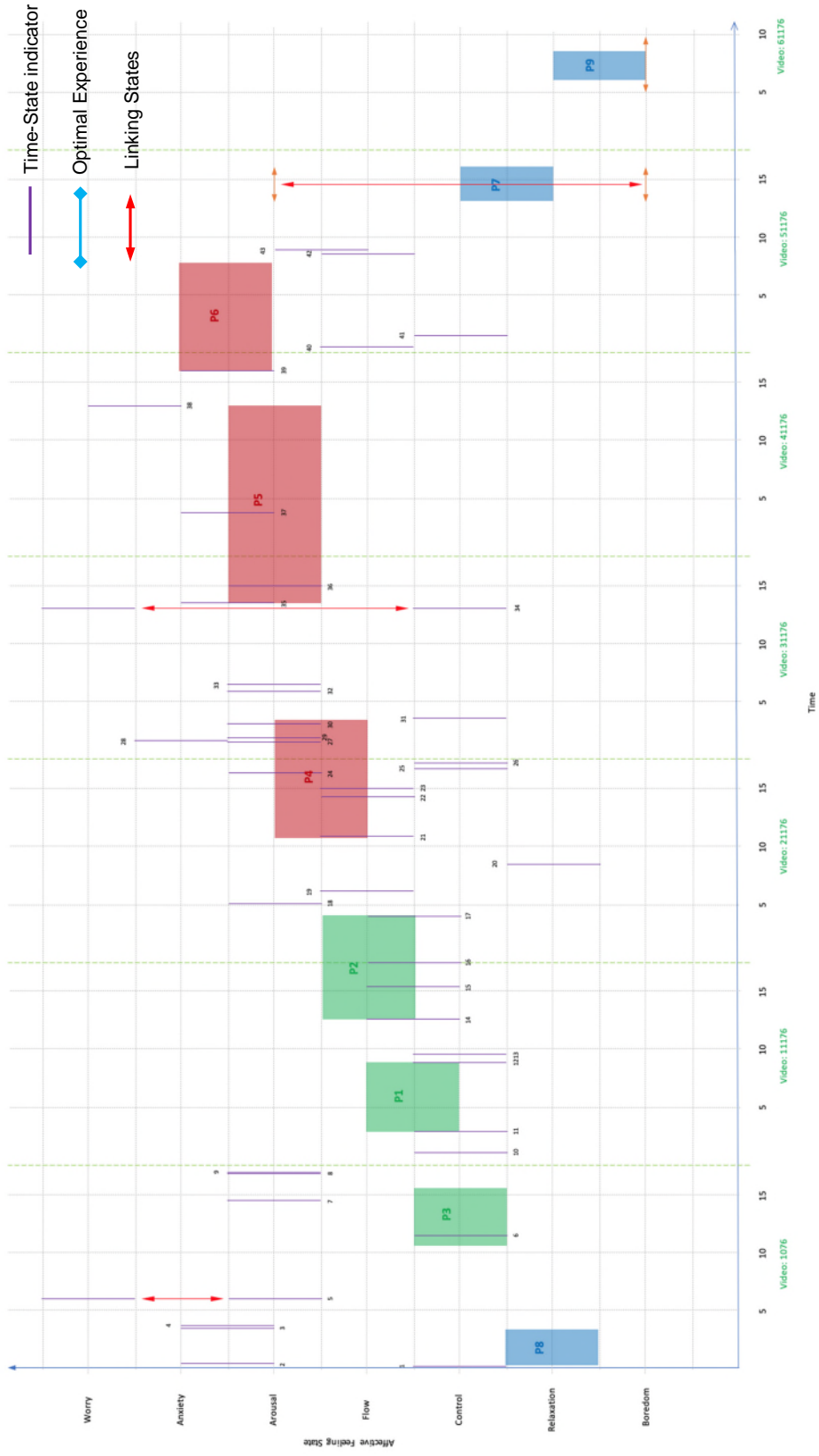
The lines on the graphs represent the codable moments. The lines that relate to the climbs are aligned with the rectangles. The lines that occur anywhere else are codable moments when the participants were not climbing. For a complete analysis of each of the codable moments, refer to the thick description *Appendix E*.

What can be seen is that the participants' subjective experience is spikey and fluctuates rapidly. When looking at the experiential states across all three participants, it can be seen that subjective experience follows a general trend. However, within this trend, there is a great deal of variation. These variations directly correspond to acute and proximal issues experienced by the participants at that specific moment. Indeed, these issues in terms of the participants' experiential states cause direct and severe fluctuations in the participants' subjective experience. For example, Participant 1 at T22, Participant 2 at T13 to T14, and Participant 3 at T7. These examples represented a moment when the acute and proximal challenge caused the participants experiential state to spike. These spikes demonstrate a correlational link between fluctuations in challenge and a person's subjective experience. These spikes in subjective experience demonstrate an aspect of subjective experience that has never been recorded before within the literature of flow theory.

Another feature of two case studies (Participant 1 and Participant 3) is two experiential states' apparent occurrence simultaneously. These states were worry and control. The participants in each instance were able to identify a specific and acute problem (worry) but were able to specifically identify the issue and apply measures to combat the issue. This analysis again shows a correlational link between challenge and subjective experience.

Climbing was chosen as a challenging activity because climbing uses a universal objective grading scale to alert climbers to the level of challenge they are attempting. Importantly, all study participants are intimately acquainted with the climbing grading system and chose their own climbs. However, while the challenge may be objective, it is experienced by the participant subjectively. The graphs show that the participants' subjective experience fluctuates around a

challenge and responds in direct relation to changes in that challenge. Moreover, in the climbing context, flow did not occur as a product of maximum challenge in relation to maximum capability. The maximum challenge in relation to maximum capability was more akin to producing the experiential state of arousal.

The final element that emerges across all three case studies is how the participants experience very low challenge levels. It is well understood how high levels of challenge cause stress. However, the stress caused when a challenge is below a particular threshold is not commonly acknowledged. This study shows that all three participants demonstrated a strong aversion to a low level of climbing challenge and being bored. This analysis is particularly salient when reading the thick description of the participants' experiences.

These results show that in the context of climbing indoors, there is a broader range of challenges between a person's median (middle) and the upper and lower threshold at which negative experiential states ensue. There are four levels of challenge above the median and four levels of challenge below the median from the median climbing grade. These thresholds are depicted in *Figure 8-5*.

Figure 8-5: The thresholds of Challenge
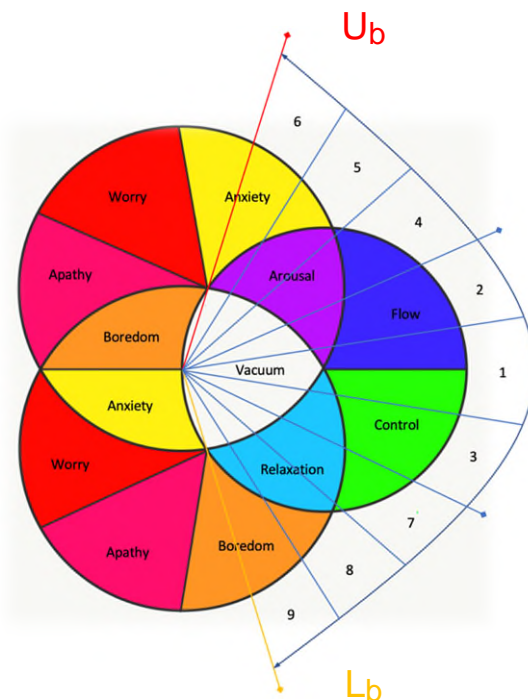
8.3 Chapter Summary

This chapter was the second of two chapters analysing and presenting the results of the experimental protocol. This chapter was divided into two sections. The first section address RQ-1 and presents the codebook of experiential states. Each of the experiential states was tabulated in terms of typologies and typifications. The typologies contained descriptions of experiential states, and the typifications related the participants' actions and behaviours to the descriptions of experiential states.

The second part of the chapter addressed RQ-2. This section presented the fluctuation of the participants' subjective experience relative to the level of challenge they were experiencing at a given moment. The graphs show that fluctuations in subjective experience are directly and subjectively linked to fluctuations in the challenge level. These subjective experiences appear to alert the individual on how to respond relative to their capability. It can easily be seen how overexposure to an acute challenge can damage the participants' subjective experiences. Importantly this occurs at both ends of the challenge spectrum.

The following chapter, Chapter 9, will present this doctoral research projects contributions to knowledge. This contribution will be achieved by directly comparing the results of this project to the literature reviews' findings in Chapters 2 and 4.

Chapter Nine

Discussion and Contributions to Knowledge

Even though you lie in your bed your mind is still busy; even if you sleep your mind is busy dreaming. Your mind is always in intense activity This is not so good. We should know how to give up our thinking mind, or busy mind. In order to go beyond our thinking faculty, it is necessary to have a firm conviction in the emptiness of your mind.

Shunryu Suzuki 'Zen Mind, Beginners Guide' (1970, p.129)

9 Introduction

This chapter is divided into three distinct sections. Firstly, the chapter extends the discussion of the results presented in Chapter 8 and reviews those findings in light of their theoretical significance in direct relation to the literature on flow theory discussed in Chapter 4. In making this comparison, this section will explicitly specify the significant contributions to knowledge made by this doctoral thesis regarding:

1. the methodologies and formal approaches for accurately capturing and expressing the way a person subjectively feels about the challenges they experience (research question 1);

2. how differing degrees of challenge can be seen to affect different people's experience of that challenge and how that challenge may also influence how they subjectively feel (research question 2); and,

3. the development of the New synthesised Model of Experience and its associated system simultaneous Boolean equations.

Moreover, this first section will discuss the other contributions to knowledge made by this doctoral thesis regarding the novelty of the approach and the application of a multi-paradigm research strategy and an empirical approach to determine if a person, from a research perspective, is being ethically challenged.

9.1 Methodologies and Formal Approaches to Capture Subjective Experience: Research Question-1.

The critical feature that differentiated Csikszentmihalyi's work on flow from other research on intrinsic motivation was Mihalyi Csikszentmihalyi interest in (As discussed in Chapter 4, *Section 4.4*):

- what does it mean for a person to be in flow; and,
- what is it like for a person to be in flow

To this end, Csikszentmihalyi developed a research agenda and strategy to identify ways of investigating peoples subjective experience of flow and being with challenge. The philosophical principles, methodologies and methods are all review in Chapter 4.

In brief, formal methods for identifying flow fall into two main categories:

1. Ways of estimating the prevalence of flow in populations:

    i. The Flow Questionnaire

    ii. The Dispositional Flow Scale

    iii. Flow Metacognition Questionnaire

    iv. Interviews

2. Capturing flow in everyday experiences (state):

    i. Experience Sampling Method (ESM)

    ii. The Flow State Scale (FSS)

    iii. Work-Related Flow Inventory (WoRFI)

    iv. Reading Flow Short Scale (RFSS)

    v. Interviews

The specific class of method this doctoral research project has focused on is how an individual's experience of flow is captured in everyday activities. Each of the methods above has its own specific limitations; these are discussed in Chapter 4. However, they all share two significant limitations: they retrospectively relying on the individual's memory to recall their experience and they rely on the individual's testimony and verbal capability to adequately express their experience (see Burr, King and Butt Chapter 6, *Section 6.7*).

The explicit method developed in this PhD research project as a product of research question-1 overcomes the major problems of the methods stated above. The codebook provides a transparent and logical way of linking typifications to

typologies. That is, linking people's observable signs and symptoms in a specific context (indoor rock climbing) to a range of affective feeling states. These states range between worry, anxiety, arousal, flow, control, relaxation and boredom. This method has five advantages over the limitations of the methods stated above:

- The method is not retrospective and does not rely on the individual's memory of engaging in the activity.

- The method does not require the individual to be able to articulate their experience verbally.

- The method does not enforce flow onto the individual, as do the FSS, WoRFI and the RFSS.

- The method does not alert the individual to the experience of flow with descriptions of the state of flow, as does the flow-q.

- Finally, the method can capture and differentiate between a broader range of experiences than just flow.

Therefore, developing a codebook that directly relates the symptomatic effects of a person as they engage in a challenging activity provides a new way of investigating, capturing and expressing a person's subjective experience of being with deferent degrees of challenge.

The following section will discuss how the codebook developed in this doctoral thesis addresses each of the five points outlined directly above.

9.1.1 Codebook Development and Associated Benefits

Methodologically, the codebook was developed using:

- the data from the quasi-experimental protocol applied on a case study basis; and,
- the data from the construct elicitation interview.

This multi-method approach means that the codebook goes beyond the traditional developmental practices used to generate the questionnaires in Chapter 4. When the practice is correctly followed, questionnaires are usually developed from the themes identified in interviews as exemplified by Csikszentmihalyi and the flow-q and Jackson's development of FSS and DFS. However, this again relies on individual testimony and the participant's ability to articulate their subjective experience of a particular experience verbally. Furthermore, this methodological practice relies on the participant's ability to assess the degree of challenge they have experienced accurately. In contrast, the codebook is not the product of interview data alone (as is the case with all other correlational methods developed to identify flow). The codebook was developed using both the interview data and the quasi-experimental data. By making challenge the independent variable of the quasi-experimental protocol, the codebook does not rely solely upon the participant's ability to assess the degree of challenge they are experiencing but directly relates the participants experience to an explicit level of challenge (see Chapter 5).

Moreover, this multi-method approach to generating the codebook means that the relationship between the specific instances of codable moments 'typifications' directly related to descriptions of affective experiential states 'typologies' provides a far closer correlation to the level of challenge the individual is experiencing.

Additionally, the multi-method approach in conjunction with the codebook demonstrates that while people experience challenges subjectively, those subjective experiences are relative in relation to an individual's capability. In other words, if two people with two very different levels of capability are faced with a challenge they find intrinsically motivating, that is, three degrees of difficulty above their median level of challenge, they will experience an affective state of arousal.

As highlighted above, some questionnaires force flow on participants (see Chapter 4). For example, when all components are rated highly on a Likert scale in a flow questionnaire, the individual's experience will be rated at its most intense. Whereas, if some of the components are rated highly, and others are

rated at only a medium level, the components will offset each other, and only medium or low levels of flow will be experienced. Finally, even when all components are rated low, the individual is regarded as experiencing a low flow level. The benefit of the codebook concerning this problem is that the codebook encompasses a far broader range of subjective experiences. Therefore, individuals are no longer limited to having flow imposed upon them.

Finally, flow questionnaires rely on people filling out the questionnaire diligently and retaining faithful memories of their experience. In this regard, it is critical to remember that research has demonstrated flow to be an experience that is notoriously elusive and ephemeral (see Chapter 4). Moreover, Kahneman and Riis (2012) distinguish between the experiencing-self and the remembering-self. In Kahneman and Riis' view, the remembering-self is a reconstruction of an event that may not be an accurate or complete reflection of the experience. When regarded together, the ephemeral nature of flow and the reconstructive nature of the remembering-self means that flow questionnaires should only be deployed with great care and when used in isolation, the results should carry the appropriate level of scientific scepticism.

However, in contrast to questionnaires, the codebook is a qualitative instrument used by a researcher to observe the symptomatic effects of the person engaging in a challenging activity. Importantly, in application, the codebook does not ignore the individual's testimony but directly incorporates the reflections of the individual in the overall encoding process.

9.1.2 The Application and Utilisation of The Codebook

As with any instrument, it is essential to be clear about its appropriate use and limitations – the codebook is no exception. Due to the nature of the phenomenon of flow and the research agenda of many flow researchers: studying peoples' experience of flow in natural settings (see Chapter 4). Many instruments for investigating flow are designed to investigate flow without the need for researchers to be present. An example of this is the ESM (see Chapter 4). Alternatively, for single sample projects, a well-constructed questionnaire is an invaluable instrument when researchers are not present.

In contrast, the codebook was developed for use when the researcher is present or has access to video footage of the study participant(s). The codebook facilitates an analysis of an individual's actions and behaviours when engaging in a specific activity; this is important because it can alert the researcher to the level of challenge that a specific individual is experiencing. Additionally, the codebook can aid the researcher to develop an appreciation of the individual's subjective experience as they engage in a challenging activity – the researcher can either be present during the activity or analysing video footage.

The codebook was developed experimentally using climbing as a challenging activity in an indoor climbing centre. To this end, the codebook at its current level of development can only and should only be regarded as a proof of concept and should only be applied in the context of an indoor climbing centre. A great deal more work is required to develop the codebook further to expand its applicability to other contexts.

Furthermore, the codebook does not provide detailed insights into an individual's intra-subjective experience of challenge. The codebook alerts the researcher to the fluctuations of the intra-subjective experience through an individual's actions, behaviours and self-reports. These fluctuations are expressed in terms of descriptions of affective feeling states. This process of relating fluctuations of intra-subjective experience to fluctuations of affective feeling states is a one-way process. It is not possible to infer intra-subjective experience from affective feeling states. Therefore, this one-way process facilitates the identification of fluctuations in intra-subjective experience in terms of affective feeling states (descriptive typologies) – thereby translating intra-subjective experience into an inter-subjective appreciation of an-Other (Levinasian – see chapter 5, *Section 5.2.3*) person's experience.

9.1.3 The Codebooks Novel Contribution to Flow Theory and Practice

This novel approach of developing a codebook that translates fluctuations in an individual's intra-subjective experience into typologies of affective feeling states provides the template for developing additional contextually situated codebooks that promote observational approaches to researching people's subjective experiences.

Engeser et al. (2021) highlighted that only one observational approach to studying flow had been conducted in the past two decades (Custodero 1998, 2005). Therefore, the observational method adopted by this doctoral research project as a part of the overall methodological approach demonstrates a shift from current trends in flow research. However, Custodero (1998, 2005) used an interpretive approach linking the observations of children's behaviour to flow indicators. The study relied solely on the consensus of the research team and did not include feedback on the results from the study participants to triangulate the results. The present study moves from the observational interpretive approach of Custodero to an observational analytical approach. As previously discussed (Chapters 7 and 8), the codebook is the iterative (the three study participants) product of interview data, observation (prolonged engagement of the researcher) and participant feedback on the codebook.

Therefore, the codebook developed in this doctoral research project provides a rigorous and explicit way of analysing a person's experience of a challenge using inter-subjective typologies that do not rely on interpretation.

This section has discussed the methodologies and formal approaches for capturing people's subjective experience of challenge and the novel contribution the codebook makes to this area of research in terms of research question-1. To this end, the codebook represents the first significant contribution to knowledge made by this doctoral research project to the methodology and methods of flow theory.

The following section discusses how the codebook is applied to address research question-2.

9.2 How Varying Degrees of Challenge Affect an Individual's Subjective Experience of the Challenge: Research Question-2

A recurring theme in the literature on flow is the effect of challenge and its relationship to capability on an individual's subjective experience. Typically, this is referred to as the skills challenge ratio. This ratio provides a lens through which to view and interpret an individual's subjective experience and generates the theoretical perspective to develop an appreciation of how people experience challenges in their environment. This appreciation is critical when imbalances occur in the skills-challenge ratio, where people often experience these imbalances as losses when things go wrong. The ratio facilitates the development of strategies as moderators to support people as they face imbalances in the skills-challenge relation (Tse et al. 2019).

In addition to this, Navarro et al. (2019:10) asked the question: "Does the skills challenge balance work for everyone?" Navarro and his team identify essential differences between different types of activity, such as work activities and leisure activities, that affect people's subjective experiences. Their findings indicate a positive relationship between skills and challenge and that this ratio is indicative of the appearance of flow. Moreover, Fong, Zaleski and Leach (2015) conducted a meta-analysis selecting studies that examined flow from an operational perspective. While they found that the skills-challenge ratio did not represent all people across all contexts, their analysis determined that the skills-challenge ratio is influential across all aspects of a person's subjective experience.

Historically, in the literature on flow, many studies have measured only one point in time; an issue that Navarro and colleagues have attempted to address. In two recent studies, Navarro et al. (2019) and Navarro and Wietrak (2019), methods have been applied that sample data from more than a single point in time. One study utilised a flow diary to collect data, and the other study distributed questionnaires at two different points in time. Indeed, it could be argued that distributing a questionnaire at two different points in time is an extreme

simplification of the ESM (see Chapter 4, *Section 4.5.4*). However, the problem remains that these methods rely heavily on memory and the participants' subjective experience. The example is if a person's last experience of an activity was negative even though the overall experience was very positive, the individual will record the overall experience as a negative experience. Conversely, if a person's last memory of an activity is positive, even though the activity was predominantly a negative one, the individual will remember the experience as positive (Kahneman 2011; Kahneman and Riis 2012).

In reality, the ESM has been applied to identify the fluctuation in people's subjective experience in relation to the manifest challenges in their daily lives. This application of this method is exemplified in the development of the Experience Fluctuation Model (EFM) by Massimini, Csikszentmihalyi and Carli (1987). The EFM depicts a person's experience in terms of feeling states in relation to challenges (see Chapter 2, *Section 2.3.2*). Essentially, these methods are limited in the frequency with which they can capture a person's subjective experience in relation to challenges and capabilities.

The section above briefly recapped the literature on methods identifying the fluctuation of individual subjective experience, the skills-challenge ratio, and the distinction between the experiencing and remembering self. The outputs of these approaches have been captured in the form of models representing research findings. The two models in *Figure 9-1* depict peoples' subjective experience in a Cartesian space of challenges and capabilities. These models are the EFM and the Non-linear Discontinuity model of Ceja and Navarro (see Chapter 2 for a complete review of flow models).

Figure 9-1: EFM and NLDMF
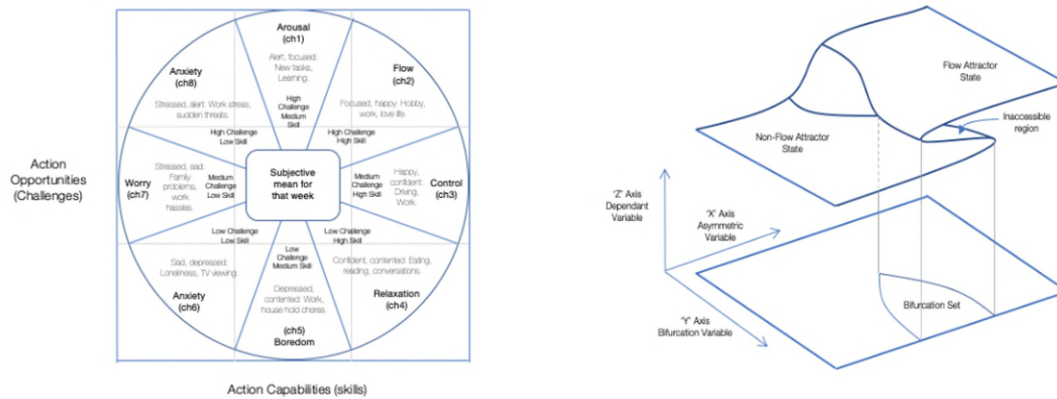
Both of these models depict generally steady states of subjective experience relative to challenge. For example, both models depict that when challenge and capability are high and in balance in relation to each other, a state of flow should ensue. Moreover, when both challenge and capability are low, a state of apathy ensues in the EFM, and a non-flow attractor state ensues in the NLDMF. However, it is at this point where the EFM and the NLDMF diverge.

The EFM shows that when a person's felt capability is high 'AND' challenge is low, the state of relaxation ensues; when a person's felt capability is medium 'AND' challenge is high, then a state of arousal ensues. Therefore, the model implies that experiential states are steady in relation to a particular ratio of capabilities and challenges. Moreover, the model implies an 'AND' relationship between challenges and capabilities.

In contrast, the NLDMF indicates that when the X-axis (capabilities) is at a medium level in relation to the Y-axis (challenge) being high, the individual may find themselves within the bifurcation set. In this zone of the NLDMF, a person may be in a positive flow attractor state 'OR' in a non-flow attractor state. This analysis means that the bifurcation set is a dynamic and non-linear discontinuous zone of subjective experience governed by an 'OR' relationship where different outcomes are possible for the exact relationships between variables (in the

268

bifurcation set). Therefore, the NLDMF can be considered as depicting a combination of 'AND' and 'OR' relationships.

Both of these models are products of the methodologies and methods that generated them. Therefore, the models are subject to and include the limitations of those methodologies and methods (see Chapter 4). Both models depict steady-state relationships between challenges and capabilities, except the 'OR' relationship within the bifurcation set, i.e., a discontinuous relationship.

This section has briefly recapped the literature on flow regarding methods of capturing people's subjective experience of challenge and its relationship to individual capability and how these findings have been modelled (for a complete account of models and methods, see Chapters 2 and 4). What follows is a review of this doctoral research project's findings as a product of research question-2 and how these findings compare to previous flow research.

9.2.1 The Dynamic Nature of Subjective Experience

The results depicted in the second section of Chapter 8 show that subjective experience in terms of affective feeling states fluctuates far more rapidly and across a broader range of states in relation to a capability to challenge ratio than has ever been demonstrated before. Specifically, this quasi-experimental study demonstrated that subjective experience fluctuates dynamically even when the challenge variable is held at an objectively specified steady-state. The fluctuations occurred across all challenge levels relative to capability. This finding stands in direct contrast to previous research on the fluctuations of subjective experience.

As previously discussed (Chapter 8), each green, red and blue rectangles in *Figure 9-2* represent a specific climb and the expected subjective experience associated with the challenge. What the diagram explicitly shows is that subjective experience is far from stable relative to an objective challenge.

Figure 9-2: Participant 1 Fluctuation of Subjective Experience
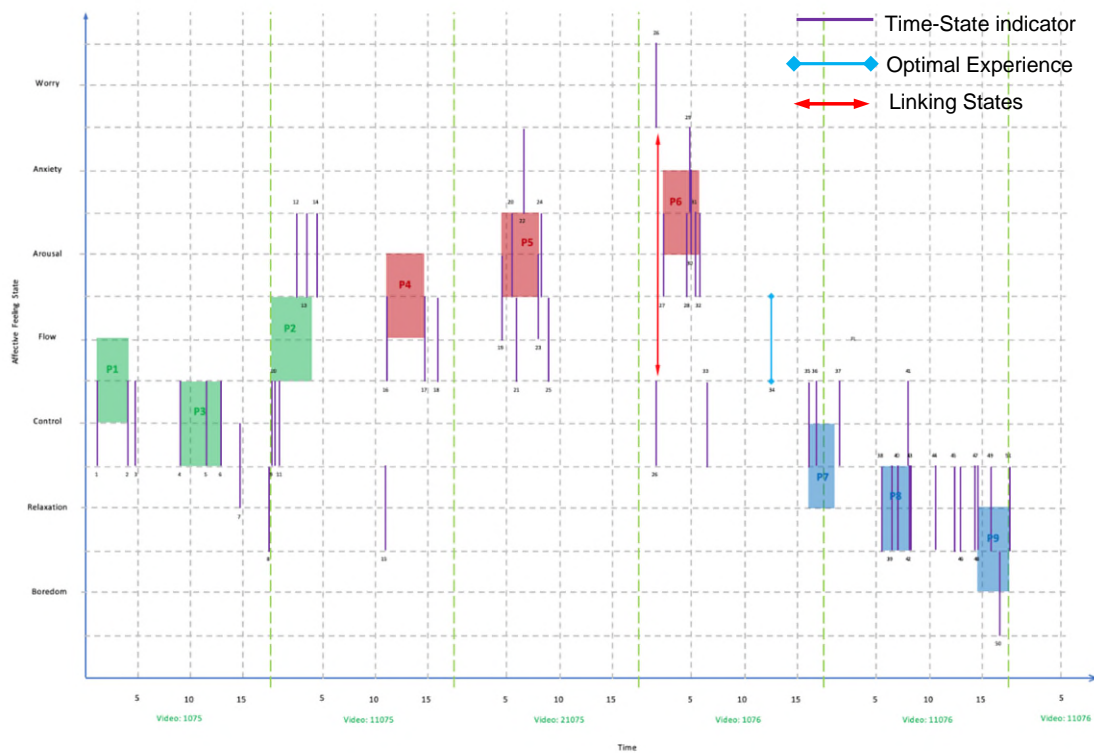
For example, at climb P2 the participant was encoded as being in control at the beginning of the climb. However, due to specific acute and proximal challenges subjectively experienced by the participant, the participant was encoded as being in arousal (see *Appendix E*). At climb P5 (red rectangle *Figure 9-2*), the participant displayed four distinct codable moments with typologies of affective feeling states ranging from flow through to spike of anxiety. Additionally, at time index T26 the participant was encoded as simultaneously experiencing worry and control. This conjunction of experiential states occurred as the participant observed the acute and proximal danger they would face were they not to act appropriately. Finally, at T34, the participant described their indoor climbing experience (that day) as their "best indoor climbing session that year". This insight from the participant was important because, while the participant experienced a broad range of fluctuating affective feeling states during the period of their engagement in the protocol, their overall experience was not adversely affected. The participant was then encoded as being in optimal experience for the duration of the climbing session up to that time (see *Appendix E*).

The observational method and utilisation of the codebook facilitated a view of subjective experience that has hitherto not been captured by other contemporary methods. This result is because methods such as the ESM or flow diaries sample at too low a frequency, typically 7 to 8 times a day. Section 2 of Chapter 8 shows that there were at least 50 codable moments across a 3-hour climbing session in each case study.

Another way to think about sampling is to use an analogy – sampling an analogue audio signal for storage in a digital format. Transforming an analogue signal into a digital signal requires a sampling rate 2.5 times the maximum frequency of the audio signal. This sampling rate is necessary if the digital signal is to retain the fidelity of the original audio signal. By utilising an observational method (increasing the potential sampling rate) for identifying fluctuations in the subjective experience of the study participants, this study was able to provide greater fidelity to the dynamic nature of individual subjective experience. Each of the three case studies demonstrates the extent to which subjective experience fluctuates in relation to challenge at a specific and objective level of challenge. By continually sampling for codable moments while observing an individual in a challenging activity, it becomes possible to build a rich picture of the individual's subjective experience as they engage in the challenge activity.

This study explicitly shows that subjective experience does not remain static at a specific level of challenge. Neither is a specific feeling state set at a specific level of challenge. There are what might be described as approximations, but as Guo and Poole's (2009) model explicitly depicts, it is not just the individual experiencing the challenge of the activity; it is the individual experiencing the challenge of the activity in a complex and challenging environment. Where the challenges that are manifest in the challenging environment along with the challenges of the activity feed directly into the individual subjective experience affecting how they feel.

Unfortunately, fluctuations in individual subjective experience are not limited to an individual's experience of a challenging activity and the cumulative effect of environmental challenges. Subjective experience is also affected by a person's

felt capability at a given moment. Indeed, a person's capability may be the most problematic dimension of the trio of subjective experience, challenge and capability.

Capability is not fixed and static. Indeed, capability is depicted in all operational models of flow as occurring on a low-to-high scale. For example, high levels of capability in relation to high levels of challenge produce flow. However, as capability wanes over time, a person may become aroused or worried depending on the nature of the activity. In other words, people get tired, thus reducing capability.

Moreover, if people do not continue to practice a specific skill, their capability will be reduced. If people have a poor night sleep, their capability will be reduced throughout the day. If people are worried, anxious or nervous, their capability will be reduced.

By explicitly using an objective challenge as the independent variable, it becomes possible to observe the individual participants' capabilities fluctuate as they progress through the climbing session; this was directly observable and apparent in all three case studies.

As depicted in the EFM above, the triplet of subjective experience, challenge, and capability provides a predominantly static view. This view is somewhat improved with the NLDMF, where there is a bifurcation at high levels of challenge and medium levels of capability. The problem with the model is that it lacks any fidelity on the surface of subjective experience.

This PhD research project demonstrates that subjective experience fluctuates far more frequently than has hitherto ever been demonstrated in flow research. By comparing the literature on flow and the models of flow outlined above, and the results of this doctoral research project (pertaining to research question-2), it can be seen how this project contributes to flow theory by showing how people's subjective experience fluctuates to the vicissitudes within a given challenge activity with far greater frequency than has previously been shown.

9.3 The New Synthesised Model of Experience and The System of Simultaneous Boolean Equations

This section will discuss the third and fourth distinct contributions to knowledge made by this doctoral research project:

1. The New Synthesised Model of Experience

2. The System of Simultaneous Boolean Equations

This element of the research project has been discussed to some extent in Chapter 3, *Section 3.6.* The New Synthesised model effectively depicts an array of feeling states.

