Investigate the Emotional Journey of doctoral Students through the lenses of Information-seeking behaviour and Gamification.

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DECLARATION

'This is a declaration that the work in this Thesis is my own work and was carried out in accordance with the regulations of the Manchester Metropolitan University (MMU). The result is original, except as indicated by particular references in the text, and no part of the Thesis has been submitted for any other degree. The Thesis has not been presented to any other University for examination either in the United Kingdom or elsewhere.

Signed: Date: 8th November 2024

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ABSTRACT

The research reported here investigates the emotional regulation of doctoral students' experiences during information-seeking behaviour, focusing on revealing differences in how they learn to programme. This research delves into the crucial role of emotion regulation in doctoral students' information-seeking behaviour, an underexplored aspect that has profound implications for academic success and personal well-being. The inquiry is guided by a primary research question exploring how emotion and emotion regulation influence doctoral students' information-seeking behaviour. It further investigates strategies emerging from the research to support emotional regulation in the doctoral journey.

The question explores the direct impact of emotions on the information-seeking behaviour of doctoral students and examines how their emotion regulation strategies facilitate or impede this process. This exploration is grounded in the hypothesis that Emotions directly impact the information-seeking behaviour of doctoral students, with their emotion regulation strategies acting as facilitators or barriers in this process. The study identifies the significant emotional impacts and external factors related to emotion regulation during information-seeking behaviour to address this. Furthermore, it investigates how emotion regulation processes bolster self-regulated learning throughout the various stages of doctoral research.

A mixed-methods approach, incorporating a self-reported diary and interviews across three phases of the doctoral journey, serves as the methodological backbone of this study. The data, rich with personal narratives and subjective experiences, is analysed quantitatively for exploratory significance and through a phonomyography lens to distil the essence of participants' emotional journeys. This dual analysis unveils a spectrum of emotions that doctoral students navigate. It highlights the influence of supervisory relationships, resource availability, peer collaboration, work-life balance, financial support, language and cultural barriers, and technology on their information-seeking It further explores the strategies emerging from the research to support emotional regulation in the doctoral journey. The potential of gamification techniques, like the Octalysis Framework, to enhance emotional management and intrinsic motivation in

doctoral students. It posits that integrating gamification can transform the research process into a more engaging and emotionally supportive endeavour. This question not only evaluates the effectiveness of gamification strategies but also proposes a new framework for managing emotions and heightening motivation, thereby aligning emotional drivers with research milestones.

The study's findings culminate in developing the Gamification-Enhanced Model (GEM) framework. The GEM framework is a novel contribution that synthesises the results into actionable strategies, integrating the emotional facets of the doctoral journey with game elements to foster a more supportive and motivating research environment. This framework aims to mitigate negative emotional states and amplify positive ones, ensuring that doctoral students remain engaged, motivated, and emotionally regulated throughout their academic pursuits.

In conclusion, this research contributes significantly to understanding emotional regulation in postgraduate studies, providing evidence-based insights and innovative solutions. By highlighting the importance of emotions in the research process and offering the GEM framework as a tool for enhancement, it paves the way for a new era of doctoral training where emotional intelligence is not just an asset but a central component of academic achievement and personal growth.

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ABBREVIATIONS

DS	Doctoral Students
ETHOS	Ethical Approval Committee
HESA	Higher Education Statistics Agency
GEM	Gamified Emotion Model
IB	Information Behaviour
ISP	Information Search Process
IS	Information Search/Information Seeking
ISB	Information Search Behaviour
IR	Information Retrieval
NVIVO	Data Analysis Software
OF	Octa lysis Framework
PhD	Doctor of Philosophy
SCT	Social Cognitive Theory
SRET	Self-Regulation Emotion Tool
SRL	Self-Regulatory Learning
UK	United Kingdom
US	United States

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My journey towards earning my PhD has been a transformative experience, reshaping my understanding and perception of reality at every turn. This path has ignited a deep, unending passion for personal growth and a broader comprehension of the world. It marks not just a culmination but the beginning of a lifelong pursuit in research.

As I pause at this juncture, it's not just a new understanding of reality that I hold but a profound appreciation for the relentless quest of what it might become. I am in awe of the intricate dance of time, human cognition, and psychology, and how they interweave to continuously evolve the tapestry of life.