Figure 9-3: New Synthesised Model of Experience
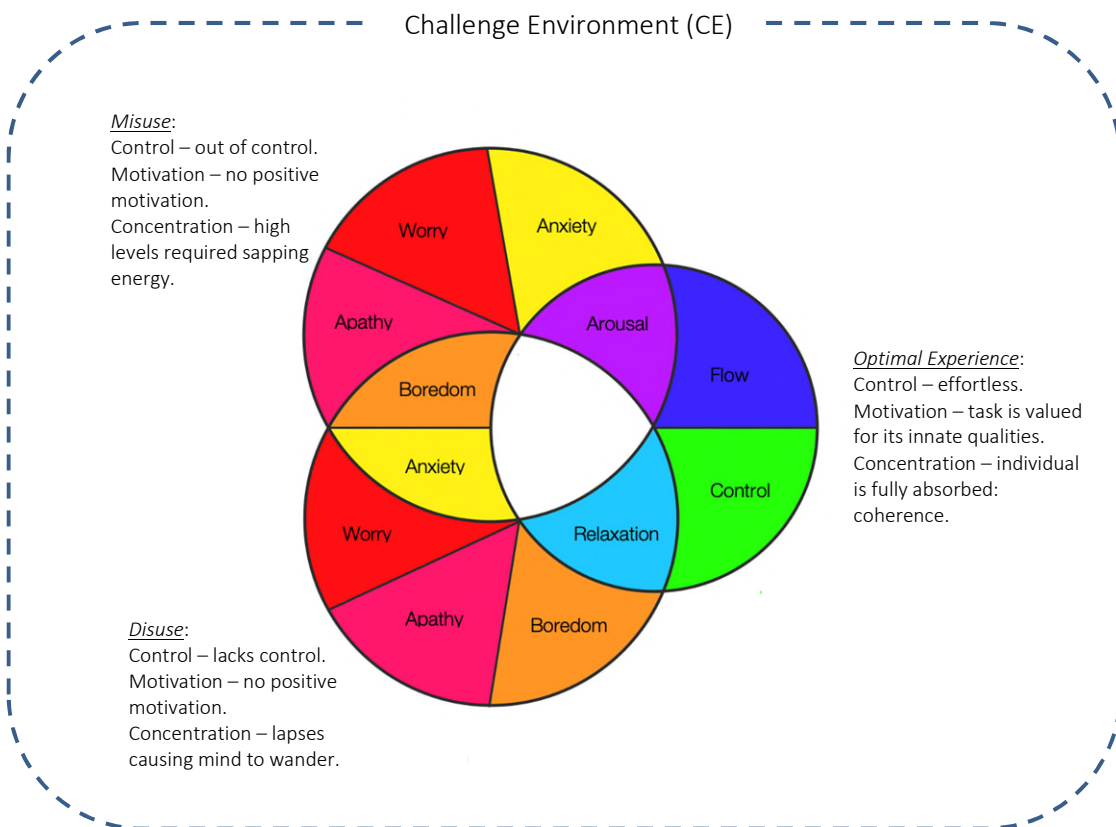
The New Synthesised Model of Experience is a meta-synthesis of the Flow channel model and the Experience Fluctuation Flow Model of flow (Chapter 2, *Sections 2.3.1 & 2.3.2*). The new synthesised model directly captures all of the

features of the two models and expresses them in an entirely new way. As with any true synthesis, it is possible to identify new knowledge; for example, the void in the middle of the new model is not present in any of the flow models described in Chapter 2. The void demonstrates the inability for a person to experience all of the states simultaneously. The model also depicts the existence of the complex boundary between disuse and misuse and the overlapping boundaries of optimal experience, disuse and misuse. The model also depicts disuse and misuse as being 20% larger in terms of being populated by more states than the space of optimal experience. The implication is that people are continually being drawn away from the space of optimal experience. This finding is entirely consistent with flow theory (Csikszentmihalyi 2003) but has never been captured in a flow model.

Additionally, the New Synthesised Model of Experience addresses several other issues in the literature on flow:

1. A Flow like experience still occurs when capability exceeds challenge (Engeser and Rheinberg 2008; Fong et al. 2015; Fullagar et al. 2013).

2. High levels of Flow can ensue with medium levels of arousal (Peifer et al. 2014)

3. Flow is a non-linear and discontinuous psychological phenomenon (Ceja and Navarro 2012, 2017; Guastello et al. 1999).

As Gibson and Isaac explain, a truth table synthesis (the method used to develop the new synthesised model of experience) is a systematic generative way of developing "a qualitative version of a quantitative theory" (1978:132). This approach means that the new synthesised model is a qualitative version of a synthesis of the Flow Channel Model and The Experience Fluctuation Model. Therefore, the resultant model has imbibed all of the aforementioned models' elements within its structure and can depict features of those models that are opaque when the models are viewed individually. To this end, the new synthesised model of experience is best appreciated when regarded in conjunction with the states' definitions (see Chapter 8) and the characteristics of flow (see Chapter 2). When the model is regarded in this way, it can be seen that

274

the model addresses all the issues in the list above. As a direct result of the truth table synthesis, the model also depicts the complex relationships between the various states. This depiction of flow theory addresses the third point in the list above.

However, the findings from how varying degrees of challenge affects an individual subjective experience of the challenge (Research Question 2) indicate that the model does not go far enough in its depiction of discontinuity at the intersections of flow and disuse, misuse and optimal experience. It would appear that there is a bifurcation in arousal and relaxation. While the bifurcation is implied in the model, it is not explicit. This problem will be discussed in Chapter 10 in the section on future work. Importantly, this issue does not limit the efficacy of the new synthesised model of experience. Indeed, the new synthesised model of experience makes a direct novel contribution to flow theory and the modelling of that theory. Therefore, the New Synthesised Model of Experience is the third direct contribution to flow theory made by this doctoral research project.

9.3.1 The System of Simultaneous Boolean Equations

The developments of the system of simultaneous Boolean equations represents the fourth direct contribution to the theory of flow made by this doctoral research project. Boolean algebra is a relational form of mathematics that is grounded in propositional logic. The system of simultaneous Boolean equations was developed from the truth table of the new synthesised model of experience (Chapter 3, *Section 3.5.3*). Essentially, the system of Boolean equations is a mathematical model of the relationships between states and represents a new way of modelling a person's experience.

Figure 9-4: System of Simultaneous Boolean Equations
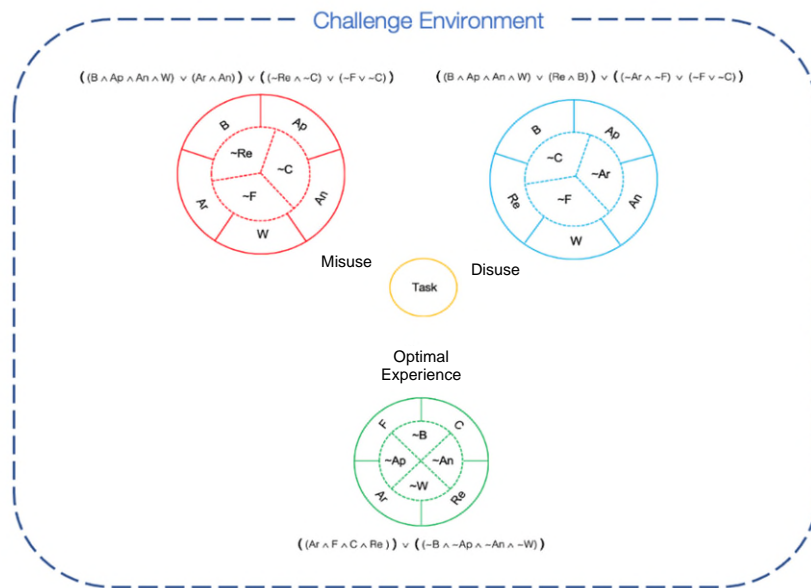
A complete discussion of the Boolean model occurred in Chapter 3 and will not be recapped here. These three equations describe the relationship of various states. Importantly, the equations should not be regarded individually; they must always be viewed as a complex dynamical system. A critical feature of the model that differentiates the model from any of the other models of experience in flow theory (Chapter 2) is that this mathematical model not only depicts what states are present in disuse, misuse or optimal experience but it depicts those states that are not present. This model of experience, while only theoretical, makes an important and highly novel contribution to modelling flow theory in that it provides an entirely new way for researchers to think about the action and interaction of states in terms of disuse, misuse and optimal experience. Additionally, Boolean algebra has never been utilised to model flow in the literature on flow. Therefore, this system of simultaneous Boolean equations represents the fourth distinct novel contribution to the theory of flow made by this PhD research project.

9.4 Novel Contribution to the Philosophy of Science and the Methodology of Flow Theory

Flow theory beginning with Csikszentmihalyi in the 1960s is characterised by its novel and creative approach to investigating the phenomenon of flow and subjective experience. This novel approach has been described in Chapter 4 (literature review). This PhD research project drew the inspiration for its novelty from the tone set by Csikszentmihalyi.

The novel approach developed by this research project is described in detail in Chapter 5. This section will place the novelty of the approach in the context of the literature on the philosophy of science and the literature of flow theory. In this way, this section will demonstrate how:

1. it contributes to the philosophy of science in the way it utilises the theoretical principle of alterity to render individual subjective experience ontologically distinct and amenable to realist scientific investigation; and,
2. the way this doctoral research project utilises two complementary paradigms to view the research problem, thus making a novel contribution to the development of methodology in flow theory.

Firstly, this project identified the first-person phenomenology of subjective experience as ontologically distinct and irreducible to epistemology. By making this identification, the first-person phenomenology of subjective experience becomes directly amenable to realist scientific investigation. This reformulation identifies and creates conceptually meaningful links between the work of Isaac and O'Connor, Buber, Levinas and Nagel. Isaac and O'Connor, Buber, and Levinas facilitate the generation of a distinction, and Nagel facilitates the movement from a philosophical perspective to an empirical operationalisation of the distinction expressed above. This operationalisation generates a specific path from the alterity of subjective experience to empirical realist scientific investigation. This movement negates the need for future studies to assume the ontological distinction of subjective experience.

Moreover, this approach directly contributes to Csikszentmihalyi's work of developing a systematic way of investigating "human psychic processes" (Csikszentmihalyi 2000:xiii). The novel combination of the authors mentioned above makes this operationalisation a novel contribution to the literature on the philosophy of science. This operationalisation of philosophical principles to a realist scientific approach for investigating people's intra-subjective experiences represents the sixth novel contribution made by this doctoral research project.

Secondly, this doctoral research project explicitly utilised two complementary research paradigms as a means of viewing the research problem from two distinct but philosophically related perspectives. These research paradigms were Interpretivist and Critical Realist. A complete description of the process of crafting the paradigms into a coherent research application is described in Chapter 5. The simultaneous application of two complementary research paradigms to investigate people's experience of being challenged represents a novel contribution to the methodology of flow theory as this approach has never been applied in this research domain. This multi-paradigm research strategy represents the seventh contribution made by this doctoral research project.

9.5 A Novel Approach to Ensure Study Participants are Ethically Challenged

This contribution to knowledge resides in differentiating stress from pressure and formally linking it to the triplet of subjective experience, challenge and capability. The formulation of ethically challenging research participants is described in Chapter 5. However, as discussed above, the problematic dimension of the triplet is capability. The example being tacit knowledge as a component of capability. How can a person's knowledge be identified when that person does not know they have and use that knowledge? Anyone who rides a two-wheeled vehicle, such as a motorcycle, uses reverse steering to ride around a corner. That is, to negotiate a left turn, they must turn the handlebars to the right. If the rider does not do this, they will not go around the corner and crash. However, most people who ride (including pushbikes) do not know they have this tacit skill and that it is a prerequisite for riding a bike. Indeed, when talking to riders about reverse

steering, many will say it is a ridiculous idea and total nonsense. So, how can a person be questioned about a skill they have that they do not know they have?

In Chapter 6, the objectives were presented in the form of a qualitative mathematical formulation:

Equation: 9-1: Formulation of the Research Objectives

$$Subjective\ Experience\ is\ the\ complex \sum_{Relaxation}^{Arousal} of\ (Challenge\ , Capability)$$

This formulation expresses the triplet of subjective experience, challenge and capability. This formulation follows the format of "Behaviour (B) is a function of the person (P) and the environment (E), B = F (P , E) and that P and E in this formula are interdependent variables" (Lewin 1951:25). The equation expresses a person's appreciation of self in the challenging environment, where the complex formulation of challenge and capability produces the individual subjective experience.

However, it is possible to transpose the formula and make capability the subject:

Equation 9-2: Capability as Product of Subjective Experience and Challenge

$$Capability\ is\ the\ complex \sum_{Leading}^{Lagging} of\ (Challenge\ , Subjective\ Experience)$$

The equation now alerts the researcher to whether capability is either in phase with challenge, lagging challenge or leading challenge. In other words, if capability is in phase with challenge, then the participant will be experiencing positive psychological states in optimal experience. If capability is lagging challenge, the individual will be experiencing states associated with misuse, and if capability is leading challenge, the participant will be experiencing states associated with disuse. This equation directly contributes to addressing the purpose of this doctoral research project – to identify the thresholds (points) where the balance between challenges and capability move to imbalance.

In the experimental protocol in this doctoral research project, the independent variable (challenge) was objectifiable and explicit. However, it is not always possible to be explicit about the challenge dimension that a study participant is exposed to in many research studies. The formulation allows the identification of subjective experience and, by extension, an appreciation of the individual's capability in relation to challenge. This approach means a researcher can now explicitly identify and map a study participants subjective experience and understand if they are being challenged inappropriately or unethically.

9.6 Chapter Summary

This chapter has discussed the various contributions to knowledge made by this doctoral research project. Firstly, the chapter began with a discussion of the development of the codebook and its contribution to the methods for identifying the experiential state of people. The section then discussed the New Synthesised Model of Experience and the associated system of Simultaneous Boolean Equations.

Moving on from this, the chapter discussed the novel contribution to the philosophy of science and the identification of individual subjective experiences being ontologically distinct. This approach compliments Csikszentmihalyi's life long quest to develop a systematic method for investigating Husserl's pure phenomenology (2000). The chapter concludes by discussing the contribution made by this project in the domain of research ethics.

The following and final chapter will discuss how this doctoral research project addressed its research objective, expressed purpose, limitations, future work and concludes with a reflection from the author.

Chapter Ten

Discussion, Limitations and Final Reflections

The mountaineer does not climb in order to reach the top of the mountain, but tries to reach the summit in order to climb.

Mihalyi Csikszentmihalyi. 'Optimal Experience' (1988: 17)

10 Introduction – Discussion, Limitations and Final Reflections

This chapter provides the concluding sections of this doctoral dissertation. The chapter will begin as the dissertation began in Chapter 1 by reiterating the research problem, the consequences of the research problem and the knowledge gap that this PhD thesis addresses. The research objectives will be restated and reviewed in terms of the research problem. Subsequently, the section will conclude with how this research addresses the research problem and the knowledge gap:

1. This PhD identified that challenge is cumulative and iterative and that cumulative and iterative challenges affect people's subjective experience.
2. This PhD identified a correlational link between challenge, subjective experience and capability.
3. Combining the link between challenge and subjective experience, the codebook and new synthesised model facilitates a new formal way to identify when people are experiencing unacceptable levels of challenge.

Following on from this, the chapter will discuss the efficacy of the new knowledge produced by this doctoral dissertation, how the knowledge fits into the landscape of flow theory, the limitations of the research and the novel and innovative research directions that should follow from this research project.

Finally, the chapter concludes with a reflection of the author and their personal learning journey while conducting this research project.

10.1 A Restatement of the Research Problem, its Consequences and Knowledge Gap

Simply stated, people experience unacceptable levels of stress when there is an imbalance between the capabilities of the individual and the challenges they experience (World Health Organisation 2020). In terms of optimal experience, flow theory, as subjectively experienced by people, is predicated on the balance between an individual's capability and the challenges they experience (Csikszentmihalyi 2003). Therefore, this doctoral research project focuses on

how the quality of a person's lived subjective experience is affected by differing degrees of challenge: stress (challenge) in the form of pressures and demands overwhelm that person's capabilities.

The problem's consequences are exemplified in a report from the Health and Safety Executive (2019) highlighting the decline of mental health and well-being due to an imbalance between challenges and capabilities. These consequences manifest in two different yet interlinked ways: 1) at the level of the individual, an imbalance between challenges and capabilities at one end of the spectrum (challenge leading capability) adversely affects the person's decision-making ability, and at the other end of the spectrum (challenge lagging capability) people are unable to realise their full potential; 2) at the level of the organisation when challenges lead capability the organisation incurs excess cost as a result of bad decisions, and when challenges lag capabilities the organisation wastes it most precious recourse the knowledge, experience and skills of its people (Stamp 1989).

An adapted systematic literature review and subsequent analysis of the research problem – the imbalance between capabilities and challenges indicates a knowledge gap. Notably, the knowledge gap is multifaceted and interdependent. It is concerned with the methodologies, methods, and formal approaches adopted by researchers to capture, measure and depict people's subjective experiences as an ensuing product of the relationship between their belief in their capabilities and the challenges they experience in a challenging environment. The boundaries of the knowledge gap are:

1. No single model of flow can depict all of the theoretical elements of flow theory (see Chapter 2).

2. There is a mismatch between the models used to depict the broad range of individual subjective experience and the methods and practices specifically tuned to capture and measure the state of flow (see Chapters 2 and 4).

3. There is an overreliance on correlational self-reporting methods to evaluate people's subjective experience of challenges in relation to their capability (Šimleša et al. 2018).

   a. Formal approaches rely on study participants' self-reports through the standardised questions found in questionnaires (Chapter 4).

   b. Questionnaires can only evaluate the phenomena that they are designed to capture. Subjective experience spans a broader range of experience than flow questionnaires can capture (Chapter 4).

4. There is an overreliance on quantitative studies to capture a qualitative experience. There is a need for more qualitative studies to capture the array of fluctuations of subjective experience depicted in the models of flow (Fullagar et al., 2017).

10.1.1 Responding to the Research Problem in the form This Studies Objectives

The strategy developed by this doctoral research project divided the research problem into a series of research objectives:

1. Study the various philosophical perspectives, methodologies, methods and formal approaches discussed in the literature that pertains to the research problem (see Chapters 2, 4 and 5).

   a. Review the literature theoretically in terms of the ways that flow is modelled.

   b. Review the literature regarding the formal approaches and methods used to capture and measure flow.

2. Address part 1 of the knowledge gap above and develop an explicit theoretical foundation in the form of a new model of flow to explore the research problem (Chapter 3). This new model should represent all the characteristics of flow theory as discussed in Chapter 2.

3. Establish and elucidate an appropriate and coherent philosophical perspective to investigate the research problem (see Chapter 5).

4. As set out in part 2 of the knowledge gap, empirically, that experimentally tests the relationship between an individual's subjective experience of challenge in a challenging environment, in such a way that a person should experience the broadest possible range of experiential states relative to challenge (see Chapter 6). Importantly, this approach should not rely on correlational methods, as outlined in Section 3 of the knowledge gap.

5. Craft a specific method from the principles (methodology) developed in Chapter 5 to analyse a person's subjective challenge experience (codebook). The method should capture and communicate the broad range of subjective experiences depicted in the new synthesised model of experience (knowledge gaps 2 and 3. See Chapter 7).

These objectives are divided into two distinct domains theoretical and empirical. The theoretical objectives are points 1, 2, and 3; and the empirical objectives are points 4 and 5. *Table 10-1* directly below shows how the research objectives directly link to the knowledge gaps of the research problem.

Table 10-1: Knowledge Gap and Research Objectives

Research Objectives	Knowledge Gap
1a. Review the literature on modelling flow. 2. Synthesise all of the elements depicted in flow models into a single coherent model of flow.	1. No single model of flow can depict all of the theoretical elements of flow theory.
1b. Review literature on the methods of measuring flow. 3. Develop a clear theoretical perspective from which to investigate the research questions. 4. Empirically test (experimentally) the relationship between: subjective experience – challenge – capability	3. Formal approaches used to investigate flow tend to be correlational and rely on: a. Focus on a single state of experience. b. Rely on self-reports of study participants.
5. Develop an analysis method to identify, capture and express the broadest range of subjective experience relative to challenge.	2. The various questionnaires utilised in flow theory are precisely calibrated to measure flow as either state or trait. These questionnaires cannot capture the broad range of states depicted in the experience models of flow.

10.2 Addressing the Theoretical Objectives

Due to the objectives of this doctoral research project, the literature was reviewed from two interrelated perspectives. Firstly, from a theoretical perspective in the way the theory of flow is modelled. Secondly, from an empirical perspective in the methodologies, methods, and formal approaches applied to capturing and measuring subjective experience in terms of flow theory. What follows is an overview of each of these perspectives.

10.2.1 The Theoretical Modelling of Flow (Objective 1a)

The theoretical domain was the first domain of the literature to be reviewed. This review can be found in Chapter 2. This review showed that flow is modelled from two complementary perspectives. The first perspective takes a componential view of flow: referring to the components of flow. The second perspective takes an operational (systemic) view that models flow in terms of the person-environment interaction and the emergent phenomenology of the person-

environment interaction. In total, five componential models were reviewed and four operational models.

The literature review of the flow models drew serval conclusions:

1. When reviewed as a whole, the flow models are not independent and distinct but represent an array of perspectives and contexts from which the phenomena of flow has been viewed and investigated. This conclusion means that the flow models are connected in distinct yet integrated ways.

2. None of the flow models can simultaneously depict all of the perspectives and characteristics of flow identified in the literature review (Chapter 2).

3. Flow as a state can be regarded as having either mild, moderate or deep levels (Guo 2004; Miles 2012; Moneta 2012). This perspective of flow having levels links the findings of quantitative and qualitative studies. Quantitative studies measure the state flow (low, medium, high). Participants in qualitative studies have described themselves as being relaxed and being in flow – a low flow level (see Csikszentmihalyi 1975).

4. The fluctuations in individual subjective experience are nonlinear and discontinuous (Ceja and Navarro 2011a; Guastello 1987; Guastello et al. 1999; Pincus, Kiefer, and Beyer 2017).

From these conclusions derived from the modelling of flow theory, a question was devised:

- *Is it possible to synthesise a new model of experience that captures all of the various elements of flow theory?*

This research question is directly linked to the second theoretical research objective and the knowledge gap with which it is associated.

10.2.2 Synthesising A New Model of Flow (Objective 2)

As per objective 2 (*Table 10-1*), this doctoral research project succeeded in developing a new synthesised model of experience that combined all of the

critical elements of the previous flow models, both componential and operational. Importantly, this synthesis was the product of using explicit methods suited to the task.

Synthesising the new model began with an adapted systematic literature review (Chapter 2). The intention was not to collate all of the various flow models but to weave the streams of literature together and identify core themes and issues.

The themes and issues identified were:

1. Models of flow can be divided into two categories operational and componential.

2. These models all depict the various perspectives of flow theory and are complementary.

3. It is essential to have a clear understanding of the perspective that each of the models is depicting.

4. Some of the models are inextricably linked to methods of measuring flow.

5. No model can depict flow simultaneously as both state and trait.

6. While the early operational flow models depict subjective experience as a linear phenomenon, that is only the model's form and not the model's structure. An essential part of the model is missing – an equation with which to interpret the model[1]. This need for additional information within or about the model is because the subjective path a person travels between experiential states could be linear, nonlinear (some form of a parabola) or discontinuous in the sense that the path is broken (as an example see *Equation 2-1* and its relationship to nLDMF *Section 2.3.3*).

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[1] The operational models of flow depict a systemic landscape of the person-environment interaction and the emergent phenomenology. When two points are identified within the Cartesian space of subjective experience it is not possible to know what path was traveled by the person moving from one point to the other point, especially, when the sampling of experience is low, say 7-8 times in a single day as in the Experience Sampling Method.

The New Synthesised Model of Experience developed in this doctoral research project is not a simple aggregation of what appears to be similar elements. That is the grouping of things that superficially appear similar into a single category. It is the coherent integration of a range of themes and elements into a coherent and interconnected whole. This synthesis was made possible by selecting an explicit set of methods that facilitated the research objective. These methods were a thematic analysis and a truth table synthesis (see Chapter 3).

The thematic analysis comprised three phases. Firstly, descriptions of the experiential states were developed from the literature (see *Appendix D*). These descriptions were then used to identify latent patterns of disuse and misuse from state descriptions associated with those spaces in various flow models. Finally, the descriptions and characteristics of flow were used to identify latent themes in the experiential states' descriptions.

By identifying the latent themes within disuse and misuse and the latent themes of flow within the descriptions of other experiential states, the synthesis concluded by integrating the experiential states within the characteristics of disuse, misuse and optimal experience into a truth table. This synthesis and the subsequent analysis was conducted by applying Gibson and Isaac's five levels of abstraction to the synthesis. This analysis facilitated the generation of the new synthesised experience model (see *Section 3.1.2*). The new synthesised model can be seen in *Figure 10-1* directly below.

Figure 10-1: New Synthesised Model of Experience
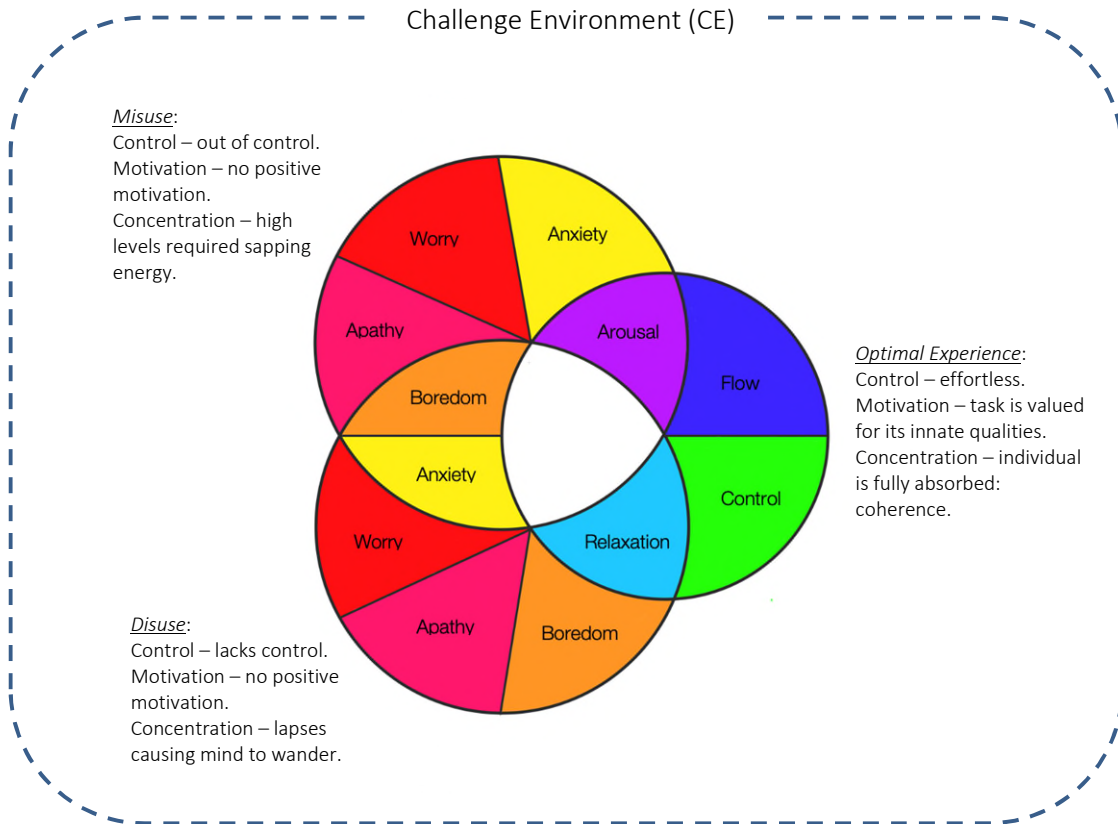
This new model directly addresses the first knowledge gap (see *Table 10-1*). The model provides several benefits that previous models of flow have been unable to provide. Firstly, this is the first model of experience that has depicted flow in relation to other experiential states and the metacognitive skills that connect them (see Chapter 3). Secondly, the new model is a direct synthesis of all of the previous theoretical models of flow. This synthesis means that the model encapsulates the operational elements of flow theory and contains all of the componential elements of flow theory. Again, no flow model has previously achieved a synthesis of all of these elements. Finally, the model depicts flow as a dynamic psychological phenomenon. This analysis is due to the synthesised model being modelled relatively and proportionally – each experiential state is represented within the model as being the same size. Therefore, because disuse and misuse have an additional state, they are represented as being more

significant. In other words, disuse and misuse act as attractor basins: constantly pulling the individual away from positive experiential states.

Moreover, following Csikszentmihalyi's original intention to investigate the 'quality' of an individual's subjective experience, the New Synthesised Model of Experience is qualitative. Critically, while the model is qualitative, it did not rely on qualitative observations for its development. It was the product of rigorous scientific investigation, explicit methods and well-established research. Therefore, in contrast to the existing quantitative flow models, the new synthesised experience model provides an explicit, systematic qualitative version of flow theory.

The New Synthesised Model formally groups experiential states' qualitative relationships utilising their thematic characteristics and the transitions between disuse, misuse and optimal experience. While the new model visually depicts the relationships between states and the transition between disuse, misuse and optimal experience, it is possible to apply greater rigour in expressing these qualitatively meaningful relationships and transitions employing a relational mathematical calculus in the form of Boolean algebra. These equations are depicted in *Figure 10-2*.

Each of the Boolean equations describes the conjunctive (AND), disjunctive (OR) and complement (NOT) of states. These equations were derived from the truth table that acted as a formal device to facilitate the organisation and ordering of experiential states and elucidated the transitions between the states and disuse, misuse and optimal experience (see Chapter 3).

Figure 10-2: System of Simultaneous Boolean Equations
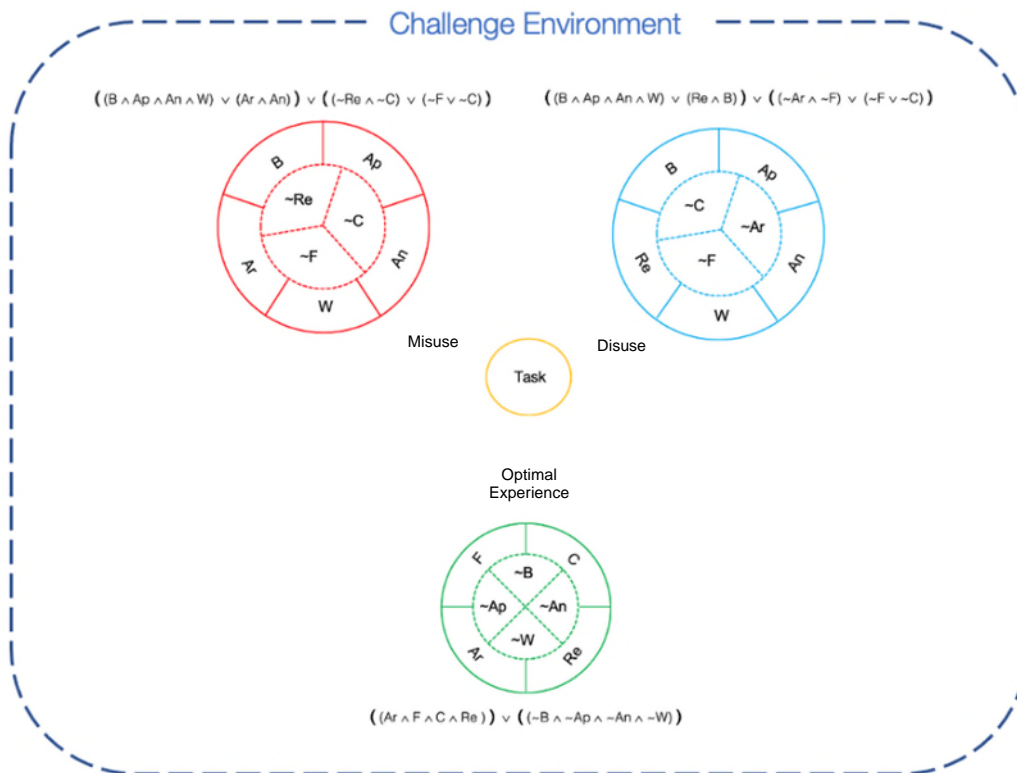
The simultaneous Boolean equations act as a novel mathematical restatement of the relationships between states, disuse, misuse and optimal experience. These Boolean expressions depict (logical) relationships and transitions between states. This approach results in a systematic mathematical model that acts and interacts as an integrated, interdependent whole.

Additionally, this mathematical depiction of subjective experience in terms of states, disuse, misuse and optimal experience includes what states are present and the states are not present. This formulation provides an entirely new perspective for researchers to investigate experience. Previously, if a participant has said to a researcher, "I'm not bored" (a direct statement said by Participant 3 in this research project), all the research could technically infer from the statement is that the participant is not bored. The state of boredom appears in both the Flow

Channel Model and the Experience Fluctuation Model; however, NOT-board does not appear anywhere and does not enable a researcher to locate the participant anywhere in the experiential landscape. However, as shown in *Figure 10-2*, NOT-board (~B) is a feature of optimal experience. This way of modelling experience provides a new and complementary way of thinking about people's subjective experiences in challenging activities. Indeed, Csikszentmihalyi (2000) argues that it is often easier for a person to say what they are not feeling as opposed to what they are feeling.

10.2.3 Addressing Knowledge Gap One

Consequently, when taken together, the two new models of experience address the gap in the literature review (stated above) and provide a novel and complementary way of viewing people's subjective experience as they engage in a challenging activity. Therefore, these models directly and explicitly address the first part of the knowledge gap identified by this doctoral research project (*Table 10-1*) and make a significant contribution to the theory of flow (see Chapter 9, *Section 9.3*).

10.3 Methods and Methodologies for Capturing and Measuring Flow (Objective 1b)

This lacuna was the second domain of literature to be reviewed (Chapter 4). This literature was reviewed from the perspective of people engaging in challenging activities in a challenging environment. The first literature review (Chapter 2) provided a theoretical appreciation of people's subjective experience (what is it like) to engage in a challenging activity in a challenging environment. The second literature review investigated the methods and methodologies used in flow research to capture and measure flow. In other words, what methods and methodologies are used to capture, express and measure what it is like (subjective experience) for a person to engage in challenging activities in a challenging environment.

The literature review revealed:

1. Work is required at the methodological level for work-related flow to be regarded as a complementary theory with other work-related constructs (Fullagar et al. 2017).

2. Methodological approaches intentionally pre-orientate study participants to the state or trait of flow. This approach acts as a form of biasing, orientating study participants to the subjective experience under investigation and may impede the participant's ability to express any other form of subjective experience. This tactic can be seen in interview techniques questionnaires such as the Flow Questionnaire (Flow-q) and the Flow Metacognitions Questionnaire (see Chapter 4).

3. Studies are needed to identify fluctuations in a person's subjective experience as they engage in challenging activities (Šimleša et al. 2018; Xanthopoulou 2017).

4. There is an overreliance on correlational methods to identify the subjective experience of study participants. That is to say, studies rely solely on the testimony of study participants. This research strategy is exemplified in study participants evaluating the level of challenge they feel they are experiencing (Šimleša et al. 2018).

5. The questionnaires used to identify subjective experience in terms of state or trait are precisely calibrated to identify and measure quantitatively either the state or trait of flow and cannot appropriately capture any other experiential state (see Section 4.5.4).

6. The quality of subjective experience is far more complex and nuanced than can be expressed in the numbers emerging from quantitative studies. Therefore, there is a need for more qualitative studies investigating what is it like to engage in challenging activities (Fullagar et al. 2017).

From these findings, two connected and interdependent research questions were developed:

RQ-1 – *Is it possible to encode a person's signs and symptoms of being in flow and moved out of flow state through the various instances and absences of states?*

RQ-2 – *What effect does challenge have on a person's subjective character of experience?*

The first research question (RQ-1) was developed as a direct response to points 1, 2, 3 and 4 directly above. If flow theory is to extend beyond studies that:

- Specifically, investigate flow in terms of state and trait; and,

- bias the participant to this experiential state and trait with explicit descriptions of the state and trait of flow.

It is necessary to design studies that investigate a broader range of experiential states as depicted in the New Synthesised Model of experience and then deliberately and explicitly vary the level of challenge experienced by a study participant to identify fluctuations in subjective experience.

The second research question (RQ-2) was developed in response to points 4 and 5 directly above. This strategy measures flow quantitatively as an experiential state or psychological trait. The approach is limited because it eradicates the nuances and fluctuations of subjective experience's relative to fluctuations in a challenging activity.

This literature review defined the knowledge gap outlined above. It highlighted the limitations in the formal approaches (methodologies) used to investigate a person's subjective experience and the measurement methods used to capture a person's subjective experience of a challenging activity. By adding definition to the knowledge gap, this literature review fulfils objective 1b and clarifies the knowledge gap 3a and 3b (*Table 10-1*).

Therefore, the literature review (Chapter 4) on the methodologies and methods for capturing flow and the relationship between challenge and capability directly fulfils the requirements of objective 1b and begins the process of addressing part 3 of the knowledge gap. The review clarifies the boundaries of the knowledge gap and facilitates the development of the research questions. These questions provide an explicit focus for the research and demonstrate the contribution made by this doctoral research project to the body of knowledge.

10.4 Theoretical Perspective and the Research Problem (Objective 3)

Making the theoretical perspective a distinct objective was significant for two reasons: 1) any project that is interested in the development of methods (RQ-1) must be interested in methodology and, by extension, philosophical perspective and the philosophy of science, and 2) the role played by philosophical perspectives in the development of new knowledge (epistemology).

Blaikie and Priest (2017) have argued that a researchers choice of conducting qualitative, quantitative or a mix of methods (qualitative and quantitative) elevates what is only a feature of data collection and analysis to a fundamental level. The choice of research methods should only occur after the researcher has:

- Identified the research problem
- Developed the research questions
- Identified and clarified the philosophical assumptions
- Developed a research design strategy (paradigm)

To this end, (as described in Chapter 5) a multi-paradigm research strategy was developed. Two interrelated paradigms were used to investigate each of the research questions. An Interpretivist perspective was applied to RQ-1, and RQ-2 was investigated using a Critical Realist perspective.

However, this doctoral research project's critical feature resides in its interest in people, specifically at the level of the individual. That is to say, (as depicted in *Figure 10-3*) an individual whose fluctuating subjective experience is contingent

upon their belief in their capability in relation to perturbations in the challenging activity they are engaging within a challenging environment.

Figure 10-3: Subjective Experience, Capability and Challenge Triad
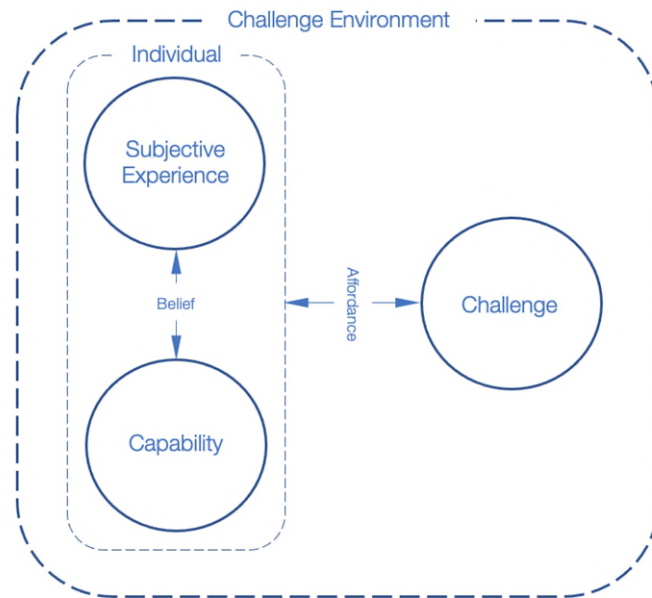
Subjective experience is an inextricable research problem because, as *Figure 10-3* shows, subjective experience resides within the individual and is only known to that individual. This problematic situation is exacerbated by the fact that an individual does not live in a vacuum. Individuals (people) live in challenging environments and engage in challenging activities. Therefore, this means that in conjunction with a challenging activity, the challenging environment affects an individual's subjective experience as a product of the individual's belief in their capability relative to the challenging activity they are experiencing.

Csikszentmihalyi (1975) recognised that this messy problem could not and should not be investigated using scientifically reductive methods. That is why Csikszentmihalyi began his investigations with phenomenological correlational approaches (see Chapter 4). To a greater or lesser extent, this approach has prevailed in flow research with the addition of bespoke questionnaires. What was needed, and this doctoral research project delivered, was a philosophically significant and unambiguous way of investigating a person's subjective experience from a Realist scientific perspective. This approach needed to

differentiate subjective experience as ontologically distinct rendering it amenable to a Realist scientific investigation, void of the associated reductionism accompanying Positivist scientific investigation.

By identifying the subjective experience phenomenon as ontologically distinct, meaningful conceptual links were identified between Buber's (1970) work and Levinas (1969). The two common themes that permeate each of these philosophers' works are:

- The individuated nature of individuality is phenomenologically unique and is described by Levinas as *Otherness*.

- The difficulty of coming to terms with Otherness through the self and other relationship is described by Buber as '*I and Thu*'.

However, to move from meaningful theory to empirical application, operationalisation was needed. Nagel (1974) provided this operationalisation through the assumption implicit in his deceptively simple question, "What is it like to be…?". The assertion embedded within the question implies that the individuated nature of subjective experience has its own unique phenomenology and is therefore ontologically distinct. Moreover, this directly contributes to Csikszentmihalyi's (2000) lifelong quest to develop Husserl's 'pure phenomenology' into a systematic method for studying human psychic processes.

By identifying individual subjective experience as ontologically distinct, it became possible to make a person's subjective experience the unit of analysis of this doctoral research project and make subjective experience directly amenable to realist scientific investigation. This operationalisation of theory to practice provided other benefits with ontology's irreducibility to epistemology and the identification of this studies unit of observation.

Therefore, the operationalisation of philosophical theory to ontological distinction taken in conjunction with a multi-paradigm design strategy provided a rigorous theoretical foundation for developing a realist empirical investigation. Moreover, this operationalisation realises objective 3 of this doctoral research project and

provides a new and theoretically significant way of rigorously investigating individual subjective experience in the flow theory domain.

10.5 Experimentally Investigate the Relationship Between Subjective Experience – Challenge – Capability (Objective 4)

The expressed intention of objective four was to investigate the research problem quasi-experimentally (Chapter 6). However, the successful completion of objective four was conditional on the previous four[2] research objectives. The objectives provide clarity and definition to the research problem and remove some of the ambiguity and noise associated with the research problem:

1. Objective 1a – clarify the research problem and identify the relationships between variables associated with the research problem. Additionally, ascertain limitations and inconsistencies related to the research problem.

2. Objective 2 – synthesise the findings of objective 1a into a holistic landscape of the research problem: the development of a new synthesised model of experience.

3. Objective 1b – review the literature associated with the research problem regarding the formal approaches associated with capturing and measuring fluctuations in individual subjective experience relative to challenge.

    a. Identify the limitations of formal approaches and methods.

    b. Define the boundaries of the research problem.

    c. Develop research questions with which to address the knowledge gap.

4. Objective 3 – philosophically locate the research problem and identify the research projects units of analysis and observation. Elect and elucidate specific distinct yet philosophically linked perspectives (paradigms) to investigate the research questions.

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[2] Note the objectives are labelled 1a, 1b, 2 and 3 etc.

As a result of these objectives, it was possible to develop a clear and explicit systems diagram of the research problem void of ambiguity.

The systems diagram in *Figure 10-4* depicts all of the relevant elements of the system and their associated relationships. The arrows depict the direction of travel, and each element is situated within the individual or within the challenging environment. Additionally, *Figure 10-4* clearly shows the independent variable, the dependent variable and the unit of observation:

- Independent variable – challenge
- Dependent variable – subjective experience
- Unit of observation – actions and behaviours

What can also be seen is that actions and behaviours are directly linked to subjective experience via a feedback loop.

What may appear unusual is that the diagram is organised around capability and not around subjective experience; this is because capability, "… is not the skills we actually have that determine how we feel" Csikszentmihalyi (1990:173) writes, "but the ones we think we have". What Csikszentmihalyi means by this is that a belief function exists between subjective experience and challenge. Therefore, the individual's belief in their capability in relation to challenge is the mediator and moderator of the individual's actions and behaviours.

Figure 10-4: Systems Diagram: Subjective Experience - Challenge - Capability
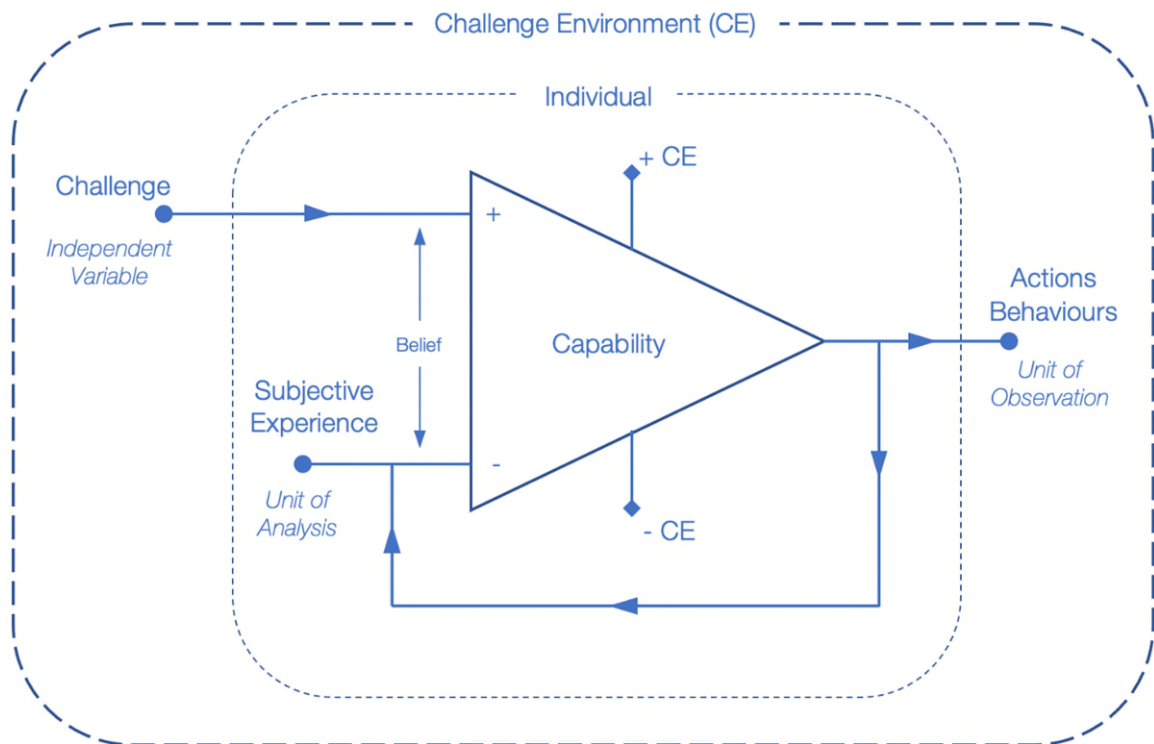
The final element to note in *Figure 10-4* is the challenge environment's influence on an individual's capability, represented in the diagram as +CE and -CE. The environment can positively influence capability (+CE), and the environment can negatively influence capability (-CE).

10.5.1 The Experimental Protocol's Subsidiary Objectives

Therefore, having clarified the research problem, developed two interrelated research questions (see objective 1b above), and identified the most appropriate perspectives from which to investigate the questions, it is possible to generate an array of theory-driven research objectives:

1. Develop a research protocol where a study participant is exposed to a range of challenges (independent variable) that will generate the full range of affective feeling states depicted in optimal experience in the New Synthesised Model of Experience.

2. Identify and generate the salient conditions to limit the transition to unacceptable stress levels as depicted in the New Synthesised Model of Experience.

3. Gather the requisite data in terms of observable actions and behaviours of the study participants as they engage in the challenge activity.

Accordingly, the first objective requires the participants to be exposed to a range of challenges in relation to their capabilities that will cause the feeling states of arousal, flow, control and relaxation to ensue for the study participants. The second objective prescribes that the study participants should not be exposed to challenges in relation to their capabilities that cause the study participants to experience prolonged exposure to challenges that will potentially produce feelings of anxiety, worry, apathy or boredom. Finally, the third objective necessitates a data collection system that can accurately capture the observable signs and symptoms of the participants actions and behaviours while the participants engage in a challenging activity.

Developing the experimental objectives made it possible to identify a suitable challenging activity and the most appropriate participants. Indoor rock climbing was selected as the challenging activity, and professional climbing instructors were chosen as the most suitable group to engage with the research. The rationales supporting these decisions can be found in Chapter 6.

Additionally, as identified in Chapter 4, studies investigating the interplay between systemic pressure and situational forces and their effect on people's lived subjective experiences should use multiple methods to support and corroborate findings (triangulation). Therefore, not only did the study use a quasi-experimental protocol to investigate people's lived experiences in the sensory domain. A construct elicitation method was also used to investigate people's lived subjective experiences in the affective domain. These methods used in combination formed a robust research design with which to investigate the research questions.

Figure 10-5 shows the overall design structure of the protocol. The New Synthesised Model of Experience shows the range of an individual's lived

experiences in terms of affective feeling states. The segments between the upper and lower boundaries show the range of challenges they will experience while engaging in the climbing activity.

Figure 10-5: Structure of the Research Design Strategy

Additionally, the construct elicitation focuses the participants' attention on their lived experience in the affective domain to identify how their inter-subjective experience fluctuates in relation to the acute and proximal challenges manifest in an indoor climbing activity.

10.6 Addressing Knowledge Gap Three

In summary, the design and implementation of the research protocol (Chapter 6) represent the successful realisation of objective 4 of this doctoral research project. When objective four is taken in conjunction with objective's 1b and 3, this PhD directly addresses part 3 of the knowledge gap identified in *Table 10-1*.

Historically, formal approaches used to investigate people's subjective experiences have relied upon correlational methodologies. These methodologies have focused on investigating the state and trait experiences associated with flow using the reports provided by participants in questionnaires. Correlational approaches are well suited to investigating people's lived experiences in naturalistic everyday settings. They allow researchers to test the expected relationships between various variables. However, they are limited to the extent that it is impossible to infer the causal relationships between variables.

In contrast to correlational methodologies, experimental methodologies allow researchers to investigate and assess the impact of experimental manipulations on the dependent variable. This approach allows researchers to infer conclusions about the relationships between variables. However, experimental approaches can be time-consuming, expensive and labour intensive. Additionally, experimental methodologies are not well suited to naturalistic environments.

The novel experimental design developed in this study allowed the explicit manipulation of experimental variables (climbing grade) on the dependent variable (subjective experience) in a naturalistic everyday setting. By manipulating variables in this way, it was possible to identify how subjective experience fluctuates in relation to challenge through the study participants' actions and behaviours. The direct benefit of this methodological approach was that it was possible to submit study participants to a wide degree of challenge and identify how individual subjective experience fluctuated in relation to the degree of challenge. While this approach is time-consuming and labour intensive, it provides certain benefits 1) the experiment is not limited by the number of observations it can make, and 2) the findings are not solely based on the participants' self-reports or testimony.

Therefore, knowledge gap 3 is directly addressed by objective 4. Moreover, objective 4 compliments the dominant correlational methodologies utilised in flow research by offering a novel and innovative approach to investigating individuals' subjective experiences while engaging in a challenging activity in a challenging environment.

10.7 Development of the Codebook (Objective 5)

As described in Chapter 4, many of the correlational methods used to investigate flow are specifically tuned to measure flow as either experiential state or psychological trait. Therefore, these methods are limited in the range of human experience that they can identify and measure (knowledge gap 2). The purpose of objective 5 is to investigate the possibility of developing a method that was not limited to capturing the state flow but to develop a method that could identify a broader range of human experience relative to challenge (see Chapter 7). The development of RQ-1 is a direct consequence of this purpose.

The development of the research protocol (objective 4) facilitated collecting a large quantity of data in the form of the participants' observable actions, behaviours and self-reports relative to a specific level of climbing challenge. That is to say, the symptomatic (actions and behaviours) attributable effects of subjective experience in relation to the degree of challenge. In this way, the experimental protocol directly subjected study participants to a comparable array of challenges to elicit a broad range of subjective experiences.

Correlational methods used in flow research have already established a range of experiential states that directly correspond to peoples' subjective experience of challenge. This doctoral research project has then synthesised these states into a New Synthesised Model of Experience (objective 2). The model used descriptions of states to identify themes that were then used to synthesise the model. Therefore, what is needed is an analysis method that links a person's symptomatic (actions and behaviours) and the attributable effects of a level of challenge to experiential states. The method should directly relate the actions and behaviours of the study participants to the themes in the descriptions of experiential states. To this end, the thematic analysis method most suitable for this task was a form of framework analysis – a codebook (see Chapter 7 for the rationale supporting this decision).

10.8 Addressing Knowledge Gap Two

This doctoral research project addressed part two of the knowledge gap and fulfilled objective 5 of this PhD by developing a codebook that related a person's actions and behaviours to their subjective experience at a particular degree of challenge. The new codebook provides a new way of identifying the subjective experience of individuals as they engage in a challenging activity (climbing indoors).

Compared to methods that quantitatively measure flow, the new method qualitatively assesses the participants' subjective experience. However, instead of only identifying the experiential state of flow, the new codebook can identify a broad range of subjective experiences – worry, anxiety, arousal, flow, control, relaxation and boredom.

The codebook facilitates the identification of a person's subjective experience relative to the challenges they are experiencing. Without the codebook, the problem is one of interpretation, relying on one person's ability to interpret (come to terms with) anOther's (Levinas) experiences successfully (as discussed in Chapter 5). However, the problem is transformed into an analytical problem with the codebook. That is to say, the problem becomes a systematic assessment void of guesswork.

The sections above have summarised each of the studies research objectives and their relationship to the knowledge gap. What follows is a discussion of how this doctoral research project has addressed the knowledge gap.

10.9 Conclusion – Addressing the Research Problem and Knowledge Gap

This section will discuss how this doctoral project's research objectives address the research problem – how the quality of a person's lived subjective experience is affected by differing degrees of challenge: stress (challenge) in the form of pressures and demands overwhelm that person's capabilities. The contributions are twofold:

- The first element of the contribution concerns the nature of people's subjective experience of challenge.

- The second element of the contribution concerns the relationship between challenge and subjective experience.

Each of the contributions will be discussed in the following two sections.

10.9.1 The Cumulative Effect of Challenge and Environment on Subjective Experience

An analysis of the research problem shows that high levels of challenge in the form of excessive demands produce unacceptable stress levels. Therefore, the first step in addressing the research problem was investigating how people subjectively experience challenges quasi-experimentally.

The quasi-experiment showed that as the challenge was either incrementally increased or decreased, the participants' subjective experience tracked incrementally to changes in challenge relative to their belief in their capability. *Table 10-2* shows the upper and lower limits of the challenge spectrum tested and the ensuing subjective experiences relative to capability.

Table 10-2: Relationship Between Subjective Experience – Capability – Challenge

Subjective Experience	Capability	Challenge
Boredom	Nominal levels utilised	4 degrees below the median
Anxiety	Maximal levels utilise	4 degrees above the median

The experiment demonstrated that challenge is cumulative moving away from a self-selected median as subjectively experienced by the study participants. Moreover, the experiment showed that boredom is an undesirable experiential state from a subjective perspective as anxiety. Quasi-experimentally, the participants were only subjected to brief periods at their climbing capability's maximum and minimum levels. Were the participants subjected to prolonged and

sustained periods at these levels of challenge, the New Synthesised Model of Experience implies that unacceptable stress levels would ensue. This research shows that challenge is cumulative, and when it is left unchecked, it will generate unacceptable stress levels.

However, the incremental nature of challenge described above is only a partial account of the problem; an in-depth analysis of the data revealed that challenge is also cumulative. Several examples in the research data attest to this conclusion (see thick description *Appendix E*):

1. Participant 1:

    a. Not being warmed up and experiencing pump.

    b. The potential of taking a ground fall on the most challenging climb (lead climbing).

2. Participant 2:

    a. The effect of wearing the wrong trousers (jeans).

3. Participant 3:

    a. The effect of being watched (first climb).

    b. The chosen climb was not in line with the quickdraws or lower-off (potential of a large swing if fall occurred).

These examples demonstrate the cumulative effect of challenge on subjective experience and, by extension, individual performance. By using the diagram in *Figure 10-4*, it is possible to describe the problem of cumulative challenge. *Figure 10-4* provides a way of analytically (objectively) differentiating the independent challenge variable (climbing grade) from other positive or negative effects (variables) in the challenging environment (+CE or -CE).

In the first example, Participant 1 experienced 'pump' in their forearms (build-up of lactic acid in the forearms). Pump occurred because the participant's first climb in the protocol was at an inappropriate level (for this participant at that time) of challenge to warm-up. To allow the participant to continue climbing the climbs in

the protocol's schedule in order of difficulty had to be adjusted. This adjustment went into the +CE input of capability and allowed the participant to continue climbing and complete all their climbs without incident. If the order of the climbs had not been adjusted, the participant would not have completed the second climb successfully.

In the second example from Participant 1, the participant on their most challenging climb identified the potential of a ground fall in the lower section of the climb. The participant was free to exercise personal discretion to solve the problem resulting in the participant's clean ascent of the climb—the participant's application of personal discretion fed into the +CE of capability. Had the participant not been allowed to utilise their discretion, the participant would have refused to climb due to the direct and very real possibility of personal injury.

These first two examples demonstrate how cumulative challenges can be successfully managed. However, the following examples demonstrate how cumulative challenges can produce undesirable consequences.

In the following example of a cumulative challenge, Participant 2 had chosen to wear jeans. While this did not present any initial problems, the jeans became an additional challenge to an already challenging activity when the participant began to climb their more difficult climbs. Firstly, the jeans caused the participant to become hot and sweaty. Then to compound the problem, the jeans restricted the participant's movement, generating increased fatigue levels.

The participant's decision to wear jeans generated an additional and distinct challenge from the independent challenge variable during the experiment. By the participant's own admission, the jeans made the task of completing all of the climbs more arduous than necessary. Therefore, this compounding challenge (it is not that jeans are inappropriate, but inappropriateness of jeans in that challenging environment) feeds directly into -CE, adversely affecting the participant's subjective experience and ability to perform effectively and optimally.

The third participant experienced the final two examples. The first example pertains to the collision of two distinctly different challenges 1) the challenge of

the first climb and 2) an intense dislike of being watched while climbing. Before commencing the climbing session, the participant's median climbing grade was established; from this reference point, an appropriate grade was identified to begin to warm-up and commence the climbing session (having learnt from the warm-up mistake for the studies first participant). The climb for the participant should have been straightforward and allowed that participant to ease into the protocol. However, it was a surprise to see the participant make a series of errors that made the climb more challenging than it should have been (see thick description *Appendix E*). When the participant returned to the floor, they spoke about their dislike of being watched while climbing. This incident exemplifies how the main challenge can be adversely affected by a secondary, unseen or unknown challenge. The participant's dislike of being watched feeds directly into the -CE of *Figure 10-4,* placing a significant drain on Participant 3's capability and directly and adversely affecting the participant's subjective experience and performance. Interestingly and importantly, after a conversation, the participant settled down, overcoming their anxiety of being watched and enjoyed the overall climbing session saying, how it was their best performance climbing indoors in a long time.

The second example for Participant 3 occurred during their third climb. Before starting the climb, the participant identified that the line of bolts was to the left of their chosen climb and that if they were to fall, they would potentially swing. By identifying this problem before commencing the climb, the participant demonstrated their understanding of the potential risks involved in trying this climb and that if they got something wrong and fell off the climb, they were in danger of getting hurt.

However, instead of choosing another climb, the participant continued with the climb as was their choice. Unfortunately, for Participant 3, the increased risk of swinging if a fall occurred adversely affected the participant's ability to complete the climb cleanly (see thick description *Appendix E*). The risk of swinging can be regarded as an additional challenge distinct from the climb's overall challenge. This additional challenge can then be regarded as feeding into the -CE of

capability in *Figure 10-4*, placing an excess load on the participant's capability. Again, this additional challenge adversely affects the participant's subjective experience and ability to perform optimally.

The examples above show that challenges can be objectively differentiated and broken down into distinct, discrete elements. In the experimental protocol, the main challenge of climbing can be distinguished from additional challenging elements. These additional elements (forearm pump, ground fall, inappropriate clothing, intense dislike of being watched, poor choice of climb), depending on how the individual participant comprehends them feed either into the +CE or -CE of capability. The addition of these challenge elements means that they feed into capability and either enable the individual to progress and succeed or adversely load capability directly and negatively affecting the individual's ability to perform.

This analysis demonstrates that challenge is not only iterative, it is also cumulative. In iterative form, a single challenging activity can have the level of challenge increased or decreased. Additionally, a challenging activity at a given level can be influenced by other challenging factors that act upon the challenge activity, either positively or negatively affecting the outcome. The point is, while the iterative and cumulative variations of challenge can be objectively differentiated and identified, the challenges themselves are experienced by the individual subjectively and in their entirety. The confluence of challenges directly affects the individual's subjective experience and, by extension, their ability to perform.

When this analysis of challenge is reviewed in the context of the research problem and its consequences:

1. Problem – the imbalance between challenges and capabilities produces unacceptable stress levels (World Health Organisation 2020).

2. Consequences – how unacceptable stress levels adversely affect the quality of people's lived subjective experience (HSE 2019).

In this regard, it can be seen that leaders have a poor appreciation of how people experience challenges.

Firstly, this doctoral research project addresses the research problem by investigating the relationship between challenges and capabilities in two interrelated ways:

1. The analysis shows a taxonomy of challenge, where challenge is both incremental and cumulative.

2. The analysis shows that capability is the abstracted location in which challenges converge. Consequently, the research shows that the convergence of challenges in capability has a specific consequence – people experience challenges subjectively and in their entirety.

Therefore, this PhD's first contribution to the research problem is to enhance our understanding of the taxonomy of challenge and that challenges are experienced by people subjectively and in their entirety.

This research directly contributes to the literature on flow theory and the study of people's health and well-being by offering a taxonomy of challenge to the extent that challenges are subjectively experienced by people in their entirety. This enhanced appreciation of challenge and its relationship with subjective experience provides new ways to think about the combinations and levels of challenge people experience and how these will impact people's capabilities in terms of their knowledge skills and experience.

This section discussed the contribution of this PhD project regarding a taxonomy of challenge and how challenges are subjectively experienced. The following section will discuss the relationship between challenges and subjective experience and the opportunity this generates to identify the level of challenge relative to capability from a person's subjective experience.

10.10 The Relationship Between Subjective Experience – Capability – Challenge

The analysis of the previous section showed that challenge is cumulative and iterative and is experienced by a person subjectively as an irreducible whole in the moment of acute and proximal challenge. For this research project to develop

this new understanding of challenge, the participants' experience of challenge had to be conducted retrospectively. The themes of incremental challenge, cumulative challenge and capability acting as the centre of convergence of challenges emerged as themes from an extensive engagement with the research data. The level of work required to develop this understanding of challenge is interesting and essential to the research problem. It exemplifies why the concept of challenge is so difficult to assess and evaluate.

Indeed, this analysis explains how, in a challenge environment, challenges in the form of demands can quickly overwhelm an individual's capability – challenges are quite simply inscrutable to assess and evaluate. Additionally, an accurate prior assessment of people's challenges in a challenging environment may not be possible when that challenging environment is part of an open system.

The difficulty in assessing and evaluating challenges relative to capability constitutes this PhD's second contribution to the research problem and knowledge gap. Moreover, this problem is exacerbated when we consider that even if challenge could be objectively analysed, it is still experienced subjectively by the individual.

A limiting factor of previous research has been its correlational nature and the limitation of measurements in terms of frequency. This research project has investigated the relationship between challenge and subjective experience by experimentally manipulating the independent variable. Each of the three case studies explicitly demonstrated with 152 separate codable moments plus the final reflections recorded by participant 3 (see *Appendix E*) and the environmental noise issues) is that subjective experience fluctuates in relation to fluctuations in the level of challenge experienced by the individual. From these codable moments, the analysis showed:

1. Subjective experience fluctuates with far greater frequency than research has previously shown (limitation of methods).

2. Subjective experience is not a linear phenomenon. It fluctuates in direct relation to changes in the level of challenge and is contingent upon the

313

individual's belief in their capability relative to that challenge. Therefore, if the acute and proximal challenge suddenly changes, so does subjective experience.

3. Fluctuations in subjective experience show that while the challenge may be set at a particular level, challenge can be spikey, causing acute and proximal spikes in subjective experience. In other words, subjective experience is not static at a particular level of challenge.

By investigating the relationship between subjective experience and challenge in a climbing environment and identifying a correlational relationship, it becomes possible to use a person's subjective experience to identify challenge levels relative to capability. In other words, because there is a relationship between subjective experience and challenge, it becomes possible to deduce the level of challenge relative to capability that a person is experiencing. Identifying an individual's subjective experience provides insight into the relationship between challenge and capability that they are experiencing.

The codebook and New Synthesised Model of Experience developed by this doctoral research project facilitate this deductive movement from subjective experience to the level of challenge relative to capability. By identifying a person's subjective experience through their actions, behaviours and self-reports using the codebook and then locating their subjective experience in the challenge landscape of the Synthesised Model of Experience, the level of challenge relative to capability experienced by the individual can be deduced.

Therefore, applying the codebook and Synthesised Model constitutes a formal approach to identifying the level of challenge experienced by an individual by identifying their subjective experience. This formal approach represents this doctoral research projects second contribution to addressing the research problem. This novel way of identifying a person's subjective experience in a broad challenge landscape extends current practices beyond identifying flow as either state or trait and facilitates the identification of the level of challenge relative to capability. This identification enables researchers to establish whether a person's

challenges are overwhelming their capabilities, are not challenging their capabilities or the challenges and capabilities are in harmony.

In summary, this formal approach to identifying subjective experience and then deducing challenge from that subjective experience provides a direct and explicit solution to the research problem this doctoral research project addresses.

The following section will discuss the limitation of this research project and the application and model developed by this research project.

10.11 Limitations of This Study

As with any study, this doctoral research project has limitations. This section will discuss those limitations in terms of the contextual nature of the results and their relationship to only investigating a limited range of the New Synthesised Model's operational range; the limitations of only using three case studies; the difficulty of developing the codebook as a product of limited resources; and finally, the theoretical nature of the system of Boolean equations.

The research problem investigated how the quality of a person's lived subjective experience is affected by differing degrees of challenge: stress (challenge) in the form of pressures and demands overwhelm that person's capabilities. Traditionally, research in this domain relied on correlational methods to investigate the research problem. However, this doctoral research project's expressed intention was to investigate the nature of the relationship between challenge and subjective experience. This intention generated a specific problem – how can an experiment be designed in a naturalistic environment where it is possible to use and manipulate challenge as the independent variable.

The innovative solution adopted by this research project was to use indoor rock climbing as the challenging activity and an indoor climbing centre as the venue. In addition to this unusual choice, professional climbing instructors were selected as the participants of choice for the investigation. The rationale supporting this decision is that for climbing instructors, an indoor climbing centre is their working environment. What is recognised is that indoor rock climbing as an activity is quite different from a more traditional working environment, but as Csikszentmihalyi

(1975:5) writes, "there is no unbridgeable gap between 'work' and 'leisure'". In comparison, it is recognised that there is a gap between rock climbing in an indoor climbing centre and a more traditional working environment. The selection of professional climbing instructors as study participants was efficacious in reducing this gap. What is essential is that there is still a gap, which places limitations on the study and contextually biases the results.

Moreover, while the research problem was to investigate an imbalance between challenges and capabilities, this research project investigated the balance between challenge and capability to identify which points an imbalance occurred (see *Figure 10-5*). The rationale for adopting this approach was twofold:

1. For the study to place participants in a situation where their capabilities were deliberately overwhelmed was considered to be completely unethical and potentially dangerous considering the activity.

2. Placing participants in a dangerous and unhealthy situation would not have provided a healthy reference point against which contrast the unhealthy situation.

This approach facilitated the identification of the thresholds at which undesirable experiential states occur by using a quasi-experimental methodology. These thresholds were consistent with the bifurcation zones depicted in the New Synthesised Model. Additionally, this study demonstrated that the thresholds between disuse, misuse and optimal experience are direct indicators of the ensuing imbalance between challenge and capability.

However, due to the expressed purpose of this doctoral research project, only a portion of the synthesised model was investigated. Therefore, this study did not address the entirety of the research problem and the attributable symptomatic effects associated with an imbalance of challenge in relation to capability. The success of this research project resides in its identification of the boundaries where imbalance occurs. However, far more research is necessary if the research problem's full extent is to be apprehended.

A further limitation is investigating the research problem using only three case studies. This homogeneous group of study participants was deliberately chosen to highlight the differences in subjective experience of a similar group of people. However, while it is recognised that this homogeneous group provided explicit benefits, the research would be far richer had it been possible to investigate the research problem using more case studies with a heterogeneous sample group. However, this was not possible due to the time and financial constraints of the project and the limitations of qualitative studies relying upon thick descriptions for their trustworthiness and reliability. Moreover, this study represents the early stages of a coherent research agenda where a homogeneous group of participants is necessary. In future research, it is recognised that a heterogeneous group may produce different behaviours that could signal different emotional states in different people, especially if different genders, ages, cultures.

Another constraint to the research pertains to the development of the codebook. Firstly, the research project's contextual nature – professional climbers climbing in an indoor climbing centre means that the codebook is contextually constrained, and caution should be taken when adapting it for other challenging environments. Moreover, a codebooks validity is achieved with the consistency of coding (Boyatzis 1998). Again, due to a limitation of recourses and time, the consistency of coding was only partially achieved. However, in an attempt to mitigate this limitation, member checks of the analysis by the study participants did confirm the study's findings as they pertain to the codebook.