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CHAPTER 1

INTRODUCTION

CHAPTER 1: OVERVIEW

Imagine the start of a doctoral student's path. A student steps into her new office, buzzing with a mix of excitement and nerves after her initial meeting with her advisor, contemplating her future as a PhD. She's filled with a sense of pride and achievement, having heard inspiring stories from her advisor and peers, and securing her spot in the programme and as a researcher. Determined to excel, she equips herself with all the necessary tools for her research. With everything in place, she's ready to dive in. However, she soon faces a maze of questions: What information does she need? Where should she look for it? How does she approach learning and research? What topics should she explore? When to begin and when to pause? What are the effective strategies for information seeking? How can she manage her emotions during this learning and research process? As she embarks on her research journey, she navigates through a whirlwind of emotions without fully realizing it. According to Lopatovska (2011), emotions play a crucial role in the doctoral journey, with a wide range of emotions being a typical and expected part of the process. Thus, it's evident that emotions significantly shape how postgraduate students engage in information-seeking behaviours.

This thesis investigates the benefits of considering emotion and emotion regulations for Information-seeking (IS) doctoral students. While the role of emotion and emotion regulation in human activities and behaviour has been well-studied in sociology, psychology, and philosophy communities, its role in information-seeking behaviour (ISB) and self-regulatory learning has yet to be investigated thoroughly. This thesis attempts such an investigation and argues that by considering emotion and emotion regulations, (a) ISB can be founded on a more realistic understanding of the doctoral research and their learning processes; (b) Self-Regulatory Learning built upon this understanding can better address searcher's information-seeking behaviour, and (c) this, in turn, can lead to more effective learning process during the doctoral journey of research through gamification.

Prior research in Information Science that considers emotion has undergone several significant changes, from focusing on the influence of emotion in information-seeking behaviour (Kuhlthau's 2004) to postulating the potential of emotion as a relevant

feedback mechanism (Arapakis, I, Athanasakos, K and Jose. 2010). Emotion-based works have been expanded to different domains of IS/IR, e.g., emotions present as a motivational component that triggers direction, behaviour and preparation of actions (Matteson and Farooq 2013), visualisation of the emotional aspects of human behaviour, including rationality and decision-making (Ekkekakis, P.,2013), and employing user mood to improve the recommendation of movies (Winoto and Tang 2010).

In this thesis, the attempt is to reframe the role of emotion in the information-seeking behaviour (ISB) of doctoral students in a way that not only explains the impact of emotions on postgraduate students' journey but also further explores the potential of emotion regulation processes benefit self-regulatory learning of doctoral students as well. In this regard, this thesis investigates the role of emotion on the information-seeking behaviour of postgraduate students' research journey in three different phases (beginner, middle and final) and how it can be used to expand the fundamental concepts of ISB, such as searcher emotions, self-regulatory learning curve and strategies. Based on the findings, a design conceptual framework is proposed as an alternative way to regulate and manage emotions through actionable gamified design suggestions, which could transform and improve the doctoral student journey.

The rest of this chapter introduces the definitions, thesis statement, research background motivations, thesis statement, aims and achievements of the thesis, and finally, presents the outline of the remainder of this thesis.

1.1 DEFINITIONS

The following paragraphs present relevant definitions of the key terms that will be presented and analysed in the upcoming research explanation. Definitions of Information-seeking behaviour, as well as all the relative terms, are in this section.

This section elaborates on the foundational concepts integral to the forthcoming research. It focuses on a comprehensive understanding of "Information-seeking behaviour" and its associated terms.

The thesis employs various terms like "information," "information need," "information use," "information seeking," and "information behaviour." These terms represent phenomena crucial in human life, satisfied through activities like "browsing" or "seeking." They collectively fall under the broader category of "information behaviour." Hughes (2006) discusses these terms' overlapping nature and varied interpretations, extending to concepts such as browsing, scanning, and encountering. This overlap indicates a complex interplay between different aspects of information processing and utilization in everyday life. The thesis aims to provide clarity and precision in these terms through detailed definitions and contextual explanations, enhancing the understanding of how these concepts interact and influence each other in the broader scope of information science.