The final limitation of the study concerns the development of the Boolean equations. While the equations themselves supported the development of the research protocol and the data analysis, the equations themselves remain untested. Therefore, they should be regarded as being purely theoretical.

This section had discussed the limitations of this doctoral research project as they pertain to the research problem. In summary, this project should be regarded as a proof of concept only. The following section will discuss the future work that should evolve from this project.

10.12 Future Work

Due to this research project's limitations and the scope of the research problem, further research is necessary if the research problem is to be fully appreciated. As stated above, this doctoral research project investigated the balance of challenges and capabilities to identify the thresholds of imbalance. Investigating the research problem from this perspective means that the entirety of the symptomatic attributable effects of imbalance has yet to be exposed to intensive and coherent investigation. The spectrum of imbalance can be seen in *Figure 10-5.*

The problem with investigating this spectrum of imbalance resides in people's unhealthy experiences within that spectrum and the potential long-term harm it can inflict. Indeed, this point of research participants experiencing harm as a product of engaging in research projects is a point captured by Sapolsky (2004), discussing the dangers of manipulating psychological variables. In this regard, the New Synthesised Model of Experience shows that when people are exposed to a sustained course of research where people are subjected to excessive challenge levels, the research may become questionable as the sustained effects cannot be ignored. However, more research is needed if the Synthesised Model's inferences are to be taken seriously. As discussed in Chapter 8, the Synthesised Model depicts a cycle that traps people in disuse and misuse, the effect of which would be devastating for any person trapped within such a cycle.

One interim research path that may provide important insights into this critical research problem of deliberately exposing study participants to unhealthy levels of stress would be to dynamically model the phenomenon of imbalance in its entirety on a computer. This simulation approach would allow the codebook, the synthesised model, and Boolean equations to realise their full utility and model people's experiences in a given context under various levels of challenge. Simulating challenging environments in this way would give researchers insights into people's experiences without the need to expose them to unnecessary harm. This approach would use the codebook as a lookup table and the Boolean equations to develop heuristic rules. This thread of research would also include

the need to develop the codebook for other organisational working environments. Moreover, this form of modelling can be used to develop a passive observational methodology that would address some of the issues described directly above. In addition to this research thread, this doctoral research project identified that subjective experience is a nonlinear phenomenon that responds directly and proportionally to discontinuous changes in people's challenges in their challenging environment.

A primary research path open to this project is the further development of the codebook, whereby the codebook is adapted to an organisational setting, allowing the organisation to identify the threshold of imbalance in their organisation to create a resonance between the demands and responsibilities of work and the capabilities of the individual employees.

This summary of future research represents a coherent research proposition directly aligned with the research problem and the knowledge gap.

10.13 Reflections – A Personal Learning Journey

Memory is a limited tool for recapturing the past. Memory never recaptures the reality of events, memory reconstructs, and all reconstructions alter the actual events. Memories become an external frame of reference that always fall short of the original experience. Therefore, this final diary entry is a reflection (not a reconstruction) of my very personal challenges of conducting meaningful research.

Long before I undertook a formal education in research and utilised a combination of flow theory and complex systems theory to investigate the research problem, I was, unbeknownst to myself, a flow practitioner (I had never heard of flow). I had taught people how to get into flow for many years, although flow was known as no-mind (a translation of a Japanese term).

This doctoral research project's expressed purpose evolved from my personal experiences and the resounding message from the clients I have taught since 1989. This message has been their desire to cope more ably with adversity (challenges). The clients' expressed need was to develop the ability to resolve

unforeseen and unexpected conflict situations. However, for many clients, the essential ability to resolve conflict becomes an emergent quality as a deeper appreciation of the nature of adversity and their relationship to the stress caused by adversity begins to evolve, liberating for them unknown, unrealised and completely unrelated abilities that previously remained dormant. Indeed, it has been the journey of discovery embarked upon by my clients and my own personal journey that has sparked and fuelled my profound interest in the nature of self-worth, personal growth and development (liberation of latent capabilities) and their potential to enhance engagement with the immediate environment and the world at large.

It is from this perspective that my reflection begins in the light of the findings described above.

Conducting meaningful and timely social science research in its own right is a challenge. Research is messy. Research by way of addressing a specific research problem and knowledge gap is not a puzzle that can be solved by following a set of rules or learning a new set of rules to solve the puzzle with one ideal complete solution. It is a real-world problem that is invariably complex, ambiguous and messy. Not only will a fundamental research problem not have an ideal complete solution, but it also may not have any solution at all. Again, before starting my research, I did not understand this distinction. Moreover, the research problem I had chosen to investigate was particularly intractable. Indeed, it is only in these final pages that I feel that I can explain the research problem with sufficient clarity so as not to oversimplify the problem to the extent that it becomes meaningless, yet able to explain it with necessary detail that it does not become ambiguous.

Indeed, as I write this final reflection, a large portion of the Western world is struggling with the imbalance of challenges and capabilities (COVID-19). So, what have I personally learned, and what would I say in a conversation with others? Importantly, there is a caveat in this hypothetical conversation. The people I am referring to in this conversation are those who, before their experience of anxiety, were not suffering from clinical mental health issues. That

is a wholly different and severe issue only to be dealt with by mental health professionals and beyond this hypothetical conversation's remit.

Contrary to widespread belief, anxiety is not bad; anxiety is essential and critical to good health and well-being. When people experience anxiety, their innermost selves try to alert them to unrealised dangers in their immediate environment. Anxiety is alerting people to the fact they need to respond – in the vernacular, this means to get out of Dodge. By ignoring anxiety, burying anxiety or adopting practices that seek to mask anxiety, people unwittingly expose themselves to the rigours of chronic stress.

In this sense, anxiety directly results from demands and pressures (challenges) that exceed people's knowledge, skills, and experience (capabilities). As discussed above, subjective experience in the form of anxiety (like research) is the product of a complex real-world problem. It is not a puzzle to be solved with an ideal solution derived from a set of rules, but a problem to be managed with great care and thought, and as with all problems, there is no single ideal solution. However, there are pitfalls to be avoided, and these pitfalls are surprising. These come from Suzuki's quote at the beginning of Chapter 9 and is concerned with being busy. As Suzuki says, "some people start to practice Zen just out of curiosity, and they only make themselves busier" (1970, p.58). When Suzuki uses the word Zen, he is speaking of meditation. As with so many mindfulness activities in a world where we are already busy, starting to meditate without giving something up just makes you busier.

One of the central findings of this thesis is that challenge is incremental and cumulative. So, in an already busy life, introducing meditation is an addition that makes an already busy life busier. Learning new skills to cope with adversity (resilience training) makes life busier.

The first thing to do if life is to become calmer and less stressful is to reduce challenge (easier said than done). Then people will have the space to learn new skills to cope with adversity. Moreover, as Ulrich et al. (2014:201) writes, "induction of flow experiences appears to be, much like meditation, a promising tool for stress reduction programs for persons suffering from chronic stress

syndromes including increased arousal and increased self-reflection with associated negative affectivity". However, we must become less busy first!

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Appendix A Experimental Protocol

Project Description

This protocol describes the design of the empirical portion of a doctoral research project. The empirical experiment will test the efficacy of a new conceptual model of Flow theory.

The model of Flow has been developed as the theoretical portion of a doctoral research project. The model represents a significant contribution to the ongoing international research into the theory of Flow. A theory that originated with Csikszentmihalyi in the 1970's (Csikszentmihalyi 1988).

A literature review identified the need for a new model of Flow (Moneta 2012) as, current models fail to capture the findings of contemporary research, specifically:

1. The Flow experience still occurs when capability exceeds challenge (Engeser and Rheinberg 2008; Fullagar et al. 2013).

2. High levels of Flow can ensue with medium levels of arousal (Peifer et al. 2014).

3. Flow exists simultaneously as both State and Trait (Moneta 2012; Xanthopoulou 2017; Xanthopoulou et al. 2012).

4. Flow is a non-linear and discontinuous psychological phenomena (Ceja and Navarro 2012, 2017; Guastello et al. 1999).

The new model developed by this study not only encapsulates previous conceptualisations of Flow theory, but also formally addresses the findings listed above. Figure 1 is a diagrammatic representation of the new model.

New Synthesised Model of Flow

Misuse

Optimal Experience

Disuse
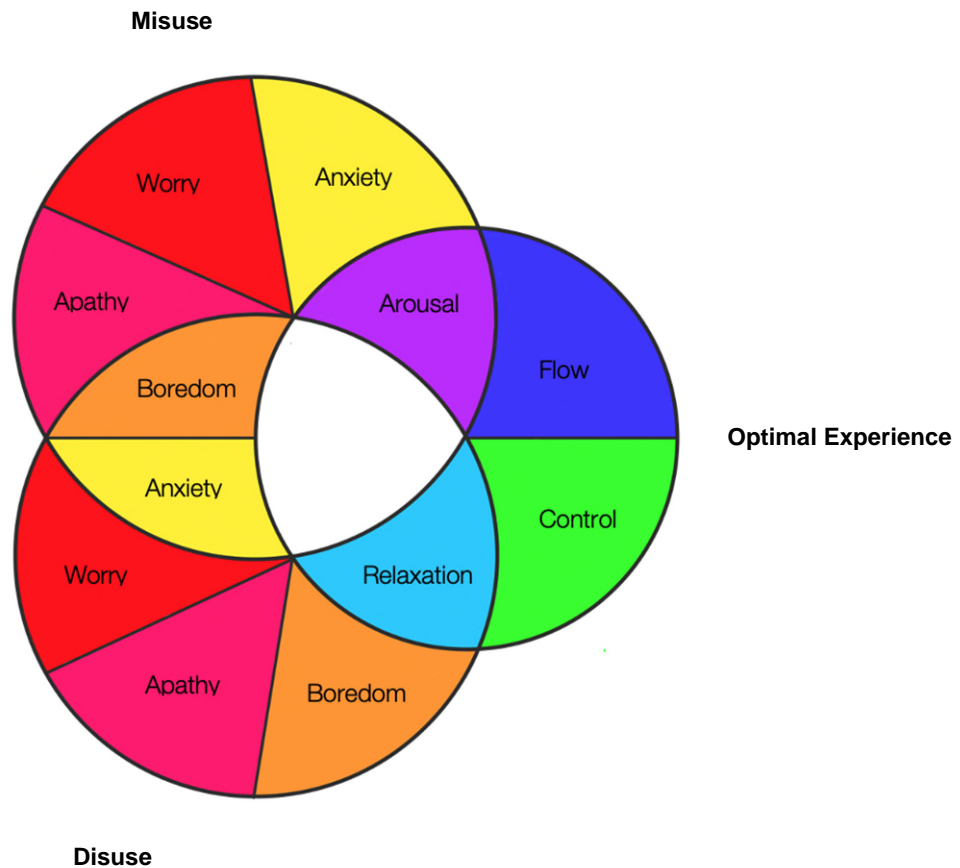
The new model is a synthesis of two pre-existing models of Flow: (i) The original Flow channel model (see Csikszentmihalyi, 1975) and (ii) the Experience Fluctuation Model (see Massimini, Csikszentmihalyi and Carli, 1987). The method used to synthesise the new model explicitly preserves the logical inferences and premises that are asserted in the previous models (Barnett 2011); while capturing and expressing the new findings listed above.

Synthesising Flow theory in this way means that the new model represents a broader range of human experience. The model captures and describes:

1. Why people are motivated and enjoy some activities but not others.
2. Why some activities create feelings of boredom, worry or even anxiety.

3. Why alienation, depression or apathy can become the dominant experiences of a person's life.

This broad scope of human experiences means that the model cannot be tested through its entire operational range in a single preliminary study. Firstly, because placing people deliberately in situations that may make them feel depressed or alienated would be entirely unethical. Also, Flow theory is supposed to be able to align people with appropriate levels of challenge and stress; or, as Selye (1974) describes it in terms of eustress being stress without distress. Therefore, the model will be tested by aligning participants with a specific challenge and then exploring the positive limits of their capabilities in relation to different degrees of challenge.

Purpose

The preliminarily investigation will test the new synthesised model through a specific range of human experience as indicated in Figure 2. This is achieved by testing three propositions (see Aims section 3.0.). The first proposition is derived from three of the major findings of the literature review, gauged against the model, to see if the model both depicts and corroborates the following conditional positions:

A. If the Flow experience occurs when capability exceed challenge.

B. If Flow ensues with medium or low levels of arousal.

C. If Flow exists as a Trait with compatible feeling States.

Propositions 2 and 3 identify and test the thresholds between:

I. The Trait of Flow and the Trait of Misuse.

II. The Trait of Flow and the Trait of Disuse.

Overlaying the Range of Challenge on Subjective Experience

Testing the model through this range of human experience means that the investigation is not straying into the unethical areas of the Misuse and Disuse traits; so, it is ethical by its very nature and it actively seeks to positively align the study participants with levels challenge appropriate to their personal levels of capability (see section 9).

Propositional Aims

The model's efficacy will be gauged by testing the following propositions aligned with the purpose of the protocol:

Proposition A
If challenge is 1-2 degrees less than the elected median challenge level or 1-2 degrees more than elected median challenge level, a person will experience positive psychological states of relaxation, control, Flow or arousal. The Trait of Flow will ensue.

First proposition tests the range of experience encompassed in the Trait of Flow. Corroborating the findings: the Flow experience occurs when capability exceed challenge; and, Flow can ensue with medium or low levels of arousal (Engeser and Rheinberg 2008; Fullagar et al. 2013; Peifer et al. 2014; Xanthopoulou 2017; Xanthopoulou et al. 2012).

Proposition B
If challenge is consistently 2-3 degrees above a person's highest elected median challenge level, the person will report feeling states analogous to anxiety, worry, and apathy. The Trait of Misuse would ensue.

Second proposition tests for and identifies the existence of the subjective threshold between the Traits of Flow and Misuse.

Proposition C
If challenge is consistently 2-3 degrees below a person's lowest elected median challenge level, the person will report feeling states analogous to boredom, apathy, and even worry. The Trait of Disuse would ensue.

Third proposition tests for and identifies the existence of the subjective threshold between the Traits of Flow and Disuse.

Study Objectives

To test the propositions above, the study is split into two coordinated sections:

1. An elicitation study to map the way a participant construes a specific challenge environment.

2. A structured challenge activity under controlled experimental conditions. Where the participant will reflect on their experience using their construct landscape while they engage in the activity.

Each study participant will pass once through each section.

It is important to note that when the participants are in the controlled experimental portion of the study, they will pass through each of the propositions three times (see Aims section above). Meaning that each participant will engage in nine challenges. Where the cycle will be:

1. Participant chooses their personal median challenge level.

2. The participant will then complete 3 different challenges at their chosen median challenge level. In accordance with proposition 1 (first pass).

3. The level of challenge will then be increased in line with proposition 2.

4. The participant will then complete 3 different challenges at this new challenge level (second pass).

5. Challenge level with then be decreased in line with proposition 3.

6. The participant will then complete 3 different challenges at this new challenge level (third pass)

Experimental Variables

The equation below describes the functionality of the model in figure 1. In words, the equation states: a person's subjective experience is a function (*f*) of their

personal capabilities in relation to the level of challenge they experience. The equation represents the experimental variables that will be varied and observed in the structured challenge activity explained in section 5.2 and described in section 8.2.

$$Subjective\ experience\ is\ a\ f\ (Capability, Challenge)$$

Dependant Variable

The dependant variable for the study is the subjective experience of the research participant. Specifically, the way the participants felt experience of themselves fluctuates relative to level of challenge, whereby the individual expresses and situates their felt appreciation of themselves in the challenge environment.

Independant Variable

The independent variable for this experiment is the degree of challenge that each participant experiences. This variable is controlled by the researcher so that the full functionality of the model can be tested with each participant. As challenge is deliberately varied through a range of difficulty subjective experience is assessed from the way the participant construes challenge in relation to their perceived capabilities.

Methods

Two coordinated methods are used in this study. The first method is construct elicitation (Kelly 1955). The rationale for using construct elicitation as opposed to using more traditional methods such as interviews, resides in the very idiosyncratic way people construe the world. Construct elicitation has been chosen, because as Xanthopoulou (2017:50) states it is important to "understand the within-person dynamics of the phenomenon". The second method is, the scientific method (Popper 1959). These two methods are used to gather the data necessary to test the efficacy of the new Flow model.

Basically, construct elicitation is used to faithfully reproduce a landscape of the subjective experience of an individual's experience of challenge (study objective

1). Once the landscape has been created, the participant is then asked to engage in the activity around which the landscape was created with the construct elicitation method (study objective 2). While the participant is engaging in the activity they are asked about their experience of the specific challenge. This is referred to by Schön (2016) as reflection in action. As the participant reflects on their experience in the moment, that experience is then mapped directly onto their personal construct landscape (described in detail below).

Construct Elicitation Method (method 1)

Construct elicitation is a recognised method taken from personal construct theory (PCT) (see Burr, King and Butt, 2014; Kelly, 1955). Kelly argued that each person creates for themselves a construct system through which they perceive the world. It is the idiosyncratic biases generated by our construct system (involving concepts such as unsure/relaxed or boring/difficult) that each individual uses to interpret their experiences. It is important to note here that construct systems are not necessarily made up of concepts that are semantic opposites. PCP methods are designed to enable people to articulate faithfully and to express clearly and explicitly the meaning of their personal experience in the form of what can be described as a landscape.

In personal correspondence, Professor Burr (2017) states "There are as many grid methods as PCP researchers, so it's not really about 'finding' the right method in a publication - you would need to adapt the general method for your own purposes". Therefore, the method described below is developed from a standardised construct elicitation method.

This adapted method is derived from Burr and King (2017). The participant is asked to think about themselves in the context of doing an activity they are familiar with, typically in ten-to-twelve specific situations (the actual number is not important - it can be more it can be less). The situations should include different aspects of the overall activity; including aspects that the individual feels are both positive or negative. No situation of the activity should be considered inappropriate or wrong. These experiences should cover a range of situations

varying in levels of seriousness and enjoyment that the participant feels are important for them and are specific to the task.

Each of these situations are then compared and for similarity and difference. Facilitating the development of a unique construct landscape. The landscape is a representation of how the participant construes a particular situation or event. By understanding the dimensionality of a person's construct landscape, it is possible to develop an appreciation of how people navigate and make sense of their experiences.

Structured Activity Interview (method 2)

Burr and King (2017) would now use the construct landscape as a way of structuring an interview for the participant. The adaptation applied to this part of the coordinated methods for this elicitation study is to carry out an active interview with the participant. Meaning that the participant actively engages in the activity whilst they are questioned about their specific experience.

The participant is asked by the researcher to elect / self-select their personal median challenge level. This level will be their personal preference for what they themselves feel is an optimal level to start the activity. The median challenge level will then act as a personal reference point for the participant from which the experiment is calibrated. The participants challenge level will then be varied by the researcher where the difficulty of the activity change in line with the propositions set out in the aims section of this protocol.

As the participant varies the activity difficulty / level of challenge they will be asked to reflect on their immediate experience for as Schön (2016:67) says "when someone reflects in action, he becomes a researcher in the practice context. He is not dependant on the categories of established theory and technique, but constructs a new theory of the unique case." The participants immediate experience of the challenge and that will be recorded on their construct landscape using their own words.

Activity

This protocol has been deliberately written so that any challenge activity could be adopted for the Structured Activity Interview. However, the specific activity chosen for this protocol is indoor rock climbing. The rational for choosing climbing as an activity is manifold:

1. Climbing has been used as an activity to study Flow since the earliest research was conducted on Flow (see Csikszentmihalyi, 1975, 2014; Fave, Bassi and Massimini, 2003)

2. Climbing provides a challenge with an objectively measurable challenge level that is infinitely variable (see BMC, 2004).

3. The objective challenge measure for climbing is essentially a peer reviewed process.

4. Climbing has a professional governing body (known in the UK as the British Mountaineering Council, BMC).

5. Professional climbers and climbing qualifications enhance the safety of climbing as the focus for a study of a challenge activity.

6. Indoor climbing centres provide a stable environment with rigorous health and safety procedures built into the environment and the activity.

7. The controlled environment of an indoor climbing centre mitigates many of the control variable issues associated with a more natural outdoor venue to conduct a climbing study.

8. The principal researcher has extensive experience of climbing. As recommended by Tracy (2010) and the importance of prolonged engagement as an evaluation strategy for any qualitative study.

Participant Selection

The study will use a group of preselected volunteers who are professional or semi-professional climbing instructors. These climbers will be selected from the climbing instructors who work at the Indoor Climbing wall that will be used to carry out the study.

This approach greatly reduces the health and safety concerns for this study as each climber is already responsible for the maintenance of the health and safety of the climbing wall.

This group has specifically been chosen due to the objective technicalities innate to any climbing challenge. Professional climbers mitigate these objective difficulties reducing any extraneous influences on the control variable. Professional climbers therefore limit the challenge to degree of climbing.

Furthermore, using climbers of this capability, any learning effect of climbing the various climbs during the experiment is rendered moot, as all participants would be well beyond this point. Also, while professional climbers are not immune, it is believed that professional climbers will not be as susceptible to extraneous influences that social conventions of climbing bring, such as image.

How the Study Will be Conducted

This section will describe in detail how the methods explained above will be used to test the experimental propositions. Each participant will have been given a consent form (see Appendix 1-2) and they will be asked if there were any problems or questions arising.

 Setting up the interview room

- Ensure that the room is quiet with a 'don't disturb' sign on the door

- Ensure all devices are switched off (or set to flight mode and silent).

- Ensure all resources for the interview are prepared

- Have timer set up and visible to enable time-stamped notations.

- Check/video audio recording

- Starting audio-recording by stating date, time, name of participant, name of researchers that are present, and project name, and that a timer for time stamp recording has commenced (confirming that it is visible to all present).

Method 1, Section 1: Construct Elicitation

<u>Preparation</u>

- On arrival, the participants are informed about the purpose of the study (as described in the participant information sheet, which is the first part of the consent form).

- The participant will then be read the participant introductory statement:

"Thank you for consenting to participate in this study. The study will be split into two sections. Each section is planned to last around 2 hours. In between the two sections a natural break will happen. However, should you wish for a break during either section, you may ask for a break at any time you feel is necessary. You are free to stop the study at any point without having to give a reason.

During the first section, we would like to discuss with you your past experiences of climbing in an indoor climbing centre. We would like you to think about these experiences in a certain way, and we will give you various instructions to help you with this. If at any time you feel that you did not understand the instructions, please, feel free to ask for clarification.

The first section is in no way an assessment of your capabilities or performance but is designed to help us develop an appreciation of your personal experience. Because of this there are no right or wrong answers.

The second section of the study will take place in the climbing centre. You will be asked to climb a series of climbs over a 2-hour period where the climbs will vary in level of challenge. The first 3 climbs will begin at a level you nominate to be your median climbing level. After each climb you will be asked to provide

feedback on your experience. Again, if at any point you need break or wish to stop the study you are free to do so, without explanation. This is not about how well you are able to climb, but your experience of the climbs that you do. Do you have any questions at this point?"

- The participant will then be asked to sign the informed consent form and complete a brief questionnaire to collect basic demographic information (in accordance with GDPR legislation).

Construct Elicitation

At the beginning of the session, the participant will be asked to think of approximately 10 situations that they have personally experienced when climbing indoors. These experiences should cover a range of situations varying in levels of seriousness and enjoyment. Each situation will then be written onto an index card. The cards will then be numbered.

Once this process is completed, the elicitation process will begin.

Instruction for the participant:

In this first section, I would like you to complete an exercise where you will be asked to compare and contrast the situations we have just written onto the cards. Firstly, I will choose three of those situations and place them in front of you. I would like you to select two of those situations, that you think are most similar in some way. I would then like you to tell me, in what way those two situations differ from the third one. Once we have completed that, I will then select a different set of three cards and I will ask you the same questions again. We will continue for a number of rounds until the combination of cards is exhausted. Do you have any questions before we begin?

Notes for researcher:

- If the participant finds it difficult to work with the triad, the researcher can remove one of the cards that the participant chooses. The participant will then be asked:

Please can you tell me how these cards are similar or how they differ

- When the participant mentions similarity between the two cards, the researcher will record the similarity. The researcher will then ask the follow up question:

What might the contrast be to that?

- It is vitally important for the researcher to the participants' own words, phrases and expressions. The researcher must refrain from rephrasing the participants' answers.

Table for Recording Elicitation

This grid will be printed on sheets of A3 paper and filled out by the researcher to provide a permanent record of the participants constructs (see appendix 4). This creates an idiosyncratic landscape of the way a specific participant construes challenge.
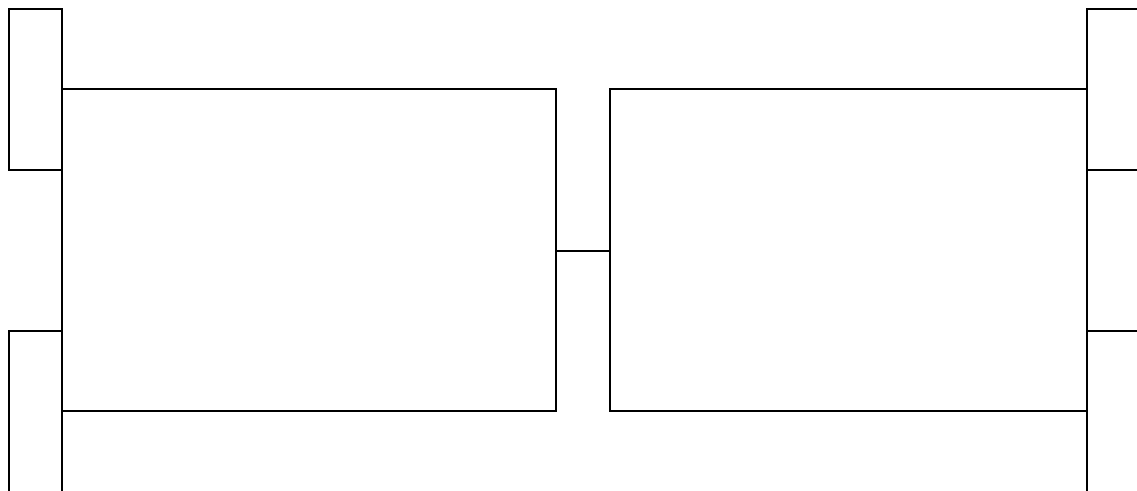
Construct preference

The participant is then asked to indicate their preferred pole for each of their constructs. The participants' explanation for choosing the preferred side forms a superordinate construct for the original construct. The researcher records the

preference for each construct and the elicited superordinate construct. The preferred side is also marked on the elicitation construed sheet.

Method 2, Section 2: Structured Activity Interview

After a natural break the investigation will move to the main climbing area. This section represents the quasi-experimental portion of the study. The climbing level (independent variable) will be varied, and the participants felt experience (dependant variable) will be recoded against their climbing construct landscape.

Preparation – for climbing

- The participant will now be appropriately equipped with harness, rock shoes and helmet (of their personal preference) and ready to climb.

- Video camera will be set up and recording

- Participant will be read the introductory Instructions for the climbing portion of the study

- Belayer will be similarly equipped (without the need for rock shoes) and have a lead climbing rope and Gri-gri.

In this second part of the study we would like to observe you whilst climbing different climbs at varying levels of challenge. Immediately after you complete each climb we would like you to describe your feelings of the climb and indicate where the climb might be located on your personal construct landscape. Please remember, if at any time you require a break or wish to stop the investigation please say so.

Round 1 (Proposition 1)

The participant will self-select their personal median climbing level. This will be the level that the participant most frequently climbs at. This is **NOT** the maximum climbing grade at which the participant is capable of achieving.

The participant will be asked:

In this first round you will be asked to climb three different climbs. Each climb will be within your moderate/middle climbing level. The climbs may vary within 1 to 2 levels as you feel most comfortable with. Please can you select the first climb that you wish to complete. Making sure that it is with your moderate/middle climbing level.

The participant will then climb the first climb. Once the climb is completed, the participant will be asked:

Please can you indicate on your landscape how that climb made you feel. If you do not feel that the landscape adequately represents how you felt, please can you explain why?

This process will then be repeated for the flowing two climbs. Remembering to record the difficulty of the climb as it corresponds to the felt appreciation of the participant.

Round 2 (Proposition 2)

In this round of climbs. The climbing challenge level will increase in accordance with proposition 2. Specifically, and importantly, 2-3 levels of difficulty above the most challenging level the participant previously completed in round 1. Ensuring that one of the climbs must be at least 3 levels of difficulty above the hardest climb completed in round 1.

The participant will then be asked:

Please can you choose a climb that is 2-3 levels of difficulty above the most challenging climb you have just completed.

The participant will then climb the first climb. Once the climb is completed, the participant will be asked:

Please can you indicate on your landscape how that climb made you feel. If you do not feel that the landscape adequately represents how you felt, please can you explain why?

This process will then be repeated for the flowing two climbs. Remembering to record the difficulty of the climb as it corresponds to the felt appreciation of the participant.

Round 3 (Proposition 3)

In this round of climbs. The climbing challenge level will now decrease in accordance with proposition 3. Specifically, and importantly, 2-3 levels of difficulty below the least challenging level the participant previously completed in round 1. Ensuring that one of the climbs must be at least 3 levels of difficulty below the easiest climb complete in round 1.

The participant will then be asked:

Please can you choose a climb that is 2-3 levels of difficulty below the least challenging climb you completed in round 1.

The participant will then climb the first climb in this 3rd round. Once the climb is completed, the participant will be asked:

Please can you indicate on your landscape how that climb made you feel. If you do not feel that the landscape adequately represents how you felt, please can you explain why?

This process will then be repeated for the flowing two climbs. Remembering to record the difficulty of the climb as it corresponds to the felt appreciation of the participant.

Participant Debrief

Once the climbing is completed. The participant and researchers will retire to the interview room to debrief from the study. The participant will be read a closing statement:

Please may we thank you for your time insight and effort in supporting this research project. Without your support this project would not be possible. May we ask you three final questions – do you have any feedback for the research team pertaining to:

1. *The fidelity of your construct landscape?*

2. *Do you feel it captures your experience of climbing indoors?*

3. *Do you have any suggestions as to how we might improve this research project for future participants?*

Again, thank you for your time, patience and efforts it is greatly appreciated.

Participant responses are appropriately recorded with their construct index cards and construct landscape

Ethical Considerations

Before conducting any study that investigates how people experience challenge, it is imperative to carefully define what is meant by challenge and what this involves for the individuals who participate in the experiment.

Challenge can be considered as a person's subjective experience of non-specific demand. We are alerted to the difficulties of studying individuals' subjective experience of challenge, because pressure can be thought of as a special case of non-specific demand. Where the negative associations of challenge with pressure are known to adversely affect people's physical and psychological well-being.

Moreover, the concept of pressure has become ubiquitous in people's every day experiences. The word pressure has come to be used by people to describe a particular type of negative experience and is used by social scientists to explain those experiences.

What researchers have identified in these explanations of pressure, is that pressure has two key features (see Sapolsky, 2004):

3. Pressure is subjective.

4. (Consequently) pressure cannot be studied in isolation of context.

The subjective nature of pressure, and its inextricability from context, highlight a boundary between challenge and pressure that is both subjective and context-specific. Creating difficulties for the study of challenge that are methodological, experimental and most importantly ethical.

These difficulties can be addressed with the help of a distinction between stress and pressure made by Weisinger and Pawliw-Fry (2015), explained below.

Several authors have identified the positive effects of stress. Hans Selye, Arron Antonovsky, Nassim Taleb and Mihaly Csikszentmihalyi have all developed terms to describe beneficial aspects of stress. Selye (1974) in his work 'Stress without Distress' (di-stress) coined the word eustress, literally meaning good-stress. Antonovsky (Mittelmark et al. 2016) in his research developed the word salutogenesis meaning the origin of health. Salutogenesis is concerned with the positive relationship between stress and health. As opposed to pathogenesis that studies the causes of diseases (dis-ease). Taleb (2014) used the word "antifragile" to describe the result that occurs when things benefit from the non-specific demands (stress) made upon them. Csikszentmihalyi (1990; 1975, 1988) used the word "Flow" to describe those moments when a person benefits from the stress that ensues from the harmonious relationship between the persons capabilities and the challenges they face.

These authors have identified an important characteristic of stress as a product of non-specific challenge that Weisinger and Pawliw-Fry (2015) have distinguished from pressure. This distinction can be characterised in the following way:

1. Stress is experienced when we perceive multiple different approaches to challenge.

2. Pressure on the other hand is experienced when challenge is characterised by a single, critical (make-or-break) course-of-action.

Here we see that Weisinger and Pawliw-Fry provide an explicit boundary between stress and pressure: a person under stress becomes 'pressured' when their options and alternatives are reduced to a single make-or-break course of action.

Thus, research into individuals' subjective experiences of challenge can be measurably confined to the realms of 'stress without distress' (variously called eustress, salutogenesis, or 'stress as opposed to pressure', Flow). This can be done by ensuring that a wide range of resources are available to participants with which to address the challenges built into the design of the protocol. As the range of resources available to participants in this research has no effect on the variables under study, it is possible to guarantee that participants will not cross from 'stress' (without distress) into 'pressure'.

In fact, given that the purpose of this research is (in short) to develop a means of keeping people in a subjectively optimal relationship with challenge, the protocol design benefits from providing as wide range of resources as possible. It is for this very reason that the activities used in this research were chosen.

Smith (2007) provides us with a mathematical means of differentiating stress from pressure and for illustrating why Weisinger and Pawliw-Fry's distinction is significant to the ethics of pressure-research:

$$Capability = (means) \bullet (ways^2) \bullet (3 \times will).$$

Smith's equation captures the behaviour or dynamics of the relationship between stress and pressure that Weisinger and Pawliw-Fry (2015) predicate on the availability of options and alternatives or 'ways'.

Under stress, the square function 'ways' may be set to any number equal to or higher than 2. Within the context of the elicitation study, it is envisaged that people would tend to have 'ways' of approaching their challenge, characterized by their alternatives and options for choice at any particular time. Under pressure, however, the square function 'ways' may be limited to 1 (the critical make-or-break course of action mentioned above). Thus, pressure effectively can

eliminate what Smith deems to be the most powerful element of capability: the square function that he calls 'ways'.

A.1 Appendix Participant Information Sheet

You are being invited to take part in a research study. Before deciding to participate it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information. Feel free to discuss issues with either myself or Lorraine Dodd (contact details below), and if there is anything which is not clear or any questions you have, feel free to ask. Please, take your time reading, and don't feel rushed.

What is the research about?

This study is designed to explore how varying degrees of challenge effect a person's felt appreciation of themselves and their capability when experiencing a climbing challenge. Specifically, how the ease or difficulty of a rock climb affects a climber's subjective felt experience of the climb and the implications that this holds for the experience of the climber before during and after the climb.

Who is doing the research?

My name is Tim Forsyth, I am a Doctoral Researcher studying for a PhD at Cranfield University, supervised by Lorraine Dodd.

My contact details are:

Tim Forsyth

07830 149 080

t.a.forsyth@cranfield.ac.uk

Supervisor:

Lorraine Dodd

Tel: +44 (0) 1793 785274

email: l.dodd@cranfield.ac.uk

Please feel free to contact myself or Lorraine at any time if you have any questions regarding this research project, or to arrange a meeting about further questions, or if you wish to participate, or meet me before deciding whether you are willing to participate.

Why choose to participate?

This research depends on gaining an in-depth understanding of your subjective experience of challenge. As research to date has not focused on the qualitative subjective experience of individuals when experiencing varying degrees of challenge.

Participation is voluntary, as this study is intended to draw relevant information from willing individuals who feel that their experience is important and relevant. The premise of data-collection for this study is: your experiences are inherently valuable and meaningful, because your subjective experience situates you in a unique position and any movement away from this unique position corrupts any understanding of your experiences. Apart from a broad focus on challenge, you are invited to guide the discussion to anything that you believe is important.

Therefore, the methods utilised in this study are intended to preserve your unique perspective with the intention of guiding future researchers, policy makers and managers to more appropriate models and methods for appreciating the subjective experience of individuals when experiencing varying degrees of challenge.

What will participation involve?

Participation will essentially be split into three parts:

1. A structured interview lasting approximately 2 hours. This interview will attempt to develop a landscape of how you perceive the challenges of climbing in an indoor climbing centre.

2. A climbing session of 2 hours will then be conducted where you will carry out a series of rock climbs of varying difficulty. During and after each climb you will be asked questions about your experience. These questions will be derived from the information you provided in the interview.

3. Post climbing session there will be time allocated for your reflection on the experience as whole with the intention of capturing your felt experience of the of the interview and climbing activity.

This split between activities is intended to strike a balance between the value of your time, and the amount of time necessary to gain an appreciation of the information you provide. You are of course not being asked to commit more time than you can spare, neither will you be cut off if what if what you wish to say or do extends past the allotted time. The framework is very flexible and if you have time constraints any time you are able to spare is valuable to the study.

What about confidentiality?

The nature of data-collection for this research is to focus on, and only on, what you as a participant feel is important to share. So, all efforts to shape the data so that it accurately portrays your views are in fact welcome, and beneficial to the analytical stage of the research.

- Under the UK Data Protection Act, and the GDPR rules, you have a right to access any information held by Cranfield University relating to your participation in the exercise.

- I will require no explanation or justification for requests to omit or delete any information that you contribute to this study at any time.

- Interviews will be recorded only if permission is given in advance. Recordings may be stopped or erased during, or after the interviews if you are uncomfortable with their content in retrospect.

- No data will be stored on cloud servers, or insecure devices.

  - All data will be anonymised at the end of each session maintaining participant privacy.

  - You will have the opportunity to vet all the information that becomes part of the final study. As mentioned above, it is important to the appreciation and analysis of this data that it be freely and willingly shared.

  - You are free to leave the study at any time without need of explanation.

What about beliefs and values?

Preservation of participant integrity, identity, gender, values, beliefs, privacy, ethnicity and culture stands above any goals or objectives set forth in this proposal. For these reasons, participants are considered researchers within the study to maintain equality within the study. Participants are actively encouraged to contribute thoughts, feelings and insights to the study.

If you are willing to participate, then please sign a Consent Form.

You can keep this Information Sheet for your records.

A.2 Appendix Informed Consent

Project: Flow**:** The benefits of aligning capabilities with challenges

Researcher:

Tim Forsyth

Tel: 07830 149 080

email: t.a.forsyth@cranfield.ac.uk

Supervisor:

Lorraine Dodd

Tel: +44 (0) 1793 785274

email: l.dodd@cranfield.ac.uk

To be completed by the Research Participant

Please answer each of the following questions:

Do you feel you have been given sufficient information about the research to enable you to decide whether or not to participate in the research?	**Yes**	**No**
Have you had an opportunity to ask questions about the research?	**Yes**	**No**
Do you understand that your participation is voluntary, and that you are free to withdraw at any time, without giving a reason, and without penalty?	**Yes**	**No**
Are you willing to take part in the research?	**Yes**	**No**
Are you aware that the interview will be audio/video recorded?	**Yes**	**No**

Will you allow the research team to use anonymised quotes in presentations and publications?	**Yes**	**No**
Will you allow the anonymised data to be archived, to enable secondary analysis and training future researchers?	**Yes**	**No**

Participants Name: _____

Participant's Signature: _____   **Date:** _____

A.3 Appendix Personal Information

Name:	
Title:	
Age:	Under 25: ☐ 25-29: ☐ 30-34: ☐ 35-39: ☐ 40-44: ☐ 45-49: ☐ 50-54: ☐ 55-59: ☐ 60-64: ☐ Over 65: ☐
Gender:	Male: ☐ Female: ☐
Nationality:	

Climbing Qualifications

Highest Level of Qualification Achieved:	
Title of Qualification:	
Date Obtained:	
Other Relevant Qualifications:	

Climbing Work Experience

Current Job Title:	
Branch:	
Level of Job (e.g. Management, team leader, team member)	
Years of Experience in this Position	
Years Relevant Experience in this Field	
Brief Description of Current Role and Responsibilities:	
Other Relevant Experience (experimental, training and/or practical / operational)**:**	

A.4 Appendix Construct Landscape Grid

Participant Code: _____
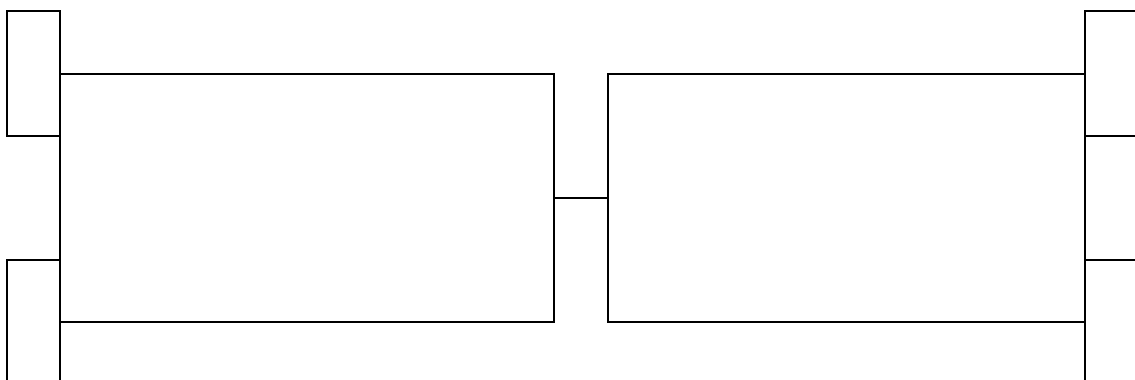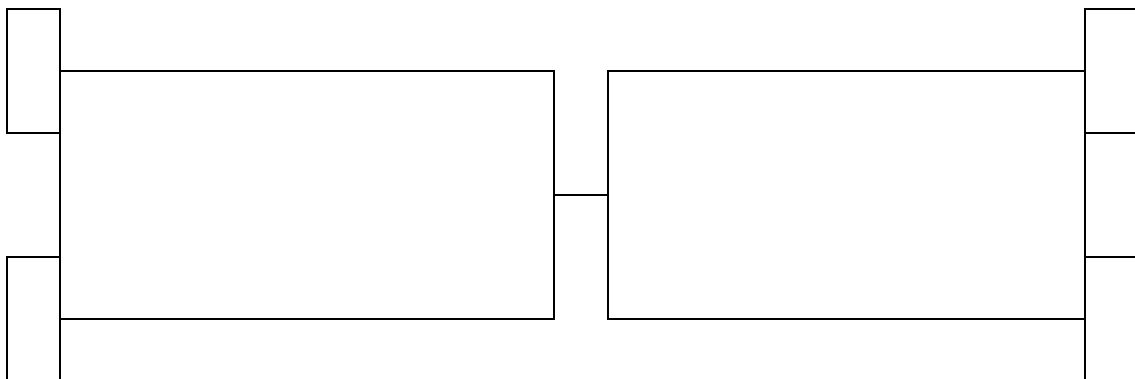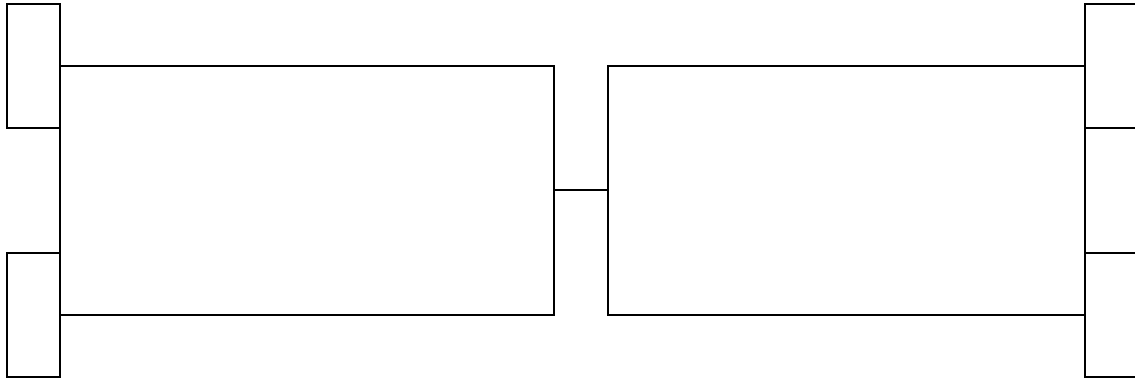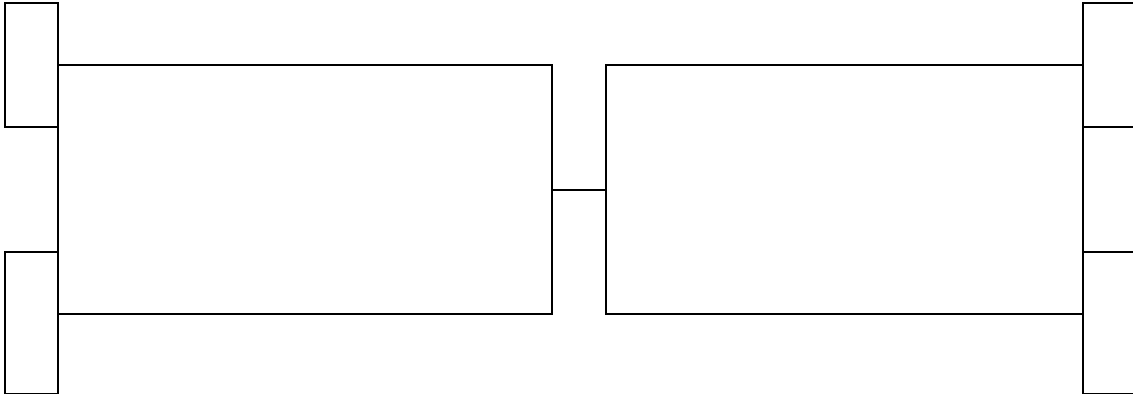
A.5 Permission to Commence Research

Dear Tim

Reference: CURES/6192/2018
Title: Aligning an Individuals Personal Capabilities with Challenge

Thank you for your application to the Cranfield University Research Ethics System (CURES).

Your proposed research activity has been confirmed as Level 2b risk in terms of research ethics. You may now proceed with the research activities you have sought approval for.

Please remember that CURES occasionally conducts audits of projects. We may therefore contact you during or following execution of your fieldwork. Guidance on good practice is available on the research ethics intranet pages.

If you have any queries, please contact cures-support@cranfield.ac.uk

We wish you every success with your project.

Regards

CURES Team

A.6 Data Management Plan

The Boundaries of Flow: an empirical investigation of the relationship between subjective experience, capabilities and challenge.

Data Collection

What data will you collect or create?

The research projects will comprise three case studies, where each case study will engage in a research protocol. The research protocol includes a construct elicitation interview and an experiment was the study participants engage in a range of 9 climbs at varying levels of challenge. Therefore, the project multiple threads of data:

1. Demographic information.
2. Audio interview data (construct elicitation method).
3. Including handwritten notes.
4. Video recordings of study participants observable actions and behaviours as they engage in a challenging activity (indoor climbing).
5. Including handwritten notes.

The video is recorded in 1920 x 1080 MPEG4 and 15Gb. The audio is recorded in standard audio format WAV and is 400Mb. Therefore, the total size of the data storage required for the three case study is 46.5 Gb. This data set is novel due to the methodological design strategy developed to create the data set.

How will the data be collected or created?

This data set was generated from a novel research protocol that combined experimental and phenomenological methodologies. This research was not funded, and all the study participants gave their time freely. No remuneration was provided in any way.

The files will be labelled:

- casestudy_one_climbing
- casestudy_one_construct_elicitation

All the files will follow this format. There will be no versions of this data as the data is in its raw format.

Documentation and Metadata

What documentation and metadata will accompany the data?

The data will be accompanied by an outline protocol facilitating anyone who wants to use this data to understand how the climbing challenge was the experimental independent variable. The participant's actions, behaviours, and self-reflections were the unit of observation. The metadata for each of the study participants is presented in a standard format but will be anonymised.

Ethics and Legal Compliance

How will you manage any ethical issues?

Before conducting this research project, a complete research protocol was written and presented to the Cranfield University Research Ethics System (CURES).

Reference: CURES/6192/2018

Title: Aligning an Individuals Personal Capabilities with Challenge

The proposed research activity has was confirmed as Level 2b risk in terms of research ethics. This provided permission to proceed with the research activities covered in the research protocol.

How will you manage copyright and Intellectual Property Rights (IPR) issues?

The data is owned by the principal research and Cranfield University. The data sharing will be postponed until publication of the research.

Storage and Backup

How will the data be stored and backed up during the research?

The data will be stored inline with Cranfield University data management policy. Additionally, each of the case studies data is also stored on labelled individual memory cards.

How will you manage access and security?

Any risks to data security are mitigated in two ways 1) the primary source of data storage will be at Cranfield Universities data storage facility; and 2) the data IS NOT stored on any other device or storage platform such as iCloud. Access to the data prior to publication is limited to the supervisory team associated to this research project and named in this data management plan:
- Jeremy Hilton
- Dr Lorraine Dodd
- Dr Annamaria Witheridge

Selection and Preservation

Which data are of long-term value and should be retained, shared, and/or preserved?

This data is constrained by any contractual obligations beyond the General Data Protection Regulation for any personal information. However, this research data contains no personal data inline with the ethical risk associated with a project. This data provides a way of investigating and identifying the relationship between subjective experience, capabilities and challenge. To identify when stress turns to pressure producing unacceptable levels of work-related stress, depression and anxiety. This data will be retained in line with Cranfield University data management policy and will remain available for a period of ten years.

Data Sharing

How will you share the data?

The data will be available to others when this research is published. The data will be accessible through the Cranfield University research data repository. Links to access the data will be provided with the published research paper.

Responsibilities and Resources

Who will be responsible for data management?

Responsibility for implementing the data management plan will reside with the principal researcher – Tim Forsyth. Moreover, this data is not subject to any consortium or contractual agreement.

What resources will you require to deliver your plan?

There is no specialist expertise required to help manage this data beyond that which has already been stated.

Appendix B Descriptions of States

It is important to note: Delle Fava, Massimini and Bassi state, arousal, control, boredom and worry "have not been as extensively studied as the four major channels" (2011:74).

Arousal (ch1)	
Reference	Description
(Massimini and Carli 1988:273)	"Characterised by cognitive involvement, activity, excitement and satisfaction."
(Delle-Fave et al. 2011:74)	"… present the best experiential profile after optimal experience (Channel 2) […] high cognitive investment, involvement, and goals in the face of a discrepancy between above-average challenge and around-average skills."
(Peifer et al. 2014:63)	"from a physiological perspective – flow-experience to occur between high arousal (characteristic for anxiety) and low arousal (characteristic for boredom)."
(Easterbrook 1959:183)	"… arousal acts consistently to reduces the range of cues that an organism uses, and that the reduction in the range of cue utilisation influences action in ways that are either organising or disorganising."

Flow (ch2)	
Reference	Description
(Massimini and Carli 1988:273)	"… brings together the positive extremes on almost every dimension of experience"
(Delle-Fave et al. 2011:74)	"… a state of high and effortless concentration, involvement, control of the situation, clear goals, intrinsic reward and positive affect"
(Csikszentmihalyi 1975:36)	"… experience is one of complete involvement of the actor with his activity. The activity presents constant challenges. There is no time to get bored or to worry […] the holistic sensation people feel when they act with total involvement […] no conscious intervention by the actor"

Control (ch3)	
Reference	Description
(Massimini and Carli 1988:273)	"… characterised by friendliness, relaxation and control"
(Delle-Fave et al. 2011:74)	"… presents the best experiential profile after optimal experience (Channel 2) […] corresponds to a pervasive experience of control and happiness in the face of around-average challenges and above average skills."
(Mullins et al. 2015:1073)	"… refers to (an individual's ability to) pursue and demonstrated their competency, superiority and mastery"

Relaxation (ch4)	
Reference	Description
(Massimini and Carli 1988:273)	"… control is still present, but concentration lapses and the experience seem to become more passive."
(Delle-Fave et al. 2011:74)	"… characterised by positive mood and intrinsic motivation, as well as low cognitive investment; it is primarily connected with energy restoration and low-challenging tasks"
(Pagnini et al. 2013:72)	"… relaxation as an opposition to stress, anxiety or tension. […] a state of decreased psycho-physiological arousal: a calming state."

Boredom (ch5)	
Reference	Description
(Massimini and Carli 1988:273)	"… already shows the apathy syndrome that become more pronounced in channel 6"
(Delle-Fave et al. 2011:75)	"… low levels of cognitive investment and a lack of goals"
(Goodstein 2005:1)	"… boredom isolates, individuates, even as it blurs the world grey." Experience without Qualities
(Koerth-Baker 2016:1)	"… a specific mental state that people find unpleasant — a lack of stimulation that leaves them craving relief."
(Koerth-Baker 2016:2)	"… boredom was about restlessness as much as apathy."

Apathy (ch6)	
Reference	Description
(Massimini and Carli 1988:273)	"… brings together all the negative poles"
(Delle-Fave et al. 2011:74)	"… characterised by psychic disorganisation, with low values of the cognitive, emotional, and motivational components of experience. High percentages of apathy in one's daily life can lead to potentially pathological outcomes"
(Delle Fave and Massimini 2005:265)	"… characterized by the perception of low challenges, lack of concentration and involvement, disengagement, and limited mobilization of individual resources"

Worry (ch7)	
Reference	Description
(Massimini and Carli 1988:273)	"… lesser extent (channel 6)."
(Delle-Fave et al. 2011:75)	"… low levels of control of a situation"
(Borkovec 2002:76)	1. "… difficulty controlling their worrisome process". 2. ". . . concerns the future, and this future-oriented thinking". 3. "… mental attempts to avoid, the many negative events that I think or that I imagine might happen". 4. "… detecting or interpreting threat in my environment all of the time". 5. "… facing problems posed by my worrying that are, however, largely insolvable". 6. "… situation that cannot be behaviorally avoided is to freeze".
(Borkovec 2002:77)	7. "… cognitive avoidance response to perceived threat prompted because of the non-availability of effective motor avoidance responses" 8. "… events conjured up by my worrisome thinking exist only in my mind",

Anxiety (ch8)	
Reference	Description
(Massimini and Carli 1988:273)	"… shows characteristics of stress: high concentration, high involvement, high stakes, but difficulty in concentrating, lack of control and feeling of anxiety."
(Delle-Fave et al. 2011:74)	"… individuals do not feel able to cope with the situation, and they repost high cognitive investment, negative affect, and often low intrinsic motivation"
(Eysenck et al. 2007:336)	"Anxiety is an aversive emotional and motivational state occur- ring in threatening circumstances".
(Borkovec 2002:78)	"… anxiety is always an anticipatory response to some possible future event".
(American Psychiatric Association 2013:222)	"… out of proportion to the actual likelihood or impact of the anticipated event". 1. "Restlessness or feeling keyed up or on edge". 2. "Being easily fatigued". 3. "Difficulty in concentrating or mind going blank". 4. "Irritability". 5. "Muscle tension".
(Power and Dalgleish 2016:177)	"a state in which the individual is unable to instigate a clear pattern of behaviour to remove or alter the event/object/interpretation that is threatening an existing goal".

Appendix C Participant Construct Elicitation

Construct 1:

1. Me when I'm being watched.	"Lots of people" "These are very negative". (An)	(About people. Link: trust)	"One person" (belayer). (Wo)	2. I'm <u>very</u> nervous when I'm being belayed.

"Number of people". "I go on very easy climbs" (to control situation). "This you can control". "I control these by grade".

"You & your friend". "Need your partner the most dangerous". "Most dangerous / difficult to deal with". "Nervous" (00:26:48).

3. Me when there is too much noise.	"These two both say to me that there are people there so there is more likely to be noise and being watched". "Being watched you are less likely to get hurt".

"With this being wrong you get hurt". "Might cause offence".

Construct 2:

6. Me when I trust my partner.	"People". (Re) "These are very positive […] slant (to construct 1)" (00:32:37).	"You can get this alone". (Fl)	4. Me when I'm enjoying the movement.

"Both about people – going out to be social".

"If you're in the groove" (00:33:07). "Zen like state" (00:33:50). "This is probably one of the main reasons people go climbing".

5. Me when I'm being social.	"Similar (to construct 1) – about people". "Trust".

NB Participant refers to this during the development of the cards as: "To get that flow" (00:05:38).

Construct 3:

8. Me when I'm enjoying the aesthetics of some walls.	"Pleasure & enjoyment" (00:36:39). (FI)	"This is a fear of failure" (00:38:01). (Wo)	7. Me when I'm afraid of failure.

"This is pleasure". "If it's quiet, in fact if it isn't, I don't go". (referring to Far Peak)

"Follows all of us around". "Fed up". "Fuck it".

9. Me when I'm on my ideal climb.	"You're more likely to find your ideal climb if you like the look of something, especially if it's set well".	"I wasn't afraid of the climb I was afraid of my fitness".

Construct 4:

8. Me when I'm enjoying the aesthetics of some walls.	"You get that nice moment". (FI)	(An)	1. Me when I'm being watched.

"Very unusual to get something artificial I like the look of".

"Uncomfortable at the least". And "Worst: get away". (makes an excuse to get away like going for coffee 00:40:20)

"Too much noise".

9. Me when I'm on my ideal climb.		"This in one of those horrible negatives that come up".

383

Construct 5:

| 1. Me when I'm being watched. | (An) | "All 3 cards are about people". | (Re) | 5. Me when I'm being social. |

"Two very negatives".

| 3. Me when there is too much noise. | | | "Pleasure, enjoyment". |

"Ooo, you're quite enjoying chatting a sitting around and drinking coffee"

(The participant described these as almost being contradictory (00:42:11), yet they produce a single construct)

Construct 6:

| 5. Me when I'm being social. | "Positive". (Co) | "This is an easy split". | (Ar?)
(Is this on the cusp of Flow trait and Misuse as opposed to just Flow?) | 7. Me when I'm afraid of failure. |

"Both these are pleasure".

"Uncomfortable. Negative".

| 9. Me when I'm on my ideal climb. | There is pleasure in social contact, well good social contact". | | . |

(Constructs 3 & 6 appear similar, but construct 6 is about people and construct 3 is about self?)

384

Construct 7:

4. Me when I'm enjoying the movement.	"You did it but you don't know how". (FI)	"Poor belaying". (Is this NOT control?)	2. I'm very nervous when I'm being belayed.

"Pleasure. That's almost why you climb. You make moves and go fuck how did I do that"?

"This is when you've finished a series of moves and you can't believe it".

'Negative and dangerous" (00:47:12).

9. Me when I'm on my ideal climb.	"These are about what's going on inside you when you're climbing" (00:46:49).

"I give people the statistics […] Most people don't know of the problems".

(participant again provided a detailed explanation of the dangers of belaying)

(Could the poles of construct 7 demonstrate the most dramatic contrast between poles?)

Construct 8:

1. Me when I'm being watched.	"Bravery". (An AND Ar?) "Its hardly an act of courage". (AND is this NOT Control)	"This is easy these are positive that's negative".	(FI)	4. Me when I'm enjoying the movement.

"You're unhappy. You want to go home.".

""Total happiness. This is why you climb".

7. Me when I'm afraid of failure.	"Bravery – saying to your mate I'm going home". "You're not always brave enough to say you want to go home" (00:51:38).

"This is probably, and you don't hear about it enough the hook for climbers" (00:53:28). "I've been climbing, why would you go again?" "Its like sex why would you do it again?"

385

Construct 9:

5. Me when I'm being social.	(Re)	(Wo AND An)	2. I'm <u>very</u> nervous when I'm being belayed.

"Both enjoyable".

"When these two come together it's perfect these two are why you climb indoors".

"Makes anybody feel uncomfortable".

| 8. Me when I'm enjoying the aesthetics of some walls. | "It's funny this is probably the most important one, how you engage with people" (00:56:41). (In relation to this construct)

"These two have to be together".

"When both of these are present". | "Going back to you don't want to fall out with people".

"Risk of falling out (with people)". |

Construct 10:

6. Me when I trust my partner.	"Trusting can put you on your ideal climb". (FI)	"Disturbing". (An)	3. Me when there is too much noise.

"Trusting + ideal climb: because they're positive".

"About being unhappy".

| 9. Me when I'm on my ideal climb. | "You can suddenly get your ideal climb because of your friend". | "One of the problems about climbing at Avon – road noise".

(Avon refers to Avon gorge in Bristol)

(3 + 9 does not equal ideal climb: 3 would spoil 9) |

Construct 11:

| 5. Me when I'm being social. | (Co) | (Ar AND An?) | 1. Me when I'm being watched. |

"State of mind, if you're happy you're more likely to find your ideal climb" (01:05:17).

"Takes you away from state of mind".

| 9. Me when I'm on my ideal climb. |

"Both pleasure".

(This appears to be a particularly distilled mix of social & personal)

Construct 12:

| 3. Me when there is too much noise. | (An) | (Re) | 5. Me when I'm being social. |

"I think noise contributes to failure".

Afraid of failure = notice noise".

"Good vibes".

| 7. Me when I'm afraid of failure. |

"These are really negative words". (Noise, failure)

"This is like treat people as you wish to be treated".

"Social high".

(Participant was unable to separate these three cards for construct 13 and considered them all positives and did not wish to discard any one of the cards)

387

Construct 13:

4. Me when I'm enjoying the movement.	"But this is our expectations". (FI)	"these are 3 positives; we've not had 3 positives".	(Is this NOT Control)
8. Me when I'm enjoying the aesthetics of some walls.	"A great day out when they all come together". "Sometimes you don't even know you want them".		"You're there because you absolutely have to be".
6. Me when I trust my partner.	"We don't talk about this, you don't say to your mate I hope you are going to keep my confidence today, are you going to belay correctly and I'm looking for the aesthetics of the wall and I'm looking for good movement. We don't talk about this" (01:10:36). (Unspoken expectations of a day climbing with friends)		(This contrast pole was a product of all three cards being similar. Because of this the participant was asked what they thought the contrast might be without a contrast card)

Construct 14:

6. Me when I trust my partner.	(FI) ← Trust	(An AND Wo) "This one you can keep putting under the heading – dangerous" (01:16:35).	2. I'm very nervous when I'm being belayed.
	"these are two of the reasons you hope to have when you climb".	"Last thing you want, even in Tesco's".	
8. Me when I'm enjoying the aesthetics of some walls.	← Aesthetics	(another explanation of demonstrating the dangers of belaying and the response of clients) "Fuck I didn't expect that (fall training)". (surprise & expectation?)	

Construct 15:

4. Me when I'm enjoying the movement.	(FI) ←Physical thing	(An AND Wo)	2. I'm <u>very</u> nervous when I'm being belayed.
	"One thing begets another".	"This negates both even though this is physical about your partner".	
6. Me when I trust my partner.	← Mental thing "This mental about your partner"	"This you won't enjoy the movement and you don't trust your partner".	

"One of those gets one of those, one of those doesn't get one of those, in fact one of those doesn't get either of these, that's a physical thing and that's a mental thing" (01:23:04).

Appendix D Experimental Analysis Sheet

Experimental Analysis (Applying Codebook)

Proposition A (the trait of Flow)

Note: Participant 1 began the experiment without a warmup causing him to become pumped (lactic acid build-up in the muscles) quite quickly. To help overcome Participant 1's pump, climbs 2/3 were swapped.

1. **Climb Description (5a):** This climb was deceptively steep (Slightly overhanging) – Video 1075

Time Index	Signs	Symptoms	Label
1:15		Normally I start off on something easier.	
1:17 to 4:18	Climbing smoothly with precision		Co (1-2)
3:27		Quite a good climb	
4:49	Rubbing forearms	Pumped, very different from what I've been doing.	Co (3)

2. **Climb Description (4c):** Off vertical with larger holds and ability to remain in balance on climb

Time Index	Signs	Symptoms	Label
8:39		Climbing indoors you get a steepness that you don't normally experience outside	
9:01 to 12:55	1. Climbing smoothly and easily with great accuracy and deliberateness of movements 2. Quite a lot of conversation while climbing		Co (4-6)
9:45		Good – quite a bit easier	Co (5)
9:57		Will probably fall off this one (said with irony at 4/5 meters)	
11:26	Pump starting to diminish		
12:58		These are quite nice climbs (while lowering off)	
14:27		A lot easier, pleasant, enjoyable	
14:42		It's one of the reasons you should climb indoors, it feels nice its good for the body	Co/Re (7)

3. **Climb Description (5b):** Doubled stepped overhangs at 1/3 and 2/3 height

Time Index	Signs	Symptoms	Label
17:22	Joking around making silly comments right before climbing	You're not here for the climbing, you're here for the sex	Re (8)

Video 11075 – new time index

Time Index	Signs	Symptoms	Label
0:04 to 0:35	Clarifying exactly what colour hold and features where allowed (while on climb)		
0:04 to 1:30	Climbing deliberately, dexterously and with precision		Co (9-11)
0:35	Looking up the climb to identify the exact line of climb location of holds etc		Co (10)
1:35	Needed to use a controlled dynamic body movement to reach hold over first roof		
3:10	Had difficulty in climbing through the second roof (Crux move)		Ar (12)
3:53	Greater effort applied but remaining in control		Ar (13)
4:27 to 4:53		A bit 'goey' (lowering off). I was trying – it was a workout	Ar (14)

Proposition B (approaching the border of misuse)

Note: Participant 1's pump had gone, and he was now properly warmed up.

4. **Climb Description (5c):** Very steep going through a big roof (15 meters)

Time Index	Signs	Symptoms	Label
11:06	Laughing and joking just before beginning to climb		Re (15)
11:16 to 14:41	Climbing very smoothly and accurately with control and dexterity	Absences of conversation	FI (16-17)
11:16 to 14:41	Completely focused – no conversation		
14:16		Laughs to himself after going through big roof	
15:29		Good quite enjoyable makes me breathless	
15:56		Good movement	FI (18)

5. **Climb Description (6a):** Left hand side of the competition wall (steep and unrelenting). Video 21075 – new time index

Time Index	Signs	Symptoms	Label
4:29 to 8:06	Movements are fluid and gymnastic by necessity and greater effort required highly focused on what needs to be done		Fl (19)
5:27	A great deal of strength required to clip in difficult position		Ar (20)
5:54	Moving with well with confidence and purpose.	This one's a first	Fl (21)
6:07		Keep me close	An (22)
8:06	Movements continue to be more gymnastic with a lot of strength and effort required to keep moving. Highly focused on what needs to be done		Ar (23)
8:07		Fucking hell I thought I was going to die – I'm fucking knackered (laughter)	Ar (24)
8:43		That's the best I've climbed all year, wish it was a bit longer	Fl (25)
9:47	After prodigious effort none of the signs of pump were present directly after completing the climb		

6. **Climb Description (6a+):** Vertical wall, difficulty came from a large number of the holds were sloping in key positions.
   Video 1076 – new time index

Time Index	Signs	Symptoms	Label
1:47	Before starting the climb, Participant 1 used any holds just to be able to make the first clip to reduce the risk so as to avoid an unnecessary ground fall, then lowered straight to the floor.		Wo AND Co[3] (26)
2:15	Dynamic climbing requiring larger steps and clipping with only 2 points of contact. Utilising a lot of strength and focus with little conversation.		Ar (27)
4:39		Grunt of effort to make move	Ar (28)
4:48	Trying to get into position to clip	Bollocks	An (29)
4:52		No holds for Participant 1 Penning	An/Ar (30)
5:27	Trying to get into position to clip grunting with effort		Ar (31)
5:45	Limited holds requiring a specific sequence of moves		Ar (32)
6:26		I wondered if I was going to give up – there is a move up there where you've got no holds	Co (33)

12:44		*This is the best days indoor climbing I've had this year*	Fl (trait)[4] (34)

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[3] Participant 1 was worried about the start of climb Num 6. However, he was able to explicitly identify the problem and was able to address the problem by enacting a specific strategy. Had Participant 1 not been able to apply the strategy he probably would have refused to attempt the climb. So, was there a simultaneous combination (AND function) of feeling states or did Participant 1 remain in a state of Control at the Beginning of the climb?