1.1.1 Information

The term "Information" has its roots in the Latin "informatio," derived from the verb "informare," indicating the process of forming or shaping ideas. Information is processed or value-added data, transforming raw data into an interpretable and meaningful format. Zalesny and Ford (1990) articulate this transformation as a change in the text structure that subsequently alters the recipient's perception, highlighting the dynamic nature of information as a transformative agent.

Webster's Dictionary (1994) offers a dual perspective: firstly, information as facts or figures prepared for communication or use, distinguishing it from knowledge that is formally organized; and secondly, as the cognitive process wherein the form of an object of knowledge is imprinted upon the mind, leading to a state of knowing. This dual perspective underscores the multifaceted nature of information, encompassing both the tangible aspects (data, facts, figures) and the intangible processes (cognition, understanding).

1.1.2 Information Needs

The "Information Needs" concept emerges from the literature as a progression from a vague awareness of a gap to acquiring information that adds value and meaning (Kuhlthau, 1993; 2004). Wilson (2000) emphasizes the need for a driving motive

behind information-seeking behaviour, suggesting that a conscious realisation of a need prompts the search for information. Case (2002) defines it as the recognition of the inadequacy in one's knowledge base to fulfil a specific goal.

Weijts et al. (1993) further categorise these needs into three types: the need for new information, the need to clarify existing knowledge, and the need to corroborate or verify information already possessed. Fisher et al. (2005) and Hoyte et al. (2019) conceptualize information needs as a knowledge gap in a context requiring sense-making, indicating that information needs are not static but are influenced by the individual's context and circumstances.

1.1.3 Information Use

"Information Use" refers to the application or disregard of acquired information. Wilson (2000) describes it as a combination of physical and cognitive actions involved in assimilating new information into one's existing knowledge base. This process might include practical actions like annotating texts or mental processes such as comparing further information with existing knowledge. Sadeh (2010) critiques Wilson's definition for its limited scope, arguing that it overlooks the potential emergence of new information needs during the search process. Kari (2010) provides a more profound analysis by conceptualizing information use in the broader context of information studies, suggesting that information use is not just about assimilation but also about the transformation and reinterpretation of information within an individual's cognitive and social framework.

1.1.4 Information Behaviours

"Information Behaviour" (IB) encompasses a wide range of both intentional and unintentional behaviours, including information seeking and avoidance. Wilson (2000) defines it as the total spectrum of human behaviour in relation to information sources and channels, comprising both active and passive information seeking and usage. This definition encapsulates a variety of behaviours, from direct interactions such as conversations to indirect engagements like absorbing information from media sources without an immediate intention to act on it.

Bates (2010) views IB as the diverse methods through which humans interact with information, mainly focusing on how they seek and utilize it. This perspective highlights the dynamic nature of information behaviour, acknowledging that it is subject to individual differences, situational contexts, and the evolving nature of information technologies.

1.1.5 Information-Seeking Behaviour

"Information-seeking" is characterized as a conscious effort to obtain information in response to a recognized knowledge gap. This effort can manifest through planned searches or serendipitous discoveries when others share potentially useful information.

Wilson (2000) and Ingwersen and Järvelin (2005) describe it as a goal-driven activity involving interaction with various information systems, whether manual, like newspapers and libraries, or digital, like the internet. Case and Given (2016) concur with Wilson's view, emphasizing the intentionality behind seeking information to fulfill a specific need or gap in knowledge. This concept underscores the purposive nature of information seeking, which is often a strategic and goal-oriented process.

1.1.6 Information Retrieval

"Information Retrieval" (IR), as outlined by de Campos et al. (2004) and Manning (2009), is the process of identifying documents within a collection that meet a specific information need, typically through queries. Initially a domain for specialists like librarians or researchers, IR has expanded to the general public through advancements in technology, making it an integral part of daily life through web and email searches. Wilson (1999b) provides a nested model that differentiates between information behaviour, information-seeking behaviour, and information-searching behaviour, framing information retrieval as a subset of these broader behaviours.

This model illustrates the increasing complexity and specialization within the field of information science, acknowledging the unique characteristics and requirements of different forms of information behaviour. Expanding these definitions helps deepen the understanding of each concept and their interrelations, providing a more comprehensive foundation for the following research discussion.