[4] This was said after Participant 1 completed the hardest climb but was talking about all of the climb's he had done that takes in a wide variety of climbing levels. This indicates the Trait of Flow.

393

Proposition C (approaching the border of disuse)

7. **Climb Description (4b):** Off vertical.

Time Index	Signs	Symptoms	Label
16:16 to 16:52	Climbing easily and smoothly while continuing conversation to about half height		Co (35)

Video 11076 – new time index

0:56		Its like going up the stairs (2/3 height)	Co/ (36)
1:10		It's like I'm cheating	
1:30		It's just comfortable	Co (37)

8. **Climb Description (4a):** Off vertical slabbey with larger holds.

Time Index	Signs	Symptoms	Label
5:34 to 8:10	Climbing and talking simultaneously and missing out hold he finds unnecessary		Re (38-43)
6:21	Turned sideways on climb standing on one foot having conversation looking down (3 meters)	Telling rude story about an old climbing friend	Re (39)
7:02	Keeps stopping looking down and talking (7 meters)		Re (40)
8:14	Pauses to concentrate on specific move		Co (41)
8:20	Resumes talking and climbing		Re (42)
10:41 to 11:29		It's climbing for the sake of climbing – Participant 1 then tells a story about being on the mountain rescue team and going out in horrendous weather just to climb (intrinsic motivation – autotelic activity)	Re (Flow trait)[5] (44-45)

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[5] This statement directly pertains to a Trait of Flow where the participant is intrinsically motivated to climb for no other reason than they love to climb (climbing is recognised as an autotelic activity). Participant 1 makes this statement directly after completing a climb where the difficulty of the climb is well below Participant 1's capability. The Literature on Flow theory now states that Flow can occur when individual capability exceeds challenge (Engeser and Rheinberg 2008; Fullagar et al. 2013). However, are these researchers confusing Flow state with Flow Trait? I need to identify the models of Flow that they were basing their research on.

9. **Climb Description (3c):** Slab climb with a large number of holds and features.

Time Index	Signs	Symptoms	Label
13:06	Participant 1 tries to do avoid doing a 3c climb and suggests we do another 4a		Avoiding Bo (46)
14:28	Being silly telling daft jokes		Re (47)
14:41 to 15:54	Climbing with minimal effort there was no urgency to any of Participant 1's movements no mater the position he was in on the climb		Re (48-49)
16:39	Fails to read climb correctly (7 meters) turns sideways for conversation to clarify what he should do (does not seem to be fully engaging with climb)	would rather be doing something harder	Cusp of Bo (50)

Video 21076 – new time index

0:15	Laughing and joking while climbing (10 meters)		Re (51)

Appendix E Thick Description

Participant 1:

Climb 1, Proposition 1 (P1): this climb is deceptively steep – slightly overhanging (5a, 12 meters).

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T1 to T2	climbing smoothly and with precision	1. Smoothness of actions. 2. Confidence of movement and decisions. 3. Able to climb and respond to questions.	quite a good climb	Positive descriptions of climb	**Control**
T3	rubbing forearms	—	pumped, very different from what I've been doing	Discussing the climb	**Control**

Action Opportunities (T1 to T2): systemically, this was the first climb that the participant undertook. It represented the participants median (middle climbing grade). Immediately before starting the climb, the participant said, "normally I start on something easier". Situationally, during the climb the participant maintained their focus and motivation reaching the top of the climb in approximately 181 seconds.

Manifest Level: between T1 to T2 the participant was observed to be – 'climbing smoothly and with precision' and during the climb described it as "quite a good climb".

Codable Moment: the observations correspond to signs of:
1. Smoothness of actions.
2. Confidence of movement and decisions
3. Able to climb and respond to questions.

In addition, the participants reported experience corresponds to the symptoms – positive descriptions of climb. This analysis places the participant in an affective state of Control.

Action Opportunities (T3): situationally, the participant had returned to the floor after completing the climb and untied from the rope. The participant was pumped (lactic acid buildup in forearms), this is a common experience for climbers at the beginning of a climbing session. Physically the participant was experiencing some discomfort in their forearms. This is a common occurrence for the participant. They had a clear memory of the climb they had just completed and why they were experiencing pump saying, "climbing indoors you get a steepness that you don't normally experience outside".

Manifest Level: the participant was observed to be 'rubbing forearms' and said "[I'm] pumped, very different from what I've been doing".

Codable Moment: the participants post climb reflections correspond to symptoms – discussing the climb. This analysis places the participant in an affective state of Control.

The participants post climb reflection provides supporting evidence in support of the analysis of T1 and T2.

Climb 2, Proposition 3 (P3): Off vertical, slightly slabbey, with the ability to stay in balance (4c, 12 meters).

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T4, T5 and T6	1. Climbing smoothly and easily with great accuracy, deliberateness and economy of movement. 2. Quite a lot of conversation while climbing	1. Smoothness of actions. 2. Confidence of movement and decisions. 3. Able to climb and respond to questions.	Good – quite a bit easier	1. Positive descriptions of climb. 2. Expressing positive emotion	**Control**
T7	—	—	It's one of the reasons you should climb indoors, it feels nice its good for the body	1. Comfortably responding to questions and elaboration on them. 2. Expressing positive emotion. Freely chatting. 3. Positive descriptions of climb.	**Relaxation/Control**

Action Opportunities (T4, T5 and T6): situationally, the participant was experiencing a flash pump. Therefore, it was decided to swap climb's 2 and 3 making the participants second climb a grade easier as opposed to a grade harder. The climb the participant chose was leaning back with a unique profile. The participant was able to utilise good technique in the form of balance to ascend the climb and only have to use his arms to essentially maintain position, conserve energy and recover from the flash pump.

Manifest Level: the participant was observed to be – 'climbing smoothly and easily with great accuracy, deliberateness and economy of movement'. Also, throughout the climb the participant was able to respond to questions about how they felt and how challenging they felt the climb was. The participant said, that the climb felt "good" and that it felt "quite a bit easier" than the first climb.

Codable Moment: the signs corresponded to the observable moments of:
1. Smoothness of actions.
2. Confidence of movement and decisions.
3. Able to climb and respond to questions.

In addition, the participants self-report corresponds to symptoms of:
1. Positive descriptions of climb.
2. Expressing positive emotion.

This analysis places the participant in an affective state of Control.

Action Opportunities (T7): Situationally, as the participant was lowering off the climb they said, "these are quite nice climbs". Indicating the positive mood of the participant and partially corroborating the analysis of T4, T5 and T6.

Manifest Level: the participant said, "it's one of the reasons you should climb indoors, it feels nice its good for the body".

Codable Moment: the participants report corresponds to:
1. Comfortably responding to questions and elaboration on them.
2. Expressing positive emotion.
3. Freely chatting.

4. Positive descriptions of climb.

Two of the points above come from the descriptions of Relaxation and 2 of these points come from the description of Control. Therefore, this analysis places the participant between the congruent affective state of Relaxation/Control.

The situation links with the participants value axis and the construct elicitation (positive pole construct 4). This construct pole is derived from 'enjoying the aesthetics of some walls' and 'being on an ideal climb', where the participant derives pleasure from the movement they get when these two things come together. Furthermore, the participant was able to lucidly remember and reflect on the climb they had just experienced

Climb 3, Proposition 2 (P2): double stepped overhangs at 1/3rd and 2/3rd's height (5b, 12 meters).

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T8	Joking around making silly comments right before climbing	1. Low cognitive investment. 2. Mild pleasure free from tension. 3. Energy restoration.	You're not here for the climbing, you're here for the sex	Joking	**Relaxation**
T9 to T11	Climbing deliberately and with precision	1. Confidence of movement. 2. Self-manage and regulate their attitudes and feelings towards a specific task and avoid undesired outcomes	—	—	**Control**
T10	Looking up the climb to identify the exact line of climb location of holds	Directing attention to where it is needed.	—	—	**Control**
T12	Had difficulty in climbing through the second roof (Crux move). Was having to concentrate.	1. Movement becomes stunted. 2. Identification of Problems 3. High cognitive investment	—	—	**Arousal**
T13	Greater effort applied but remaining in control	High levels of effort.	—	—	**Arousal**
T14	—	—	A bit 'goey' (lowering off). I was trying – it was a workout	1. Expressing great effort. 2. High cognitive and or physical investment.	**Arousal**

Action Opportunities (T8): situationally, the participant is on the ground and transitioning between climbs and trying to identify their 3rd climb. Systemically, while the participant was restricted to a specific challenge level, there is a good deal of choice of climbs spanning a wide variety of types of climb. The participant was able to utilise personal discretion in selection of climb. Allowing the participant to be drawn to their own personal preference of climb.

Manifest Level: the participant was observed to be very social and quite effervescent. They were, 'joking around making silly comments right before climbing', one of the comments the participant made at this time was, "You're not here for the climbing, you're here for the sex".

Codable Moment: the observations correlate to signs of:
1. Low cognitive investment.
2. Mild pleasure free from tension.
3. Energy restoration.

This analysis places the participant in an affective state of Relaxation.

This links to the participant's construct elicitation (positive pole construct 9) where they talk about being inspired by the "aesthetics" of a wall – how this can inspire them and when they are being social. The participant describes this pole as "probably the most important (construct)". They go on to say, "when these two come together it's perfect these two are why you climb indoors".

Action Opportunities (T9, T10 and T11): systemically, this particular climb comprising a double stepped overhang, coloured holds, inset holds and features. This made route identification tricky, because to stay in the prescribed grade it was important to realise that hands and feet could be used on all hold allocated to the climb. This difficulty was compounded further by 4 other routes set on the same wall using different coloured holds. The participant was again drawn to a steep overhanging climb. This means that the participant would need to utilise more strength in combination with agility in order to negotiate the double stepped overhangs.

Manifest Level: the participant was seen to be – climbing with dexterity and precision at T9 but paused after a few seconds to identify the line of the holds at T10. The participant then continued to climb to the first roof with the same dexterity and precision as before T11.

Codable Moment: these observations correlate with signs of:
1. confidence of movement.
2. Individual is able to achieve their preferred outcomes with the ability to self-manage and regulate their attitudes and feelings towards a specific task and avoid undesired outcomes. This is achieved by directing attention to where it is needed.

This analysis places the participant in an affective state of Control.

Action Opportunities (T12 and T13): situationally, for the participant to complete the climb it was necessary to climb through the two roofs and clip the rope in the appropriate places to maintain safety. The participant would need to stay focused, not only to defy gravity on an overhanging climb, but to stick to the route and not be tempted to stray onto an easier climb. There is a is an aspect of climbing that relates to personal integrity and not cheating.

Manifest Level: at time index T12 and T13 respectively the participant was seen to – 'had difficulty in climbing through the second roof (crux move)' after which 'greater effort applied to remain in control'. Prior to this the participant used 'controlled dynamic body movement to reach a hold over the first roof'.

Codable Moment: these observations corollate with the signs:
1. Movement becomes stunted.
2. Identification of Problems
3. High cognitive investment
4. High levels of effort

These signs place the participant in an affective state of Arousal.

Action Opportunities (T14): the participant was lowering off the climb and removing the quickdraws as he descended. The participant was lucid, reflective and able to provide a detailed assessment of how they experienced the climb.

Manifest Level: the participant said, "a bit goey. I was trying – it was a workout".

Codable Moment: the participants personal reflection of their experience correlates with:

1. Expressing great effort.
2. High cognitive and or physical investment.

This analysis places the participant in an affective state of Arousal. This personal reflection correlates with the analysis of time indexes T12 and T13.

Climb 4, Proposition 4 (P4): very steep going through big roof (5c, 15 meters).

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T15	Laughing and joking just before beginning to climb	1. Low cognitive investment. 2. Mild pleasure free from tension. 3. Energy restoration.	—	—	**Relaxation**
T16 – T17	1. Climbing very smoothly and accurately with control and dexterity 2. Completely focused – no conversation	1. Focus is complete. 2. No conversation. 3. Smoothness of movement.	Laughs to himself after going through big roof	Enjoyment.	**Flow**
T18	—	—	1. Good quite enjoyable makes me breathless 2. Good movement	Expressing enjoyment.	**Flow**

T15 appears to be a repeat of T8 (see T8 above).

Action Opportunities (T16 to T17): systemically, the participant was drawn to probably the most prominent feature of the climbing centre. A 15-meter wall with a large an imposing 1-meter overhang at approximately 11 meters. The wall is a profile wall made up of individually profiled panels comprising multiple coloured holds, inset holds and features. The wall leans over from the very beginning meaning that the wall is overhanging to the very top. Again, the participant was able to utilise personal discretion in selection of climb. Allowing the participant to

be drawn to their own personal preference of climb. Where a pattern is beginning to form – the participant appears to like steep climbs.

It is important to note that the lactic acid build-up (pump) had completely gone in the participants forearms and the participant was now properly warmed up.

Manifest Level: between time index T16 to T17 the participant was seen to be 'climbing smoothly and accurately with control and dexterity'. The participant was 'completely focused' and there was 'no conversation'. As the participant climbed over the big roof, they, 'laugh/giggle to them self'.

Codable Moment: the signs and symptoms correlate with:
1. Focus is complete.
2. No conversation.
3. Smoothness of movement.
4. Enjoyment.

This analysis places the participant in an affective feeling state of Flow.

Furthermore, this examination of the participants experience links to the participant's construct elicitation (positive pole construct 9) where they talk about being inspired by the "aesthetics" of a wall – how this can inspire them and when they are being prosocial. The participant describes this pole as "probably the most important (construct)". They go on to say, "when these two come together it's perfect these two are why you climb indoors".

Action Opportunities (T18): situationally, the participant was lowering off the climb and removing the quickdraws as he descended. The participant was lucid, reflective and able to provide a description of how they experienced the climb.

Manifest Level: the participant in their post climb reflection say's, "good quite enjoyable makes me breathless" and describes the climb as producing "good movement". Importantly, these reflections correlate with one of the participants constructs (see the positive pole of construct 13).

Codable Moment: the symptoms correlate with 'expressing enjoyment'. Therefore, the participant is coded as being in an affective felling state of Flow. The participants self-reports supports the analysis of TT16 to T17.

Climb 5, Proposition 5 (P5): left hand side of competition wall overhanging and unrelenting (6a, 12 meters).

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T19	Movements are fluid and gymnastic by necessity and greater effort required highly focused on what needs to be done	1. Focus is complete. 2. Limited or no conversation while climbing. 3. Fully absorbed in activity. 4. Smoothness of movement. 5. Innately knowing what needs to be done.			**Flow**
T20	A great deal of strength required to clip in difficult position	High levels of effort			**Arousal**
T21			This one's a first	1. Fully absorbed in activity. 2. Innately knowing what needs to be done.	**Flow**
T22			Keep me close	Identifying problematic situation	**Anxiety**
T23	Movements continue to be more gymnastic by with a lot of strength and effort required to keep moving. Highly focused on what needs to be done	High levels of effort			**Arousal**
T24			Fucking hell, I thought I was going to die – I'm fucking knackered (laughter)	Expressing great effort.	**Arousal**
T25			That's the best I've climbed all year, wish it was a bit longer	1. Deep sense of enjoyment. 2. A resonance between action opportunities and action capabilities. 3. A deep desire for the experience to of continued. 4. Feelings of energized focus.	**Flow**

Action Opportunities (T19): systemically, the competition wall is relentlessly steep/overhanging with multiple changes in angle. The wall is brightly coloured. The colours are utilised to great effect to accentuate the changes in angle and pitch that produce this wall. Consistent with the participant previous choice of

climb, this climb was very steep. This again aligns with the participants 9th construct.

Manifest Level: the participant was observed – 'movements are fluid and gymnastic by necessity and greater effort required highly focused on what needs to be done'.

Codable Moment: the observations correlate with:
1. Focus is complete.
2. Limited or no conversation while climbing.
3. Fully absorbed in activity.
4. Smoothness of movement.
5. Innately knowing what needs to be done.

The analysis places the participant as being in an affective state of Flow.

Action Opportunities (T20): situationally, the participant needed to make the second clip. This situation can be described as acute. Due to the nature and profile of the wall if the participant failed to clip the rope, they would be looking at quite an unpleasant fall with the potential of hitting the ground. The participant is well aware of the potential danger of the immediate situation due to their extensive experience. They have had complete autonomy over choice of climb.

Manifest Level: to make the clip the participant was seen to require – 'a great deal of strength required to clip in difficult position'.

Codable Moment: the observations align too – 'high levels of effort'. Therefore, the analysis places the participant as being in an affective state of Arousal.

Action Opportunities (T21): situationally, at 27 seconds after the participant made the clip at T20 and had continued to climb. The climb to this point was continuously steep and overhanging.

Manifest Level: the participant was seen to continue to – 'move well with confidence and purpose' and was heard to say to himself "this one's a first". This was said with some excitement.

<u>Codable Moment</u>: the observations and report correlates to signs of:
1. Fully absorbed in activity.
2. Innately knowing what needs to be done.

The self-report correlates to symptoms of: that expressed enjoyment and positivity.

Therefore, this analysis places the participant as being in an affective state of Flow.

Furthermore, this statement aligns with the participants construct 7 vis. "you make moves and go fuck how did I do that" and "you've finished a series of moves and can't believe it". The participant goes on to say these "are what's going on inside (intrasubjective) you when you're climbing". Construct 7 adds to our appreciation of the participants experience at T21 enabling the participant to be seen as being in Flow

<u>Action Opportunities (T22)</u>: situationally, the participant began the crux (hardest single move on the climb).

<u>Manifest Level</u>: the participant said with some urgency "Keep me close". Indicting the participant had identified a generalise danger as opposed to a specific threat, that was both acute and proximal. This statement was intended to alert the belayer to make sure that the was not too much excess rope (slack rope) in the system, because the participant felt there was a possibility of them taking a fall (excess rope means a long fall)

<u>Codable Moment</u>: the participants self-report correlates to signs of:
1. Identifying problematic situation (serious potential of taking a fall)
2. Micro focus on immediate problem.
3. Checking with belayer.

This analysis places the participant in an affective state of Anxiety.

In addition, this statement relates back to the participants climbing constructs and the participants card – "I'm very nervous when I'm being belayed". Every time this card occurred in the triad the participant associated it with:

1. "Makes anybody feel uncomfortable".
2. "Negative and dangerous".
3. "Most dangerous […] difficult to deal with – nervous".

This corroborates the participant experiencing an acute proximal moment of Anxiety.

Action Opportunities (T23): situationally, the participant is in the upper section of the climb. The climb continues to be steep and overhanging.

Manifest Level: the participant is seen to continue to be – 'gymnastic with a lot of strength and effort required to keep moving'.

Codable Moment: the observations corollate to signs of: 'High levels of effort'. This analysis places the participant in an affective state of Arousal.

Action Opportunities (T24): situationally, the participant reaches over the top of the climb having completed it in what might be described as good style. The only demand the participant is faced with is lowering back to the floor.

Manifest Level: immediately at this point the participant said, "fucking hell I thought I was going to die – I'm fucking knackered (and began laughing)". The participants voice conveyed exhilaration.

Codable Moment: the participants self-report correlates to symptom of: 'expressing great effort'. This analysis places the participant in an affective state of Arousal.

Action Opportunities (T25): situationally, the participant had reached the floor after completing the climb and was in the process of untying from the rope. At this point there are no specific demands place on the participant.

Manifest Level: the participant said with some excitement, "that's the best I've climbed all year (indoors), wish it was a bit longer".

Codable Moment: the participants statement aligns with symptoms of:
1. Deep sense of enjoyment.
2. A resonance between action opportunities and action capabilities.

3. A deep desire for the experience to of continued.
4. Feelings of energized focus.

Therefore, the participant in coded as experiencing an affective state of Flow.

Furthermore, the participants statement triangulates with what the participant described as the positive pole of construct 8: "total happiness – this is why you climb". The codebook and the participants climbing constructs coalesce to corroborate the analysis and coding of Flow at T25. Also, this examination of the participants experience links to the participant's construct elicitation (positive pole construct 9) where they talk about being inspired by the "aesthetics" of a wall – how this can inspire them and when they are being prosocial. The participant describes this pole as "probably the most important (construct)". They go on to say, "when these two come together it's perfect these two are why you climb indoors".

Climb 6, Proposition 6 (P6): vertical wall, difficulty came from a large number of slopping holds in key positions (6a+, 12 meters).

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T26	Before starting the climb, Participant 1 used any holds just to be able to make the first clip to reduce the risk so as to avoid an unnecessary ground fall, then lowered straight to the floor	1. Identification negative consequences of a specific threat. individual is able to 2. Achieve their preferred outcomes and regulate tasks and avoid undesired outcomes.			**Worry AND Control**
T27	Dynamic climbing requiring larger steps and clipping with only 2 points of contact. Utilising a lot of strength and focus with little conversation	1. High cognitive and or physical investment and involvement 2. Discrepancy between above-average challenges and around-average skill.			**Arousal**
T28			Grunt of effort to make move	Unable to communicate other that in single words – grunts of effort	**Arousal**
T29	Trying to get into position to clip	Physically struggling	Bollocks	1. Identifying problematic situation.. Expressing negative feelings	**Anxiety**
T30			No hold for … (participants name)	Identifying problematic situation.	**Anxiety/Arousal**
T31	Trying to get into position to clip grunting with effort	Unable to communicate other that in single words – grunts of effort.			**Arousal**
T32	Limited holds requiring a specific sequence of moves	High cognitive and or physical investment.			**Arousal**
T33			I wondered if I was going to give up – there is a move up there where you've got no holds	Discussing the climb.	**Control**
T34			*This is the best days indoor climbing I've had this year*	Intrinsically motivated and fully immersed in the task. Task focused not outcome focused. Expressing	**Flow (Trait)**

Action Opportunities (T26): Systemically, this climb represented objectively the greatest challenge that the participant had attempted as part of the protocol. Situationally, the participant identified a specific and acute threat in the initial section of the climb vis. the climb contained a very serious first clip (the potential of a ground fall with serious consequences – falling from at least 2.5 meters and

hitting the floor), representing a make or literal break situation. Situationally, the participant approached the threat with complete autonomy and discretion and did not feel any implied constraints from the protocol. The participant through their knowledge and experience had the means to understand the nature of the threat; the way's open to them to address the threat and the will to carry out their plan.

Manifest Level: the participants solution was to use any holds available to climb up to the first clip and clip the rope – greatly reducing the risk of a ground fall. The participant then lowered straight back to the ground. The participant utilised this tactic to maintain their own personal safety.

Codable Moment: this was coded as Worry AND Control. The rational supporting this unusual coding was:

1. The participant identified a specific threat that they felt was beyond their personal climbing capability. Aligning with a description of Worry arising from the specific identification negative consequences of a specific threat.

2. The participant was free to employ personal discretion in developing and enacting a tactic to radically mitigate against the perceived threat of a ground fall. This aligns with the description of Control vis. the individual is able to achieve their preferred outcomes and regulate tasks and avoid undesired outcomes.

Therefore, the participant at T26 is coded as Worry AND Control.

Action Opportunities (T27): systemically, the climb by its nature had a paucity of holds that were smaller, awkwardly positioned and dispersed. The analogy being: the climb acts as a lock, requiring the climber to perform a detailed sequence of moves to unlock the climb and reach the top. If the climber fails to follow the sequence or cannot complete one of the moves, they will fail to reach the top. Theoretically, the participant possessed the means, ways and will to complete the climb.

Manifest Level: the participant was observed to be – 'climbing dynamically requiring larger steps and often clipping in positions with only two points of contact. Utilising a lot of strength and focus with little conversation'.

Codable Moment: this correlates to:

1. High cognitive and or physical investment and involvement
2. Potential discrepancy between above-average challenges and around-average skill.

This analysis places the participant in an affective state of Arousal.

Action Opportunities (T28): situationally, the climb is becoming problematic. The participant appears to adopt a bottom-up, local and detailed processing style (Huntsinger and Ray 2016).

Manifest Level: the participant is observed to – "grunt" with effort to make difficult move.

Codable Moment: this observation corresponds to the participant being 'unable to communicate other that in single words – grunts of effort'. This analysis places the participant in an affective state of Arousal. However, there is there a subtle yet profound shift in the state of Arousal taking place from positive affect to negative affect (Huntsinger and Ray 2016).

Action Opportunities (T29): situationally, 9 second on from T28 at T29 the participant is trying to make a difficult clip. This forces the participant to focus on a specific problem that requires the participant to balance a range of critical factors. The participant appears to be highly motivated, because this situation has a very obvious make or break out come either, taking a potentially long fall (because of the amount of excess rope in the system) or succeeding.

Manifest Level: the participant is seen pulling up rope with one hand while holding on with the other, on a steep wall with marginal foot placements. The participant must then reach with the hand holding the rope to clip it into the carabiner. The participant is then heard to say, "bollocks".

Codable Moment: these observations correspond to signs of, 'physically struggling' and symptoms of:

1. Identifying problematic situation.
2. Expressing negative feelings.

This analysis places the participant in an affective state of Anxiety.

<u>Action Opportunities (T30)</u>: situationally, in this section of the climb there is a paucity of holds. The participant is climbing at the self-elected limit of their capability requiring the participant to utilise all of their climbing knowhow and ingenuity. A technique the participant uses in this situation is third person self-talk (Moser et al. 2017). This has been identified as technique that people in stressful or difficult situations apply to help them regulate their emotions.

<u>Manifest Level</u>: the participant is heard to say to himself, "no holds for (participants surname)".

<u>Codable Moment</u>: Cogitatively, the participant is highly focused on a challenging problem – the participant reports, "no holds". No holds while climbing presents a significant problem requiring both cognitive problem-solving skills, but also physical strength and gymnastic dexterity. Analytically, the participant is attempting to identify holds, is having to apply a great deal of effort and has indirectly reported a problem with self-talk. This analysis predominantly aligns with Anxiety with some correlation to Arousal. However, when this is taken in conjunction with self-talk, we have interpreted the participants affective state at T30 as Arousal/Anxiety.

<u>Action Opportunities (T31 – T32)</u>: situationally, the participant is in the upper section of the climb with a final clip to make before reaching the top of the climb. The participant is fully focused and applying their full range of recourses to reach the top of the climb.

<u>Manifest Level</u>: at T31 the participant is, 'trying to get into position to clip and is grunting with effort. Immediately after making the clip at T32 the participant needs to perform 'a specific sequence of moves' that allows them to reach the top of the climb.

<u>Codable Moment</u>: these observations correspond to:
1. Unable to communicate other that in single words – grunts of effort.
2. High cognitive and or physical investment.

This analysis locates the participant in an affective state of Arousal.

Action Opportunities (T33): situationally, the participant has completed the climb successfully. The participant is able to reflect on what has just occurred during the climb.

Manifest Level: the participant said, "I wondered if I going to give up – there is a move up there where you've got no holds".

Codable Moment: This statement aligns with, 'discussing the climb'. This analysis places the participant in an affective state of Control. Furthermore, this statement confirms the situational analysis of T30.

Action Opportunities (T34): situationally, the participant had returned to the floor and was casually discussing the climbs he had completed so far. The participant was commenting on their experience of the climbing session.

Manifest Level: the participant said, "this is the best days indoor climbing I've had this year".

Codable Moment: the participant is intrinsically motivated to climb. Indeed, it has been their life-long passion (at the time of taking part in the protocol the participant had been climbing for 49 years). Therefore, the participants statement corresponds to:
1. Intrinsically motivated and fully immersed in the task.
2. Task focused not outcome focused.
3. Expressing enjoyment post climb.

This analysis places the participant in an affective trait of Flow.

Additionally, this corresponds to the positive pole of the participants construct 13 and the positive pole of construct 8. These constructs all contain elements of:
1. Enjoying movement.
2. Enjoying the aesthetics of a wall.
3. Trusting your climbing partner.

The participant describes these things as being "a great day out when they all come together". The participant says the difficulty is, "We don't talk about this, you don't say to your mate I hope you are going to keep my confidence today, are you going to belay correctly and I'm looking for the aesthetics of the wall and I'm looking for good movement".

This analysis in terms of the participants subjective valuing and affective meaning systems (constructs)

localises and corroborates the analysis at T34 placing the participant in an affective trait of Flow in the challenge environment.

Climb 7, Proposition 7 (P7): climb leans back, with positive holds (4b, 12 meters).

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T35	Climbing easily and smoothly while continuing conversation to about half height	1. Smoothness of actions. 2. Confidence of movement and decisions. 3. Able to climb and respond to questions			**Control**
T36			It's like going up the stairs (2/3 height)	Discussing the climb	**Control**
T37			It's like I'm cheating It's just comfortable	Expressing positive emotion	**Control**

Action Opportunities (T35,T36 and T37): Systemically, the challenge level dropped 6 objective grades. The climb at this level is by its nature populated with larger holds, more holds and the climb is leaning backwards. The climb is well within the participants capability. This is indicated by the participant being able to both climb easily and talk about the climb.

Manifest Level: the participant was observed to be – 'climbing easily and smoothly while continuing conversation to about half height'. In addition, the participant said, "it's like going up the stairs (2/3 height)" and "it's like I'm cheating, it's just comfortable".

Codable Moment: these observations and the participants responses align with:
1. Smoothness of actions.
2. Confidence of movement and decisions.

414

3. Able to climb and respond to questions.
4. Expressing positive emotion.

This puts the participant in an affective state of Control.

In addition, this analysis of Control, aligns with construct 6 of the participants construct elicitation. The participant describes being on an ideal climb plus being social as pleasurable.

Climb 8, Proposition 8 (P8): off vertical, slabbey with larger holds (4a, 12 meters).

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T38 to T43	Climbing and talking simultaneously and missing out hold he finds unnecessary	1. Ease of movement and decisions. 2. Not using all the holds.			**Relaxation**
T39	Turned sideways on climb standing on one foot having conversation looking down (3 meters)	Ease of movement and decisions.	Telling rude story about an old climbing friend	Freely chatting	**Relaxation**
T40	Keeps stopping looking down and talking (7 meters)	Climbing and talking			**Relaxation**
T41	Pauses to concentrate on specific move	Regulate their attitudes and feelings towards a specific task and avoid undesired outcomes			**Control**
T42	Resumes talking and climbing	Climbing and talking			**Relaxation**
T44 – T45			It's climbing for the sake of climbing – Participant 1 then tells a story about being on the mountain rescue team and going out in horrendous weather just to climb (intrinsic motivation – autotelic activity)	1. Positive mood and intrinsic motivation. 2. positively influence and regulate their response to those activities that affect them in such a way that they experience mild pleasure and are free from tension.	**Relaxation (Flow trait)**

Action Opportunities (T38 to T43): systemically, the climbs are reducing in degree of challenge. The climb has a large number of holds, indirectly this means that the climber has a wide range of choice over which holds to use to ascend to the top of the climb. The participant is able to split their personal resources at this level to both climbing and talking.

415

Manifest Level: the participant is observed to be:

1. Climbing and talking simultaneously.
2. Keeps stopping and looking down to talk (turning sideways standing on one foot and holding on with one hand).
3. Telling a rude story and joking while climbing.

Codable Moment: these observations correspond to signs of:

1. Climbing and talking.
2. Ease of movement and decisions.
3. Not needing to use all the holds on the climb.

These signs place the participant in an affective state of Relaxation.

Action Opportunities (T41): situationally this codable moment occurred partway up climb 8 when the participant came to the crux move on the climb. Just for a moment the climb demanded the participants full attention. This problem focused the participants attention.

Manifest Level: the participant was observed to – 'pause and concentrate on a specific move'. This move was just enough to demand the participants full attention.

Codable Moment: this observation corresponds to signs of being able to:

1. Regulate their attitudes and feelings towards a specific task.
2. Avoid undesired outcomes.

This analysis locates the participant in an affective state of Control.

Action Opportunities (T44 – T45): situationally, the participant is on the ground and reflecting on climb 8 and describing their feelings and attitude towards the climb. The participant is lucid, motivated and articulate.

Manifest Level: the participant describes the climb as, "climbing for the sake of climbing". Importantly, the participant qualifies this statement with a personal story from when he was in the RAF mountain rescue team. The story was

416

basically about: a day off in Scotland while taking part in an exercise of walking from north to south Scotland, the participant still wanted to go out climbing.

His persuaded one of his team mates to go out climbing with him in the pouring rain, who said, "the problem is with you, you just climb for the sake of climbing".

The participant replied, "yes I do".

<u>Codable Moment</u>: while this statement may initially appear to be negative, for the participant it describes how he feels about climbing. This comment plus its accompanying story aligns with the analysis at T34. This statement directly pertains to a Trait of Flow where the participant is intrinsically motivated to climb for no other reason than they love to climb.

Additionally, this analysis, aligns with a nexus of positive poles in the participants construct landscape construct 4, construct 7, construct 8, construct 10, construct 13, construct 14 and construct 15.

Climb 9, Proposition 9 (P9): slab climb with a large number of holds and features (3c, 12 meters).

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T46	Participant tries to do avoid doing a 3c climb		suggests we do another 4a	1. Asking to do a harder climb. 2. Expressing desire to be doing something else	**Trying to avoid Boredom**
T47	Being silly telling daft jokes	Joking around			**Relaxation**
T48 – T49	Climbing with minimal effort there was no urgency to any of Participant's movements no matter the position he was in on the climb	1. Effortless actions. 2. Ease of movement and decisions. 3. Climbing and talking. 4. Comfortably responding to questions and elaboration on them.			**Relaxation**
T50	Fails to read climb correctly (7 meters) turns sideways for conversation to clarify what he should do (does not seem to be fully engaging with climb)	The participant not being interested in surroundings (what they are doing). Lack of concentration on climb	would rather be doing something harder	Asking to do something more challenging.	**Cusp of Boredom**
T51	Laughing and joking while climbing (10 meters)	a low challenging task and climbing and talking.			**Relaxation**

<u>Action Opportunities (T46 – T47)</u>: systemically, it is now the easiest climb of the protocol. It is very normal after a strenuous climbing session for the climbers to do a couple of easier climbs to warm down. Situationally, the participant is looking for his final climb at the level of challenge proscribed by the protocol. The participant does not appear to be experiencing any excess fatigue.

<u>Manifest Level</u>: between these two-time indexes, the participant is observed – 'being silly and telling daft jokes'. During this time the participant suggest that he does another 4a climb instead of the proscribed 3c climb.

<u>Codable Moment</u>: while the signs the participant presents code to and affective state of Relaxation, the participant symptoms indicate he not interested in a climb at this level of challenge. Therefore, the participant is coded as being on the cusp of or is potentially approaching an affective state of Boredom.

Action Opportunities (T48 – T49): situationally, the participant has identified a climb of appropriate grade and has commenced climbing. This climb is at the bottom of the participants self-elected lowest climbing level.

Manifest Level: the participant is observed to be – 'climbing with minimal effort there was no urgency to any of participant's movements no matter the position he was in on the climb'.

Codable Moment: these signs align with:
1. Effortless actions.
2. Ease of movement and decisions.
3. Climbing and talking.
4. Comfortably responding to questions and elaboration on them.

This analysis locates the participant in an affective state of Relaxation.

Action Opportunities (T50): situationally, the participant fails to read the climb correctly. This indicates the participant is not applying all of his attention to the climb.

Manifest Level: the participant, 'turns sideways to clarify what he should do' (what colour holds he can use). When asked how the climb is feeling, the participant says, "I would rather be doing something harder".

Codable Moment: these signs and symptoms correspond to:
1. The participant not being interested in surroundings (what they are doing).
2. Asking to do something more challenging.

This analysis places the participant in an affective state of Boredom.

Action Opportunities (T51): situationally, the participant has identified what they now need to do and continues climbing. The participant has easily absorbed the information that he requires to continue the climb correctly.

Manifest Level: the participant is observed to be – 'laughing and joking while climbing'.

<u>Codable Moment</u>: these observations align with signs of: 'a low challenging task and climbing and talking'. This puts the participant in an affective state of Relaxation.

Participant 2:

Climb 1, Proposition 1 (P1): vertical wall, slightly leaning over towards the top (5a, 12 meters)

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T1 – T2	Climbing smoothly competently and with precision. Following the climb very well	1. Smoothness of actions. 2. Confidence of movement and decisions.			**Control**
T3			Nice Route, Straight forward, Tricky at top	Positive descriptions of climb	**Control**
T4			Going technical – hoping to make it to 9 so going to give my arms additional rest	Regulate their attitudes and feelings towards a specific task and avoid undesired outcomes.	**Control**

Action Opportunities (T1 – T2): systemically, this climb represents the participant's median position in the range of climbs they feel capable of climbing. Situationally, the participant selected the climb from a wide selection of other potentially suitable climbs. Also, the participant has completed two easy climbs with the intent of enabling them to warm up so as to avoid any form of flash pump.

Manifest Level: the participant was observed to – 'climbing smoothly competently and with precision. Following the climb very well'.

Codable Moment: this corresponds to signs of:
1. Smoothness of actions.
2. Confidence of movement and decisions.

This analysis positions the participant in an affective state of Control.

Action Opportunities (T3): situationally, the participant had returned to the floor and was reflecting on their experience of the climb.

Manifest Level: the participant said, "nice route, straight forward, tricky at top".

Codable Moment: this report aligns with symptoms of, 'positive descriptions of climb'. These symptoms conform with the previous analysis situating the participant in an affective state of Control.

The participants reflection at T3 is consistent with the analysis of T1 – T2.

<u>Action Opportunities (T4)</u>: systemically, the participant is aware that he has 8 further climbs to complete. He is well aware of how taxing physically and psychologically taxing this will be. Situationally, the participant makes a strategic choice about the style of climb for their second climb (climb 2).

<u>Manifest Level</u>: the participant says, "going technical – hoping to make it to 9 so going to give my arms additional rest".

<u>Codable Moment</u>: this statement aligns with the participant being able to – 'regulate their attitudes and feelings towards a specific task and avoid undesired outcomes'. This analysis locates the participant in and affective state of Control.

This analysis aligns with the positive pole of construct 2. The participant describes this pole a being about, "focused choices and actions". Specifically, how this approach influences the participants choice over their next climb.

Climb 2, Proposition 2 (P2): slab climb – this is a technical climb (5b, 12 meters).

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T5 to T7	Excellent use of balance and body position to ascend climb demonstrating innate knowledge of what needs to be done and how to do it	1. Smoothness of movement. 2. Innately knowing what needs to be done.			**Flow**
T6	Suits Participant's style of climbing	Knowing exactly what to do.	This is balance rather than strength	Individual capability compliments the challenge of the activity.	**Flow**
T8 to T11	Struggled with final crux move right at top of climb	1. Identification of problems. 2. Movement becomes stunted.			**Arousal**
T9	Balancing on one foot only without difficulty and not using his hands	Confidence of movement and decisions.			**Control**
T10	Asked for clarification of climb, did not realise he could use features for feet	Able to climb and respond to questions.			**Control**

<u>Action Opportunities (T5, T6 and T7)</u>: systemically, the grade of the climb has increased. Theoretically, this puts increased demands on the participant compared to the previous climb. However, the participants has been able to utilise

personal discretion in climb selection with an approach to this climb has been measured and reasoned.

Manifest Level: the participant is observed to be making – 'excellent use of balance and body position to ascend climb demonstrating innate knowledge of what needs to be done and how to do it'. In addition, the participant says, "this is balance rather than strength".

Codable Moment: the observations correspond to signs of:
1. Smoothness of movement.
2. Innately knowing what needs to be done.
3. Knowing exactly what to do.

Furthermore, the participants self-report corresponds to, "individual capability compliments the challenge of the activity". Taken together this analysis locates the participant in an affective state of Flow.

Action Opportunities (T8-T11): situationally, the participant reaches the hardest section on the climb (this occurs near the very top of the climb). This makes the crux of the climb acute and proximal. If the participant is to reach the top, he must face the challenge, give up or cheat.

Manifest Level: the participant is observed to be – 'struggling with the crux move right at the top of the climb'.

Codable Moment: this observation aligns with signs of:
1. Identification of problems.
2. Movement becomes stunted'.

This analysis places the participant in a state of Arousal.

Action Opportunities (T9): situationally, the participant takes rest. The participants approach to a rest may not appear to many as rest. As his position/ location on the climb is precarious. The participant is utilising good technique and his ability to maintain a structured body position in a difficult position.

Manifest Level: the participant is seen to – 'balancing on one foot only without difficulty and not using his hands'.

Codable Moment: this observation corresponds to signs of:

Confidence of movement and decisions.

This analysis locates the participant in an affective state of Control.

Action Opportunities (T10): situationally, while the participant is stood balancing on one foot, they are looking around trying to unlock the final sequence of movements that will enable them to reach the top. At this level of challenge the participants experience is probably talking to the participant informing him that he is missing something.

Manifest Level: at this point the participant asks for clarification of the route from the route description at the bottom of the climb (importantly, the participant did not realise he could use features for feet).

Codable Moment: Even though the participant is no technically ascending the climb at this moment, they are still using a great deal of proficiency and competence. Therefore, the observation corresponds to signs of:

Able to climb and respond to questions.

This analysis places the participant in an affective state of Control.

Climb 3, Proposition 3 (P3): Vertical wall that begins to lean over at 2/3 height (4c, 12 meters).

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T12	Climbed very smoothly quickly and easily, very little conversation or talking	1. Smoothness of actions. 2. Confidence of movement and decisions.			**Control**
T13			Oha, jeans.	Expressing great effort	**Arousal**
T14	Struggled with final move	Movement becomes stunted.	It's nice, but you've got to be quite tall	Discrepancy between action and perception of events.	**Arousal**
T15			It's quite dynamic and you've got to reach quite far	Discussing the climb.	**Control**

Action Opportunities (T12): systemically, this is the easiest climb the participant has attempted. Situationally, the participant is not showing any signs of fatigue and is maintaining focus and continues to be critical in his selection of climbs.

<u>Manifest Level</u>: the participant is seen to be – 'climbing very smoothly quickly and easily, very little conversation or talking'.

<u>Codable Moment</u>: these observations align with signs of:
1. Smoothness of actions.
2. Confidence of movement and decisions.

This analysis places the participant in and affect state of Control.

<u>Action Opportunities (T13)</u>: situationally, the participant has ascended approximately 8 meters up the climb an reaches the most difficult section of the climb.

<u>Manifest Level</u>: the participant says, "ah jeans". This is interpreted as the participant having to excerpt greater effort because of their choice of clothes.

<u>Codable Moment</u>: this statement corresponds to symptoms of:

Expressing great effort'.

This analysis positions the participant in an affective state of Arousal.

<u>Action Opportunities (T14)</u>: situationally, the participant is climbing through the most difficult section of the climb to reach the top.

<u>Manifest Level</u>: there appears to be a slight discrepancy between how the participant was observed to climb – 'struggle with the final crux move'. Then, just after completing the move and pulling over the top, the participant says, "it's nice, but you've got to be quite tall".

<u>Codable Moment</u>: the observations correspond to signs of – 'movement becomes stunted' and the participants statement to symptoms of – 'discrepancy between action and perception of events'. This analysis locates the participant in an affective state of Arousal.

<u>Action Opportunities (T15)</u>: situationally, the participant has returned to the ground and is discussing their experience of the climb. Importantly, the participant was critical of the black climbs design (climb 3). This is not an uncommon complaint when climbs have been set by climbers that climb very well. They often

just throw big holds at an easier climb with the attitude of that will do. The participants appraisal of this problem is the product of many years of experience and a great deal of conversation over the years with peers.

<u>Manifest Level</u>: the participant says, "It's quite dynamic and you've got to reach quite far".

<u>Codable Moment</u>: the participants statement corresponds to symptoms of – 'discuss the climb'. This analysis places the participant in an affective state of Control.

Climb 4, Proposition 4 (P4): Completely vertical wall (5c, 12 meters)

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T16			Doing this one because I like the shape of the holds	1. Discuss the climb. 2. Express positive emotion	**Relaxation**
T17 to T21	Climbing well and following the line of the climb. Identifying the holds as they were required. Demonstrated confidence in his ability to do the climb.	1. Smoothness of movement. 2. Innately knowing what needs to be done			**Flow**
T18	Turning and looking down describing the previous move	Able to climb and respond to questions.	It's nice but one of those you're not quite sure if it's there	Positive descriptions of climb.	**Control**
T19	Talking quite a lot about the merits of the climb, while climbing.	Able to climb and respond to questions.	All very nice and Flowy	Task focused not outcome focused.	**Control/Flow**
T20	Talking while climbing (this is self-talk).		Makes you do things that are impossible, and you think oh that was alright	1. Inability to explain sequence of events. 2. Innately knowing what needs to be done	**Flow**
T22			What was that 5c? Technically that was harder than the black one (previous route) but it flowed better. This was more intuitive.	1. Comfortably responding to questions and elaboration on them. 2. Discussing the climb. 3. Expressing positive emotion.	**Relaxed**
T23			Explained he did not feel the black route was set very well especially when compared to climb. A lot more comfortable a lot nicer to climb	1. Comfortably responding to questions and elaboration on them. 2. Discussing the climb. 3. Expressing positive emotion.	**Relaxed**

Action Opportunities (T16): situationally, the participant is on the ground looking for their next climb. He is moving around the climbing centre discussing the merits of various climb before he settles on his next climb.

Manifest Level: the participant is drawn to this particular climb and say's, "doing this one because I like the shape of the holds".

Codable Moment: this symptom corresponds to the participants ability to:
1. Discuss the climb.
2. Express positive emotion.

This analysis puts the participant in an affective state of Relaxation.

Additionally, this corresponds to construct 5, where the participant talks about importance of looking for new routes to climb saying, "being inspired by some new route to climb that looks interesting [because] for indoor climbing repetition I find quite dull and I find it difficult to get inspired". Therefore, allowing the participants to select his own routes as is the intention of the protocol would therefore appear to be a very coherent way of maintaining this participant's focus.

Action Opportunities (T17 – T21): situationally, the participant is now climbing and is well motivated because of how they have previously described the climb.

Manifest Level: the participant is observed to be, 'climbing well and following the line of the climb. Identifying the holds as they were required. Demonstrated confidence in his ability to do the climb'.

Codable Moment: these observations correspond to signs of:
1. Smoothness of movement.
2. Innately knowing what needs to be done.

This analysis locates the participant in an affective state of Flow.

Action Opportunities (T18): the participant is continuing to ascend the climb.

Manifest Level: the participant is observed to be – 'turning and looking down describing the previous move' and then say's, "it's nice but one of those you're not quite sure if it's there"

Codable Moment: these observations and statements correspond with signs and symptoms of:
1. Ability to respond to questions.
2. Positive descriptions of climb.

This analysis locates the participant in an affective state of Control.

Action Opportunities (T19): the participant is continuing to ascend the climb. They are approximately in the top third of the climb.

<u>Manifest Level</u>: the participant is seen to be, 'talking quite a lot about the merits of the climb, while climbing'. The participant describes the climb as being, "all very nice and flowy".

<u>Codable Moment</u>: applying the codebook the observations correspond to the participant, 'able to climb and respond to questions', returning an affective state of Control.

However, following on from this the participant uses the word "Flowy", while this may appear axiomatic placing the participant in an affective state of Flow, we have chosen to disregard the potential superficiality of this theme. Instead of purely analysing what the participant reports, we systematically utilised the codebook in conjunction with the participants immediate situation. The participants statement of, "all very nice and Flowy" is the participant actually talking about the way that the climb encouraged the participant to move. This corresponds to the participant being, 'task focused and not outcome focused', the differential analysis places the participant in an affective state of Flow.

Therefore, we conclude that the participant is located in an affective state comprising of Control/Flow.

<u>Action Opportunities (T20)</u>: the participant is nearly at the top of the climb.

<u>Manifest Level</u>: the participant says, "makes you do things that are impossible, and you think oh that was alright".

<u>Codable Moment</u>: the participants narrative and be broken down into two distinct part that correspond to:
1. Inability to explain sequence of events, yet,
2. Innately knowing what needs to be done.

This analysis puts the participant in an affective state of Flow.

Collectively, time index T17 to T21, T18, T19 and T20 align with the participants description of the positive pole of construct 7. The participant say's, "It's that physical movement. Muscle memory […] you remember the sensations […]

amazing move, fantastic location". This corresponds with an affective state of Flow.

<u>Action Opportunities (T22)</u>: situationally, the participant is on the ground having just lowered off from the top of the climb. They are lucidly discussing their experience of the climb.

<u>Manifest Level</u>: the participant asks, "what was that 5c"? and then says, "technically that was harder than the black one (previous route) but it flowed better. This was more intuitive".

<u>Codable Moment</u>: this time index is important for two reasons firstly, is enables the participants immediate affective state to be gauged. Secondly, it provides confirmatory evidence for the analyses of this climb (climb 4). The way the participant is talking and reflecting on the climb aligns with:

1. Comfortably responding to questions and elaboration on them.
2. Discussing the climb.
3. Expressing positive emotion.

Proximally, this puts the participant in and affective state of Relaxation. Importantly, the participants immediate post climb reflections again provide evidence to confirm the analysis of time indexes T17 to T21, T18, T19 and T20.

<u>Action Opportunities (T23)</u>: the participant is continuing to reflect on climb 4. However, at this time index they are comparing climb 4 to climb 3 and their experience of the difference between them.

<u>Manifest Level</u>: the participant explains, "the black route was not set very well especially when you compare it to this climb […] a lot more comfortable a lot nicer to climb".

<u>Codable Moment</u>: The way the participant is talking and reflecting on the climb aligns with:

1. Comfortably responding to questions and elaboration on them.
2. Discussing the climb.
3. Expressing positive emotion.

Proximally, this puts the participant in and affective state of Relaxation. Importantly, this reflection confirms the analysis of climb 3 and time indexes T12 to T14.

Climb 5, Proposition 5 (P5): vertical, end of wall with holds spread around three faces (6a, 12 meters).

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T24			I said I wanted to try that pink – did I mean it (laugh)	1. Discussing the climb. 2. Expressing positive emotion.	**Relaxation**
T25			This isn't just about difficulty but style. There are a lot of steep 5c's along here, but I wouldn't of chosen them. I would if I was training for something outside. But equally you wouldn't normally climb 9 routes back to back and two warm-ups	1. Discussing the climb. … 2. The individual is able to achieve their preferred outcomes. 3. Self-manage or regulate their attitudes and feelings towards a specific task and avoid undesired outcomes.	**Relaxation/Control**
T26 to T29	Participant's movements are more gymnastic and dynamic His movements on the wall are not as tidy as they were on the previous climbs	1. High physical investment/involvement. 2. Movement becomes stunted.			**Arousal**
T27			Watch me	Identifying problematic situation	**Anxiety**
T28	Right elbow is sticking out – indicating fatigue	1. High physical investment/involvement. 2. Focus narrows.			**Arousal**
T30	Shaking out arms but still sticking with climb	High physical investment/involvement.			**Arousal**
T31	Tried crux move but failed, reversed back to rest position	1. High physical investment/involvement. 2. High levels of effort.	Ooo	Expressing great effort.	**Arousal**
T32			You feeling pumped? "Yeh".	Expressing great effort.	**Arousal**
T33	Tries crux move again but falls	1. Unsure of what to do or how to complete a move. 2. Physically struggling.			**Anxiety**
T34	Resting on rope. Trying to look for the holds.	1. Identification of problems. 2. May stop to identify holds.			**Arousal**
T35	Suddenly tries crux again and falls	Unsure of what to do or how to complete a move.			**Anxiety**
T36	tries crux again get very close but falls	Unsure of what to do or how to complete a move.	If I'd of done that first	Identifying problematic situation.	**Anxiety**
T37	Completes crux move and climbs smoothly to through to top with ease	1. Identification of problems. 2. Fully absorbed in the activity.			**Flow/Arousal**

Action Opportunities (T24): situationally, the participant is on the ground preparing to do their 5th climb. They are concentrating on preparing for the immediate challenge yet are jovial in the face of that challenge.

Manifest Level: the participant says, "I said I wanted to try that pink – did I mean it" and then laughs.

Codable Moment: this statement corresponds to symptoms of, 'discussing the climb and expressing positive emotion'. This analysis locates the participant in and affective state of Relaxation.

Action Opportunities (T25): the participant is stood right at the bottom of the route is already tied into the rope and ready to begin the climb. They are looking up the climb trying to discern the route.

Manifest Level: the participant says, "This isn't just about difficulty but style. There are a lot of steep 5c's along here, but I wouldn't of chosen them. I would if I was training for something outside. But equally you wouldn't normally climb 9 routes back to back and two warm-ups".

Codable Moment: the participants pre-climb statement is split between two contiguous affective states. Firstly, the participant is, 'discussing the climb'. This corresponds to an affective state of Relaxation. Secondly, the participant is pondering their experience of investigation – how much they have already done and how much more they need to do. The participants deliberations in this matter correspond to:

1. The individual is able to achieve their preferred outcomes.
2. Self-manage or regulate their attitudes and feelings towards a specific task and avoid undesired outcomes.

This analysis locates the participant between to contiguous affective states Relaxation/Control.

Action Opportunities (T26 – T29): situationally, the participant is climbing on the initial section of the climb.

Manifest Level: the participants 'movements are more gymnastic and dynamic; his movements on the wall are not as tidy as they were on the previous climbs'.

433

<u>Codable Moment</u>: these observations align with signs of:

1. High physical investment/involvement.
2. Movement becomes stunted.

This analysis places the participant in an affective state of Arousal.

<u>Action Opportunities (T27)</u>: while the participant is climbing in the initial section of the climb, the participant identifies some anomaly that is both acute and proximal that completely draws their attention.

<u>Manifest Level</u>: the participant says to the belayer with some urgency, "watch me".

<u>Codable Moment</u>: this statement corresponds to symptoms of:

Identification of problems.

This analysis places the participant in a momentary affective state of Anxiety.

<u>Action Opportunities (T28)</u>: at this moment in the climb the participant has overcome the previous difficulty and is continuing to climb. The climb is strenuous and is very demanding on the participants personal recourses.

<u>Manifest Level</u>: critically, it is observed that the participants – 'right elbow is sticking out'.

<u>Codable Moment</u>: this sign is indicative of a person beginning to experience the effects of fatigue. This corresponds to signs of:

High physical investment/involvement.

This analysis places the participant in an affective state of Arousal.

<u>Action Opportunities (T30)</u>: situationally, the participant appears to of identified a position on the climb where they are able to rest. This does not mean the participant is using artificial means of resting – for example using the rope. The participant is using skill and body positioning to achieve this rest. . However, the participant is not giving up and is continuing the climb in what would be described by climbers as 'good style'.

434

Manifest Level: the participant is observed to be – 'shaking out their arms alternately but continuing to stay in position on the climb'. The participant – shaking out their arms is indicative of the participant experiencing an elevated level of fatigue

Codable Moment: these observations correspond to signs of:
1. High physical investment/involvement.
2. Focus narrows.

This analysis places the participant in an affective state of Arousal.

Action Opportunities (T31): situationally, the participant is at the crux move on the climb. This situation is acute and proximal and drawing all of the participants attention.

Manifest Level: the participant is observed to – 'try crux move but failed, reversed back to rest position' as the participant attempts the crux they are heard to say, "Ooo". Attempting a crux move, failing to complete it and then reversing the move is exceptionally difficult and energy sapping. This is axiomatic, because if the climber was strong enough to complete the move and of read the move correctly, they would have completed the move.

Codable Moment: the observation in conjunction with the situation corresponds to:
1. High physical investment/involvement.
2. High levels of effort.

With the additional of symptom:
3. Expressing great effort.

This analysis places the participant in an affective state of Arousal.

Action Opportunities (T32): situationally, the participant is still below the crux move having reversed back to the previous rest position and has to apply great effort to stick with the climb.

Manifest Level: the participant is asked the question: are you feeling pumped? The participant responds, "Yeh".

Codable Moment: this response corresponds to the symptom of:

Expressing great effort.

The analysis therefore places the participant in an affective state of Arousal.

Action Opportunities (T33): situationally, the participant makes a second attempt at climbing through the crux.

Manifest Level: at this moment the participant – 'falls off the climb'. This is potentially a result of two problems. Either the participant has runout of strength; or, they failed to read the combination of moves correctly that are necessary to complete the crux; or a combination of both problems.

Codable Moment: this observation corresponds to signs of:
  1. Physically struggling.
  2. Unsure of what to do or how to complete a move.

This analysis places the participant in an affective state of Anxiety.

Action Opportunities (T34): having just fallen the participant is now sat in his harness suspended by the rope. The participant is not talking and is keeping his own council.

Manifest Level: the participant is seen to be 'resting on rope and is looking up trying to look for the holds on the crux'.

Codable Moment: this observation corresponds to signs of:
  1. Identification of problems.
  2. Stopping to identify holds.

The analysis of this observation places the participant in an affective state of Arousal.

Action Opportunities (T35): situationally, without warning the belayer the participant attempts the crux on the climb for the 3rd time.

Manifest Level: the participant is seen to – suddenly try crux again and fall of the climb.

Codable Moment: this observation corresponds to signs of:

Unsure of what to do or how to complete a move.

This analysis places the participant in an affective state of Anxiety.

Action Opportunities (T36): having rested on the rope for 23 seconds. The participant attempts the crux for the 4th time. The participant nearly completing the crux indicates that they are unlocking the sequence of movements necessary to complete the crux. This is corroborated by the participants statement.

Manifest Level: the participant is seen to –'tries crux again gets very close to completing the crux but falls again' having fallen the participant then says, "If I'd of done that first".

Codable Moment: the observation corresponds to signs that the participant is, 'unsure of what to do or how to complete a move'. However, the participants statement corresponds to symptoms that the participant is 'Identifying problematic situation'. This analysis places the participant in an affective state of Anxiety.

Action Opportunities (T37): the participant rests on the rope for 49 seconds. Then attempts the crux move for the 5th time.

Manifest Level: the participant is observed to 'complete crux move and climb smoothly to through to top of the climb'.

Codable Moment: the observation corresponds with signs of:
    1. Identification of problems.
This would place the participant in an affective state of Arousal. However, the sign of the participant being:
    2. Fully absorbed in the activity.
Places the participant in an affective state of Flow.

Therefore, taken together the differential analysis locates the participant between the congruent affective states of Arousal/Flow.

Furthermore, this observation of the participant climbing through the crux confirms the participants previous statement at T36

Climb 6, Proposition 6 (P6): vertical technical corner that becomes a technical chimney (6a+, 12 meters)

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T38	Struggling to identify all holds	1. May stop to identify holds. 2. Difficulty to identify critical cues.			**Arousal**
T39	Falls just after making first clip at about 3m	Physically struggling.			**Anxiety**
T40	Moves very well and intuitively well through a complicated sequence of moves to make second clip	High levels of cognitive and physical investment.			**Arousal**
T41	Bridges after making third clip and looks around attempting to identify the next sequence of holds	Confidence of movement and decisions.			**Control**
T42	Struggling to make clear identification of holds	1. Unsure of what to do or how to complete a move. 2. Difficulty to identify critical cues			**Arousal**
T43	Tries/struggles to make a high left leg step up	Physically struggling.	Jeans bad.	1. Identifying problematic situation. 2. Expressing negative emotion.	**Anxiety**
T44	Fails to identify a hold that was badly needed on the previous move	Failure to identify critical cues.			**Anxiety**
T45	All of a sudden - just sits back and rope and asks belayer to hold him	Physically struggling.	Take me there	Resting on rope.	**Anxiety**
T46	Singularly determined and climbing quite well	1. High cognitive and or physical investment. 2. Finding the climbing difficult	ahhhh	Unable to communicate other that in single words – grunts of effort	<mark>**Arousal**</mark> **(cusp)**
T47	Working hard to stay on climb.	1. High cognitive and or physical investment. 2. Finding the climbing difficult.	Uhhh	Unable to communicate other that in single words – grunts of effort	<mark>**Arousal**</mark> **(cusp)**
T48			I'm not supposed to put my legs that far apart at my age	1. Identifying problematic situation. 2. Detailed descriptions.	**Arousal/Anxiety**
T49	Works hard to top out on climb with-out further incident	High levels of effort.			**Arousal**
T50			I would describe that as unpleasant - That's quite energetic but in a wrestling kind	1. Identifying problematic situation. 2. Expressing negative feelings.	**Anxiety**

			of energetic rather than a pumped in the fingers or forearms that's just like a uhhhr. Are things going to get easier now?	3. Saying the climb is too hard.	

Action Opportunities (T38): systemically, climb 6 is objectively the participants most challenging self-elected climbing grade. Situationally, the participant has at this time completed 7 climbs so far, where the challenge has been continually increasing.

Manifest Level: as the participant is starting to climb, they are seen to be – 'struggling to identify all of the holds'.

Codable Moment: the observation correlates to signs of:
1. May stop to identify holds.
2. Difficulty to identify critical cues.

This analysis locates to the participant experiencing an affective state of Arousal.

Action Opportunities (T39): situationally, the participant is working hard to make the first clip from a difficult position. The specific challenge for the participant is both acute and proximal.

Manifest Level: just as the participant makes the first clip, he –'falls'. The participant is approximately 3 meters above the ground. The belayer manages to catch the fall before the participant hits the ground.

Codable Moment: this observation correlates with the sign of the participant 'physically struggling'. This analysis locates the participant in an affective state of Anxiety.

This situation specifically links to the negative pole of the participants 10th construct. The participant describes this as, "You might feel that you're gonna take a fall and try and clipping from potentially the wrong location […] both (weather you're gonna take a fall AND when I'm clipping from the wrong location) detract from your focus". Incidentally, this links to several other negative construct poles for the participant.

Action Opportunities (T40): situationally, having just fallen the participant is hanging on the rope and laughs. He then lowered to the floor to start the climb again from the beginning.

Manifest Level: the participant is seen to –'move very well and intuitively well through a complicated sequence of moves (past the first clip where he fell) to make second clip'.

Codable Moment: this observation correlates with signs of:

Highlevels of cognitive and physical investment.

This analysis positions the participant in an affective state of Arousal.

Action Opportunities (T41): the participant is at approximately 6 meters on the climb.

Manifest Level: the participant is seen to – 'bridges on the climb after making third clip and looks around attempting to identify the next sequence of holds'.

Codable Moment: the ability of the participant to identify a position on the climb where it is possible to bridge (facilitating a rest) and enabling them to look around and identify the next sequence of holds corresponds to signs of:

Confidence of movement and decisions.

This analysis corresponds to the participant in an affective state of Control.

Action Opportunities (T42): situationally, the participant is moving into the next challenging sequence of moves. The climb is now spread across three faces.

Manifest Level: the participant is seen to be, 'struggling to make clear identification of holds'.

Codable Moment: this observation corelates to signs of:
1. Unsure of what to do or how to complete a move.
2. Difficulty to identify critical cues.

This analysis places the participant in an affective state of Arousal.

Action Opportunities (T43): situationally, the challenge the participant must address is acute and proximal, the challenge requires the participant to make a particularly agile move. This move is a necessary for the participant to be able to continue to climb.

Manifest Level: the participant is seen to –'try/struggle to make a high left leg step up', during which he says, "jeans bad".

Codable Moment: the observation correlates with signs of:

Physically struggling.

The participants comment correlate with symptoms of:

Identifying problematic situation.

This analysis places the participant in an affective state of Anxiety.

Action Opportunities (T44): situationally, the participant is struggling with climb. Firstly, they have been struggling to make a move; then, secondly, they have inelegantly had to wedge themselves between two opposite walls so that they can make a clip.

Manifest Level: at this point the participant sees a critical hold that the desperately required to make the previous move that they had struggled so much with.

Codable Moment: this observation correlates with signs of:

Failure to identify critical cues.

This analysis locates the participant in an affective state of Anxiety.

Action Opportunities (T45): situationally, while wedged on the climb the participant comments (to himself) on the inadequacy of jeans for climbing. This represents and acutely challenging situation, as it is always difficult for a climber to move out of a position like this.

Manifest Level: then, all of a sudden, the participant, 'just sits back and rope' and asks belayer to "take me there".

Codable Moment: the observations correlate with signs of, 'physically struggling' and asking the belayer to 'take them' correlates with symptoms of, 'resting on rope'. This analysis places the participant in an affective state of Anxiety.

Action Opportunities (T46): situationally, the participant has just been sat quietly in their harness and hanging on the rope. The participant was like this for 25 seconds. Then all of a sudden, the participant Just starts to try to climb (nothing said, no warning).

Manifest Level: the participant is observed to be 'singularly determined and climbing quite well' at one point the are heard to say, "ahhhh".

Codable Moment: the observations correlate to signs and symptoms of:
1. High cognitive and or physical investment.
2. Finding the climbing difficult.
3. Unable to communicate other that in single words – grunts of effort

This analysis locates the participants between the congruent affective states of Arousal.

Action Opportunities (T47): situationally, the participant is continuing to climb and making persistent progress.

Manifest Level: the participant is seen to be – 'working hard to stay on climb' and is heard to say, "uhhh".

Codable Moment: the observations correlate to signs of:
1. High cognitive and or physical investment.
2. Finding the climbing difficult.

The participants statement correlates to symptom correlates to, 'Unable to communicate other that in single words – grunts of effort'.

This analysis places the participant in an affective state between Arousal.

Action Opportunities (T48): situationally, the participant is attempting to make a specific move that requires him to bridge between two holds on opposing walls that are quite wide apart.

Manifest Level: at this moment the participants says, "I'm not supposed to put my legs that far apart at my age".

Codable Moment: this self-report corresponds to symptoms of:
1. Identifying problematic situation.
2. Detailed descriptions.

This analysis locates the participant between two congruent affective states Arousal/Anxiety.

Action Opportunities (T49): the participant is now in the upper section of the climb and is continuing to make progress.

Manifest Level: the participant is observed to – 'work hard to top out on climb with-out further incident'.

Codable Moment: this observation correlates to signs of, 'high levels of effort'. This analysis places the participant in an affective state of Arousal.

Action Opportunities (T50): situationally, the participant has lowered of the climb and is on the floor whilst reflecting on their experience of the climb. They appear to be experiencing the affects of fatigue.

Manifest Level: the participant describes the climb saying, "I would describe that as unpleasant - That's quite energetic but in a wrestling kind of energetic rather than a pumped in the fingers or forearms that's just like a uhhhr". The participant then asks, "are things going to get easier now"?

Codable Moment: the participants self-report correlates to symptoms of:
1. Identifying problematic situation.
2. Expressing negative feelings.
3. Saying the climb is too hard (in an unpleasant way).

This post climb reflective analysis of the participant places the participant in an affective state of Anxiety while they were climbing. This corroborates much of the situational interpretations from T39 to T49.

Furthermore, the participant asking if things are going to get easier now suggest the participant is becoming fatigued.

Climb 7, Proposition 7 (P7): right hand side of the purple profile wall next to the slab (4b, 12 meters).

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T51 to T53	Climbed easily with very little effort or any great thought	1. Effortless actions. 2. Ease of movement and decisions.			**Relaxing**
T52	Stood at 2 meters making second clip not using hands at all (just balancing with ease)	Ease of movement and decisions.			**Relaxing**
T54			That's just very relaxing. It's a gentle stroll. It's the opposite end of the danger scale	1. Discussing the climb. 2. Expressing positive emotion.	**Relaxing**

Action Opportunities (T51, T52 and T53): systemically, the objective challenge of the climb has lowered substantially. The participant understands with clarity what this reduction in the objective climbing grad means for how much easier this climb will now be.

Manifest Level: overall, the participant is seen to be – 'climbing easily with very little effort or any great thought'. At T52 the participant is even seen to be, 'stood at 2 meters making second clip not using hands at all (just balancing with ease)'.

Codable Moment: these observations correspond to signs of:
1. Effortless actions
2. Ease of movement and decisions.

This analysis places the participant in an affective state of Relaxation.

Action Opportunities (T54): situationally, that participant has returned to the floor and is reflecting on their experience of the climb.

Manifest Level: the participant describes the climb saying, "that's just very relaxing.

It's a gentle stroll". The participant then adds to this by saying, "It's the opposite end of the danger scale".

<u>Codable Moment</u> taken literally the participants post climb reflection is self-evident and corroborates the analysis of T51, T52 and T53. In addition, the participants post climb reflection can be analysed semantically where the participants statement corresponds to symptoms of:

1. Discussing the climb.
2. Expressing positive emotion.

This semantic analysis places the participant in an affective state of Relaxation. This also corroborates the analysis of T51, T52 and T53.

Importantly, what does the participants final statement say about their experience of climb 6? Is this further evidence confirming the Anxiety analysis of T50?

Climb 8, Proposition 8 (P8): left hand side of the purple profile wall (4a, 12 meters).

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T55	Stood on one foot holding on with one hand and looks up and around at the top of different wall (not at his climb) and then looks down. All while clipping.	1. Looking down. 2. Missing out holds. 3. Only 2 points of contact – not using hands at all	Having fun then? (said rhetorically and sarcastically)	Expressing negative emotion.	**Boredom**

<u>Action Opportunities (T55)</u>: systemically, action opportunities have objectively decreased again.

<u>Manifest Level</u>: the participant is seen to be, 'stood on one foot holding on with one hand and looks up and around at the top of different wall (not at his climb) and then looks down. All while clipping the rope'. The participant then says, "having fun then?", this statement is said with sarcasm and rhetoric.

<u>Codable Moment</u>: the observations and participant statement correspond to signs and symptoms of:

1. Looking down.
2. Missing out holds.
3. Only 2 points of contact – not using hands at all
4. Expressing negative emotion.

This analysis corresponds to the participant being in an affective state of Boredom.

Climb 9, Proposition 9 (P9): (3c, 12 meters).

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T56			Question: What are you thinking about at this point? Answer: "climb then go and have a pint" Question: why? Answer: "this is just – I'm not going to enjoy this"	1. Easy conversation 2. Expressing negative emotion.	**Boredom (Trait of Misuse or Disuse?)**
T57			Can we just go to the pub now?	Expressing a desire to be doing something else.	**Boredom**
T58			Question: how do you think you would feel if the entire experiment was conducted at this grade? Answer: "a lot more bored"	Expressing negative emotion.	**Boredom**

Action Opportunities (T56, T57 and T58): systemically, the participant is going to do the last climb in the series of climbs prescribed by the protocol. Situationally, prior to the participant commencing the climb, the participants body posture is observed to be slipping, at this moment the participant then leans up against a wall and sighs, heavily. This indicates that the participant is heavily fatigued prior to commencing the final climb.

Manifest Level: as the participant climbs, they are asked the question: what are you thinking about at this point? The participant answers, "climb then go and have a pint". When asked why? The participant says, "this is just – I'm not going to enjoy this". This is then followed up by the participant asking, "can we just go to the pub now?"

The participant is then asked the question: how do you think you would feel if the entire experiment was conducted at this grade? The participants answer is, "a lot more bored".

Codable Moment: the participants statement can be taken literally, thus placing the participant in an affective state of Boredom and in the Trait of Disuse. This analysis is corroborated when the participants statements are analysed semantically in terms of symptoms:

1. Easy conversation
2. Expressing negative emotion
3. Expressing a desire to be doing something else.

The semantic analysis of symptoms places the participant in an affective state of Boredom. This aligns both literal and semantic analysis of the affective state of the participant.

Participant 3:

Climb 1, Proposition 8 (P8): purple wall right hand side by the slab (5a, 12 meters)

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T1	Checking belay device before starting to climb	Directing attention to where it's needed.			Control
T2 – T3	Ascended without incident climbing with precision. However, the initial high step was unnecessary as if participant did not see any of the lower foot placements	1. Failure to identify critical cues. 2. Working harder than necessary.			Arousal/Anxiety
T4	Participant forgot that they needed to take out the quick draws having just placed them. Failed to clip both lower offs at the top of the climb (safety issue). Participant is acutely aware this is an issue	1. High level of cognitive effort. 2. Failure to identify critical cues.			Arousal/Anxiety
T5			I was feeling pressure. I had to try to keep in mind this was only a warm-up It felt alright. Just a pressure thing. Wasn't comfortable at all I know I'm being watched	1. High levels of cognitive effort. 2. Attempts to mitigate demands of challenge. 3. Identification of specific problem.	Arousal AND Worry

Action Opportunities (T1): systemically, this is the first climb that the participant is attempting. The objective challenge represented by this climb is well below the participants self-selected median climbing grade. This climb is intended to act as

447

a warmup for the participant. Situationally, the participant is on the floor in front of the climb and is ready to climb.

Manifest Level: immediately before the participant begins to climb, they are seen to – check that the belayer has correctly setup the belay device.

Codable Moment: this observation correlates to the sign of – directing attention to where it's needed. This analysis places the participant in an affective state of Control.

Furthermore, checking the belayer is a very integral part of construct 2 in the participants construct elicitation. The participant describes it as an issue of trust, saying it's, "about trusting the other person […] about the little things that can go wrong. Are they capable of doing that?"

Action Opportunities (T2 to T3): situationally, the participant has touched the wall and is literally stepping from the floor to being on the wall.

Manifest Level: as the participant steps onto the wall they are observed to – make an unnecessarily high step onto the wall, failing to see or utilise any of the lower foot holds.

Codable Moment: these observations correspond to signs of:
1. Failure to identify critical cues.
2. Working harder than necessary.

This analysis combines elements of Arousal and Anxiety. Therefore, the participant is interpreted as being in an affective state between Arousal/Anxiety.

Action Opportunities (T4): situationally, the participant has successfully reached the top of the climb and is about to lower off the top.

Manifest Level: the participant – forgets that they needed to take out the quick draws having just placed them. The participant also fails to clip both lower offs at the top of the climb (safety issue). Participant is acutely aware this is an issue and its potential dangers.

Codable Moment: these failures of safety by the participant correlate to signs of:
1. High level of cognitive effort.

2. Failure to identify critical cues.

This analysis combines elements of Arousal and Anxiety. Therefore, the participant is interpreted as being in an affective state between Arousal/Anxiety.

<u>Action Opportunities (T5)</u>: situationally, the participant has returned safely to the ground (this situation was allowed to continue because the participant had left the quickdraws in the climb. Had the participant started to remove the quickdraws having not double clipped at the top of the climb the participant would have been stopped).

<u>Manifest Level</u>: the participant said in their post climb reflections, "I was feeling pressure. I had to try to keep in mind this was only a warm-up. It felt alright. Just a pressure thing. Wasn't comfortable at all I know I'm being watched."

<u>Codable Moment</u>: the participants self-report correlates to symptoms of:
1. Focus strays form immediate to future.
2. High levels of cognitive effort.
3. Attempts to mitigate demands of challenge.
4. Identification of specific problem.

The symptoms combine elements of Arousal and Worry. This analysis places the participant in an affective state that encompasses two affective states, therefore, the participant is coded as being in a complex state of Arousal AND Worry. This analysis closely approximates to the interpretation of the participants experience of the first climb.

In addition, to the analysis of climb 1, the participants construct elicitation triangulates with the participants expressed dislike of being watched. This in the negative pole of construct 14 – fear of judgement of others (being watched).

Climb 2, Proposition 3 (P3): slab climb – this is a technical climb (5c, 12 meters).

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T6			"Say's Liam set these climbs"	Able to climb and respond to questions.	**Control**
T7	Participants is distracted by the climber to his right lowering off. Indicating his attention is being split between his own climb and other extraneous distractions	1. Focus strays form immediate. 2. Being distracted from task. 3. Attention moves from focus to alertness.			**Arousal (Upper end)**
T8			"I wasn't as comfortable as I would have liked"	Expressing discomfort.	**Arousal**
T9			"I could feel myself trying to pay attention and getting distracted by other climber to the right lowering off"	Attention moves from focus to alertness.	**Arousal**

Action Opportunities (T6): situationally, the participant is on the first third of the climb, they are climbing well with accuracy and dexterity.

Manifest Level: after climbing for 49 seconds the participant says, "Liam set these climbs".

Codable Moment: the participants ability to – climb and respond to questions, correlates to the participant being in an affective state of Control.

Action Opportunities (T7): situationally, at about half height on the climb progress for the participant appears to of become more effortful.

Manifest Level: the participant is seen to be, 'distracted by the climber to his right lowering off. Indicating his attention is being split between his own climb and other extraneous distractions'.

Codable Moment: this observation correlates with signs of:
1. Focus strays form immediate.
2. Being distracted from task.
3. Attention moves from focus to alertness.

This analysis places the participant in an affective state of Arousal.

Action Opportunities (T8 and T9): situationally, the participant has returned to the floor and is reflecting on their experience of the climb.

Manifest Level: at T8 the participant says, "I wasn't as comfortable as I would have liked" and then at T9 says, "I could feel myself trying to pay attention and getting distracted by other climber to the right lowering off".

Codable Moment: these self-reports correlate to - expressing discomfort at T8 and then at T9 describing how attention moves from focus to alertness. This analysis corresponds to the participant being in an affective state of Arousal.

The participants reflections corroborate the previous analysis at time index T7.

Climb 3, Proposition 1 (P1): same slab, different climb (6a, 12 meters).

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T10			"I feel like I'm just starting to warm up"	Expressing positive emotion	**Control**
T11 – T12	Climbing with precision, control and delicacy. In spite of pump developing in both arms (no one climbs around participant for the duration of the climb)	1. Smoothness of actions. 2. Confidence of movement and decisions. 3. Directing attention to where it's needed.			**Control**
T13			"That's the hardest I've climbed for a while" "Felt great"	1. Discussing the climb. 2. Positive descriptions of climb. 3. Expressing positive emotion.	**Control**

Action Opportunities (T10): situationally, the participant is on the ground preparing for their 3rd climb and discussing how they are feeling.

Manifest Level: at this point the participant says, "I feel like I'm just starting to warm up".

Codable Moment: this statement correlates to symptoms of – expressing positive emotion. This analysis places the participant at this moment in an affective state of Control.

Action Opportunities (T11 to T12): situationally, the participant is ascending the same slab for the 2nd time but using an objectively harder climb that is one grade harder.

Manifest Level: the participant is seen to be climbing – with precision, control and delicacy.

In spite of pump developing in both arms. The participant over comes the pump by stopping and shaking out both arms separately. The participant achieves this by using skill and good climbing technique.

Codable Moment: these observations correspond to signs of:
1. Smoothness of actions.
2. Confidence of movement and decisions.
3. Directing attention to where it's needed.

This analysis places the participant in an affective state of Control.

Action Opportunities (T13): situationally, the participant has returned to the floor and is reflecting on their experience of the climb.

Manifest Level: the participant says, "that's the hardest I've climbed for a while […] felt great".

Codable Moment: the participants self-report corresponds to symptoms of:
1. Discussing the climb.
2. Positive descriptions of climb.
3. Expressing positive emotion.

This analysis places the participant in an affective state of Control. Furthermore, this analysis of the participants self-report corroborates the analysis of time index's T11 to T12.

This analysis is supported by the positive pole of the participants 3rd construct. In this construct the participant describes himself as being in Control. He derives this from 'being in a situation that he has doubted himself' and a situation when 'everything comes together'. The participant goes on to say, "is like competency with the right amount of challenge".

Climb 4, Proposition 2 (P2): Same slab, different climb (6a+, 12 meters)

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T14 – T15	Demonstrating dexterity, precision of movement and accuracy of placement	1. Smoothness of actions. 2. Confidence of movement and decisions. 3. Focus is complete. 4. Limited or no conversation while climbing.			**Control/Flow**
T16 – T17	Maintains focus and smoothness and dexterity of movements through entirety of climb even though some one is climbing on the left-hand side of participant	1.Directing attention to where it's needed. 2. Fully absorbed in activity.			**Control/Flow**
T18			"there were moments where I lost it"	Expressing discomfort.	**Arousal**
T19			"Really nice – it's been ages since I've climbed that hard"	Expressing enjoyment/pleasure after climb.	**Flow (Trait?)**

Action Opportunities (T14 to T15): preciously the participant has been identified as being in a buoyant positive. Situationally, the participant chooses to do a third, but different climb on the same slab. While the participant is preparing for this (4th) climb they say, "I'm looking forward to this".

Manifest Level: between time index T14 and T15 the participant is observed to be – demonstrating dexterity, precision of movement and accuracy of placement.

Codable Moment: these observations correlate with signs of:

1. Smoothness of actions.
2. Confidence of movement and decisions.
3. Focus is complete.
4. Limited or no conversation while climbing.

This analysis contains elements of two contiguous affective states. Therefore, the participant is interpreted as being between an affective state of Control/Flow.

Action Opportunities (T16 to T17): the participant has been making sustained progress ascending the climb. However, as previously noted at time index T9 the participant does not like people climbing around him. Situationally, another

person in the climbing center begins to ascend the easier climb immediately to the left of the participant.

Manifest Level: the participant is seen to – maintain focus and smoothness and dexterity of movements through entirety of climb even though some one is climbing on the left-hand side of participant.

Codable Moment: these observations correspond to signs of:
1. Directing attention to where it's needed.
2. Fully absorbed in activity.

This analysis contains elements of two contiguous affective state – Control and Flow. Therefore, the participant is interpreted as being in an affective state between Control/Flow.

Action Opportunities (T18 and T19): having successfully completed the climb and returned to the ground, the participant is reflecting on their experience of the climb.

Manifest Level: the participant initially talks about how they were feeling when the other climber was climbing by the side of them. The participant at T18 says, "there were moments when I nearly lost it up there" (the participant was referring to focus). In addition to this, at T19, the participant goes on to say, "really nice – it's been ages since I've climbed that hard"

Codable Moment: the participants self-report at T18 corresponds to symptoms of – expressing discomfort and at T19 the participants self-report corresponds to symptoms of – expressing enjoyment/pleasure after climb.

This analysis of the participants self-reports at T19 indicates that overall the participant experienced an affective state of Flow. However, this experience was mitigated (particularly in the top half of the climb) with acute moments of Arousal. This analysis is consistent with the analysis at T9 and provides corelative evidence for why the participant may not have fully experienced and affective state of Flow from T14 to T17.This aligns with the positive pole of the participants 5th construct. The participant says, "moving without influence in my body […] no fear, no logic, just moving […] nothing going on I'm just moving".

Climb 5, Proposition 4 (P4): Same slab, different climb – not completed (6b, 12 meters).

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T20	Participant has become more animated and is smiling in his discussion of what we are doing	1. Comfortably responding to questions and elaboration on them. 2. Discussing the climb			**Relaxation**
T21 to T23	Participant is completely focused and manages to combine power with accuracy and delicacy, requiring increasingly agile movement.	1. Focus is complete. 2. Fully absorbed in activity. 3. Smoothness of movement. 4. Task Focused.			**Flow**
T22	Takes a no hand rest, just using balance to keep position (very difficult, demonstrating confidence	1. Innately knowing what needs to be done.			**Flow**
T24	Stood on larger holds lightly slapping the wall with right hand (five times).	1. Identification of problems. 2. Stop to identify holds. 3. Focus strays.			**Arousal (Frustration)**
T25	Looking at the holds above and reaching for them to see what they are like	Regulate their attitudes and feelings towards a specific task and avoid undesired outcomes.			**Control**
T26	Stood on one leg and holding on with one hand looking down and around	Regulate their attitudes and feelings towards a specific task and avoid undesired			**Control**
T27	Part way through crux move has to make difficult clip.	1. Unable to communicate other that in single words – grunts of effort. 2. Identification of problems			**Arousal**
T28	Trying to clip rope participant falls	Physically struggling			**Anxiety**
T29	Stood on larger holds resting and shaking out arms	1. May stop to identify holds. 2. High levels of physical effort.			**Arousal**
T30	Is unable to complete the move	Movement becomes stunted			**Arousal**
T31	Participant decides not to continue with climb. Retreats safely.	Regulate their attitudes and feelings			**Control**

T32			"The less you trust your feet the more likely you are to slip off"	1. Detailed descriptions. 2. Expressing great effort.	**Arousal**
T33			"mentally tiring rather than physically"	Expressing discomfort.	**Arousal**

<u>Action Opportunities (T20)</u>: systemically, there is always going to be a period of time when one climb ends and before another begins. Situationally, the participant is casually interacting with the researcher, as would be the case in any normal indoor climbing session between two people.

<u>Manifest Level</u>: the participant is observed to be – more animated (than has been previously observed) and is smiling in his discussion of what we are doing and how his climbing is going.

<u>Codable Moment</u>: this observation correlates with signs of – comfortably responding to questions and elaboration on them. This analysis places the participant in an affective state of Flow.

<u>Action Opportunities (T21, T22 and T23)</u>: this is the fourth climb the participant has elected to do on the same slab. The holds on this climb are increasingly small as would be expected on a section of wall with a range of climbs that increase in degree of challenge.

<u>Manifest Level</u>: between time index T21 to T23 the participant is seen to be – completely focused and managing to combine power with accuracy and delicacy, requiring increasingly agile movement. In addition, to this, between T21 and T22 the participant is seen at T22 to – take a no hands rest, just using balance to keep position.

<u>Codable Moment</u>: these observations correlate to signs of:
1. Focus is complete.
2. Fully absorbed in activity.
3. Smoothness of movement.
4. Task Focused
5. Innately knowing what needs to be done.

This analysis places the participant in an affective state of Flow.

Action Opportunities (T24): Situationally, at approx. 9 meters the participants progress is impeded by the crux move (a very small rounded foot placement for right foot and very little for hands). This situation is acute and proximal. For the participant to proceed they have to unlock this sequence of moves. Then at this juncture the participant takes a rest by standing on larger holds not allocated to the climb.

Manifest Level: the participant is seen to be – stood on larger holds lightly slapping the wall with right hand (five times).

Codable Moment: this observation correlates to signs of:
1. Identification of problems.
2. Stop to identify holds.
3. Focus strays.

This analysis places the participant in an affective state of Arousal.

Action Opportunities (T25): situationally, after slapping the wall the participant just sits back in his harness hanging on the rope.

Manifest Level: the participant is then seen to be – looking at the holds above and reaching for them to see what they are like. This is indicative of a climber trying to unlock the crux move.

Codable Moment: this observation correlates to signs of the individual – regulating their attitudes and feelings towards a specific task and avoid undesired outcomes. The analysis places the participant in an affective state of Control.

Action Opportunities (T26): situationally, the participant is still unable to progress his assent up the climb.

Manifest Level: the participant is observed to be – stood on one leg and holding on with one hand looking down and around.

Codable Moment: this observation correlates to signs of the participant trying to – regulate their attitudes and feelings towards a specific task and avoid undesired. The analysis places the participant in an affective state of Control.

Action Opportunities (T27): situationally, the participant resumes the climb – steps back onto the correct hold for the 6b. The participant makes a powerful very high step up on small hold but doesn't complete move and has to step back down onto larger foot holds. The participant stays with the climb and is looking around trying to work out how to make the crux move. The participant then makes a second attempt to do crux move. This situation is acute and proximal.

Manifest Level: at this point the participant is seen to be – part way through crux move has to make difficult clip.

Codable Moment: this observation correlates to signs of:
1. Unable to communicate other that in single words – grunts of effort.
2. Identification of problems

This analysis places the participant in an affective state of Arousal.

Action Opportunities (T28): situationally, the participant is attempting to clip the rope from a very strenuous position partway through the crux move.

Manifest Level: the participant - falls

Codable Moment: this observation correlates to signs of the participant – physically struggling. This analysis places the participant in an affective state of Anxiety.

Action Opportunities (T29): having just fallen the participant is sat in his harness hanging on the rope.

Manifest Level: the participant is seen to be – stood on larger holds resting and shaking out arms.

Codable Moment: this observation correlates to signs of:
1. May stop to identify holds.
2. High levels of physical effort.

This analysis places the participant in an affective state of Arousal.

Action Opportunities (T30): situationally, the participant moves up to clip the rope in the quickdraw above the crux where he previously fell at T28. Then the participant then returns to his previous position. At this point the participant sits back in his harness and takes another rest on the rope. Then the participant attempts the crux move for the third time with a different approach.

Manifest Level: the participant is seen to be – unable to complete the move (and retreats).

Codable Moment: this observation correlates to signs of – movement becomes stunted. This analysis places the participant in an affective state of Arousal.

Action Opportunities (T31): at this point the participant uses personal discretion and decides not to continue with the climb. However, because the participant is at approximately 9 meters in height, it is imperative that he does so safely. A typical example might be for someone to just lower off from that point on just the quickdraw.

Manifest Level: the participant is observed to – ascends to the top using any hold. Clips the rope properly and safely at the top and then lowers to the floor.

Codable Moment: this observation correlates to signs of – regulate their attitudes and feelings. This analysis places the participant in an affective state of Control.

Action Opportunities (T32 and T33): situationally, the participant has returned to the floor and is reflecting on his experience of the climb.

Action Capabilities:

Manifest Level: the participant says, "the less you trust your feet the more likely you are to slip off […] mentally tiring rather than physically."

Codable Moment: these self-reflections correspond to symptoms of:
1. Detailed descriptions.
2. Expressing great effort.
3. Expressing discomfort.

This analysis places the participant in an affective state of Arousal. While this does not correlate with the analysis of the acute moments identified during the climb, it does confirm several of the other encoded moments.

The participants recognition of trust – trusting feet in this instance is a theme that occurs across 4 of his personal constructs, constructs 1, 2, 6 and 7. In construct 2 the participant makes a distinction between logic and emotion saying, "Logic & emotion: logic leaves you at the ground". Indicating that the experience in emotive. The participant describes how you can do all of the preparatory work you like on the ground, but when you're climbing, he says, "none of this makes a difference". Implying that success of failure resides in how you feel about a very specific and acute situation. One small rounded foot hold.

Climb 6, Proposition 5 (P5): vertical wall, in the middle of the white wall – not completed (6b+, 12 meters)

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T34			"if I fall it could be a big swing"	1. Directing attention to where it's needed. 2. Self-manage or regulate their attitudes and feelings. 3. Identification negative consequences of a specific threat.	**Worry AND Control**
T35	Instantly moves onto larger holds	1. Identification of (consequence) of specific problem. 2. Using extra holds.			<mark>**Anxiety/Worry**</mark>
T36	Makes the clip using big holds	1. Identification of problems. 2. High levels of cognitive and/or physical effort. 3. Attention moves from focus to alertness.			**Arousal**
T37	Left foot slips off hold	1. Unable to communicate other that in single words – grunts of effort. 2. Participant focus narrows	Sharp exhalation (surprise)	An acute sharp expiration type of breath.	**Arousal/Anxiety**
T38	Lowers off to the ground. Forgetting to retrieve the auto bely or to climb to the top on larger holds as he had previously done on climb 5	1. Physically struggling. 2. Failure to identify critical cues.			**Anxiety**

Action Opportunities (T34): systemically, this is the participants penultimate challenging climb. The participant elects to climb in the middle of the end wall of the climbing centre. While inspecting the wall before climbing, the participant identified that the clips were to the left of the climb.

Manifest Level: the participant says, "if I fall it could be a big swing".

Codable Moment: the participants interpretation of the objective challenges this climb presents corresponds to symptoms of:

1. Directing attention to where it's needed.

2. Self-manage or regulate their attitudes and feelings.
3. Identification negative consequences of specific problem.

This analysis places the participant between two apparently conflicting affective states Worry AND Control.

Action Opportunities (T35): situationally, the participant has climbed well to approx. 5 meters and has clipped the rope twice and is moving towards the 3rd clip that is situated of to the far left of the climb.

Manifest Level: at the point of it becomes necessary for the participant to make the 3rd clip, the participant is seen to – instantly moves onto larger holds.

Codable Moment: this observation correlates to signs of:
1. Identification of (consequences) of specific problem.
2. Using extra holds.

This analysis places the participant between the congruent affective states of Anxiety/Worry.

Action Opportunities (T36): having moved onto bigger holds to alleviate the participants fear of falling.

Manifest Level: the participant is seen to – make the clip.

Codable Moment: this observation corresponds to signs of:
1. Identification of problems.
2. High levels of cognitive and/or physical effort.
3. Attention moves from focus to alertness.

This analysis places the participant in an affective state of Arousal.

Action Opportunities (T37): having made the third clip the participant then asks to be taken on the rope and lowered off to the first clip so that he can reclimb that section. The participant then starts to reclimb the wall, he moves up past the third clip, carries on through makes the 4th clip and then proceeds on to the 5th clip. At this point the participant moves onto big holds to make the 5th clip and then asks to be lowered back down to the first clip so that he can reclimb the entire section.

Manifest Level: as the participant is re-ascending the climb the participants foot is seen to – slip off a hold and the participant does a sharp exhalation of breath.

<u>Codable Moment</u>: these observations correlate to signs and symptoms of:
1. Unable to communicate other that in single words – grunts of effort.
2. Participant focus narrows.
3. An acute sharp expiration type of breath.

This analysis places the participant between to congruent affective states of Arousal/Anxiety

<u>Action Opportunities (T38)</u>: exactly at the level of the 5th clip sits back on the rope and vigorously shakes out arms from pump. As the participant is hanging on rope looking around and down for approx. 2 minutes. The participant then makes a few attempts to get back on the wall but makes no progress, he then sits on the rope for another 1min 48 sec. He then attempts to climb again but quickly sits back on rope. The researcher asks, "would you like to come down?"

The participant responds, "I'll try one more"

Researcher, "Yeh go for it". The participant then starts to climb again at 5th clip for 3rd time. He makes 2 determined moves but again sits back on the rope. At this point the participant then asks to be lowered back to the ground.

<u>Manifest Level</u>: at this point the participant is seen to – forget to retrieve the auto bely or to climb to the top on larger holds as he had previously done on climb 5.

<u>Codable Moment</u>: this observation corresponds to signs of:
1. Physically struggling.
2. Failure to identify critical cues.

This analysis places the participant in an affective state of Anxiety.

The participant goes on to say, "I stuck with it because the whole idea is the research […] normally I'd be raging if I messed up a move"

This aligns with the participants 7th construct that discusses failure of a climb. The participant describes this pole as, "this isn't fear … shame. I should be able to do this; to <u>demonstrate</u> that I can do this (to everyone including self)".

From this point the background noise in the climbing centre was so loud it makes audio transcription exceptionally difficult from the video footage. Symptoms documented in the tables below are taken form notes that were recorded at the exact time the participant said them during the experiment.

Climb 7, Proposition 6 (P6): vertical wall, right hand side of the white wall – not completed (6c, 12 meters).

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T39	Elected to use the auto belay instead of leading	1. Identification of (consequences) of problems. 2. Does not feel able to cope with the situation			**Anxiety/Worry**
T40			"There was nothing else in the room"	1. Focus is complete. 2. Fully absorbed in activity.	**Flow**
T41			"Can't climb until he's finished"	1. Confidence of decisions. 2. Regulation of attitude and behaviour.	**Control**
T42			That orange was perfect	Expressing enjoyment/pleasure after climb.	**Flow**
T43	Participant is far more talkative and animated about this climb	1. Expressing enjoyment/pleasure after climb. 2. Detailed descriptions.			**Flow/Arousal**

Action Opportunities (T39): systemically, this is the hardest climb that the participant attempts. The participant chose this climb, because he said he found the look of the climb "pleasing".

Manifest Level: prior to the starting the climb the participant asked if they could use the auto belay.

Codable Moment: this movement from lead climbing to using the auto-belay removes a great deal of the objective difficulty and danger the climber will experience when trying to ascend the climb. This desire expressed by the participant corresponds to signs of:

1. Identification of (consequence) of specific problems.
2. Does not feel able to cope with the situation.

This analysis places the participant between congruent affective state of Anxiety/Worry.

Action Opportunities (T40): situationally, the participant is moving well. He ss having to work out how to do moves at each point of the climb. At one point the participant chalks up both hands, carry's on climbing moving deliberately knowing what needs to be done. While on the crux move the participant falls of the climb. When the participant was back on the floor, he was asked how the climb felt.

Manifest Level: the participant responded by saying, "that was really nice up there […] there was nothing else in the room".

Codable Moment: this response codes to symptoms of:
1. Focus is complete.
2. Fully absorbed in activity.

This analysis places the participant in an affective state of Flow.

The participants experience of climb7 aligns with two positive poles of the participants constructs: constructs 1 and 11. The participant describes the pole of construct 1 as, "not thinking, I don't need to think […] relaxed. Body knows where to go. Working on its own, or so quickly it seems to be working on its own". Then in the positive pole of construct 11 the participant says, "my ideal climb isn't a climb, it's a situation". He then qualifies this by saying he, "use it as a way to feel more:

(i) Not a climb, a mindset; (ii) It feels like nothing; (iii) You're not carrying any of the stuff that fills the space; (iv) Like how meditation is described".

Action Opportunities (T41): situationally, the participant is on the ground getting ready to attempt climb 7 again.

Manifest Level: prior to starting the climb the participant says, "can't climb this until he's finished" (there was another person climbing immediately to the left of climb 7).

Codable Moment: this statement of the participants corresponds to signs of:
1. Confidence of decisions.
2. Regulation of attitude and behaviour.

This analysis places the participant in an affective state of Control.

Interpreting the participants affective state in this way aligns with an element of the positive pole of the participants 6th construct. In the construct the participant provides a list of elements that need to present for as he describes it, "everything comes together", a specific element is: other climbers, climbing around him.

Action Opportunities (T42): situationally, while the participant is stood around waiting for the other climber to finish, he can be seen stood appraising the climb, working through the moves with his hands as he is stood on the ground. Once the other climber has finished the participant starts the climb again.

Manifest Level: after 1 min 39 sec the participant falls in the same position of the same crux move. Moments later the participant was on the floor again (result of auto belay) and said, "that orange was perfect […] I was smiling when I fell of that move". When asked why? The participant said, "not juggling" (because of the auto belay he could just concentrate on the climb).

Codable Moment: the participants self-reports correlate to symptoms of – expressing enjoyment/pleasure after climb. This analysis places the participant in an affective state of flow. This analysis is again corroborated by the positive pole of construct 6.

Action Opportunities (T43): situationally, the participant is on the ground having just fallen of the climb and he is talking about the nuances of the climb.

Manifest Level: the participant is seen to be – far more talkative and animated about this climb discussing its qualities as a climb and the merits of the orange holds.

Codable Moment: these reflections of the participant correspond to signs of:
1. Expressing enjoyment/pleasure after climb.
2. Detailed descriptions.

This analysis places the participant between 2 contiguous affective states Flow/Arousal.

Climb 8, Proposition 7 (P7): left corner of the white wall (5b, 12 meters).

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
T44 – T45	Climbs with ease missing out some holds	1. Effortless actions. 2. Climbing and talking. 3. Missing out holds.			**Relaxation/Boredom**
NT1 No Time Index			"I didn't like it, sluggish and clumsy. There is no value to it."	Expressing negative emotion	**Boredom (Disuse)**
NT2			"There were levels of stress because I was going above the grade" (missing out holds)	1. Expressing negative emotion/feelings. 2. Expressing a desire to be doing something else. 3. Trying to do/make something harder. 4. Identifying problematic situation.	**Boredom AND Anxiety**

Action Opportunities (T44 to T45): systemically, the challenge level has radically decreased – 6 objective grades.

Manifest Level: the participant is seen to be - climbing with ease, but missing out some holds.

Codable Moment: these observations correlate with signs of:
1. Effortless actions.
2. Climbing and talking.
3. Missing out holds.

This analysis places the participant between the contiguous affective states of Relaxation/Boredom.

Action Opportunities (NT1 to NT2): situationally, the participant is on the floor reflecting on their experience of the climb.

Manifest Level: the participant says, ""I didn't like it, sluggish and clumsy. There is no value to it. […] There were levels of stress because I was going above the grade (missing out holds)".

Codable Moment: the participants post climb reflections correlate with symptoms of:
1. Expressing negative emotion/feelings.

2. Expressing a desire to be doing something else.
3. Trying to do/make something harder.
4. Identifying problematic situation.

An analysis of these symptoms implies that the participant is simultaneously experiencing two non-contiguous affective states Boredom AND Anxiety.

The participants sensory experience of climb 8 in the affective domain links to the positive pole of the participants 6th construct. This link however is not about the presence of:

1. Level of challenge.
2. Belayer.
3. Other climbers.
4. Mental state

It is the affect that the absence of these elements has on the experience of the participant. Specifically, in this instant the absence of an appropriate level of challenge.

Climb 9, Proposition 9 (P9): left of centre of the white wall (4c, 12 meters).

Time Index	Observed (Manifest)	Signs (Codebook)	Reported (Manifest)	Symptoms (Codebook)	Affective State
NT3			"To get the same level of enjoyment I have to up the stakes"	Asking to do a harder climb.	**Boredom**
NT4	Climbs with very little effort missing out holds on the route. The number of holds seem to be making the participant use contrived moves interrupting the natural flow of the way they climb	1. Missing out holds. 2. Trying to do/make something harder			**?**
NT5			"It was alright – no it wasn't – It required more effort than something harder"	Expressing negative emotion.	**Boredom**
NT6			"You don't need good technique, so you have to find a way of doing it with good technique"	1.Expressing negative emotion. 2. Trying to make climb harder.	**Boredom**

Action Opportunities (NT3): situationally, the participant is getting ready to begin the last and easiest climb in the protocol. He is expressing his thoughts on climbing at this level challenge.

Manifest Level: the participant says, "To get the same level of enjoyment I have to up the stakes".

Codable Moment: even though a warm down climb at the end of a climbing session is normal, the participants expressed thoughts correspond to symptoms of: 'asking to do a harder climb'. This analysis places the participant in an affective state of Boredom.

Action Opportunities (NT3): systemically, the participant is engaging in climbing the easiest and final climb of the protocol. The participant is not showing any excess signs of fatigue, physically or psychologically.

Manifest Level: the participant is seen to – climb with very little effort missing out holds on the route. The number of holds seem to be making the participant use contrived moves interrupting the natural flow of the way they climb

Codable Moment: these observations correlate with signs of:
1. Missing out holds.
2. Trying to do/make something harder.

This analysis places the participant in an affective state of Boredom.

Action Opportunities (NT5 and NT6): situationally, the participant is on the floor having completed the final climb of the protocol successfully.

Manifest Level: in his post climb reflections the participant says, "It was alright – no it wasn't – It required more effort than something harder […] You don't need good technique, so you have to find a way of doing it with good technique"

Codable Moment: the participants reflections correspond to symptoms of:
1. Expressing negative emotion.
2. Lack of clear goals.

This differential analysis places the participant in an affective state of Boredom.