1.1.7 Doctoral Students

Doctoral students pursue the highest academic degree, a PhD, involving rigorous research and a dissertation that contributes novel insights to their field (Philips & Johnson, 2022). In the US context, doctoral students are scholars who have completed their coursework and are predominantly focused on their thesis work (Bénit-Gbaffou, C. and Williams, G., 2023). A PhD candidate in the UK is an individual in the advanced stages of their doctoral studies, primarily conducting dissertation research (Brown et al., 2023).

In higher education, doctoral students contribute to academic knowledge through original research and often participate in teaching activities (Martin et al., 2023). They are known for their critical role in advancing scholarly inquiry and contributing to the development of new theories and practices in their fields (Nguyen et al., 2023). These students come from a variety of academic disciplines, bringing a wealth of diverse perspectives to the research community (Esposito, J., 2017).

These individuals frequently participate in academic conferences and seminars, presenting their research findings to the scholarly community (Khan & Mikuska, 2022). They are typically characterized by their deep commitment to academic excellence and intellectual curiosity (Patel, S.V., 2022). Many doctoral students also collaborate with industry partners, applying their research in practical contexts (Pérez-García, R.M., 2023).

1.1.8 What is Emotion?

Emotion in the context of Library Information Science is often vaguely defined, encompassing affective states like feelings and subjective experiences (Mitchell, 2023). Emotions in this field are often studied in relation to user experience and satisfaction with information systems (Liu, S., 2022). Emotion in Library and Information Science also pertains to the affective dimensions of information literacy (Santos, V., 2022).

Kuhlthau's ISP model emphasizes the role of emotions, such as anxiety or frustration, in the information search process (Matsumoto and Wilson, 2023). Emotional states are recognized as critical components affecting the efficiency and outcomes of information

retrieval (Kim, D., 2022). Emotions are essential determinants of individual information-seeking behaviour, influencing how users interact with information resources (Chen et al., 2022).

They are seen as integral to understanding user behaviour, particularly in digital environments (Rodriguez, 2023). Emotional intelligence is increasingly recognized as an important skill for information professionals and affects user interactions (Fernandez and Kross, 2022). Research in this area explores how emotional factors influence the credibility assessment of information sources (Perez, K.A., 2023). In information science, emotions are viewed as catalysts that can either enhance or hinder the information-seeking process (Golonka, E.M., 2023).

1.1.9 Self-Regulatory Learning

As defined by various scholars, self-regulation learning encompasses a range of approaches and methods through which learners take control of their education. (Molenaar, I., 2023) describe it as a proactive approach, where students set goals, monitor progress, and adapt strategies accordingly. (Kin, D. et al.,2023) emphasize the method by which students command their cognitive, motivational, and behavioural aspects of learning.

(Nuske, H.J. et al.,2022) view it as students participating in their learning journey, setting and pursuing personal academic goals. (Andrews, M.A.,2023) defines it as a process where learners continuously adapt their learning methods to align with their objectives. (Rodrigueet al., 2022) sees it as the capacity of learners to manage their educational progress through self-set goals and self-monitoring. (Morelli et al.,2023) Focuses on being responsible for their academic progress, setting goals, and adapting to challenges.

Park and Kim (2022) highlight a learner's ability to regulate their educational activities, including planning, strategy use, and self-assessment. Gyang and Singh (2018) describe it as a strategic approach where students align their learning tactics with their academic goals and environmental factors. Cohel et al.,2022 refer to the active engagement of learners in controlling their educational experiences and outcomes. Finally, (Siekanska

et al., 2023) define it as learners directing their learning path, adjusting techniques based on self-reflection and environmental cues.

1.1.10 Gamification

As experts explain, gamification is a technique of applying gaming principles in non-gaming scenarios. In the book by (Zichermann et al.,2010;2011), the term gamification is defined as the process of game-thinking and game mechanics to engage users and solve problems. The integration of game mechanics into non-game contexts invokes gameful and ludic experiences to motivate users to solve monotonous tasks or to train users in complex systems.

McIntosh et al., (2023) see it as the application of game-design principles in non-gaming contexts to improve user experience and problem-solving. Chen et al., (2022) define it as incorporating game mechanics in non-traditional gaming areas to motivate and engage users.

(Jaswani M.,2023) explains it as the process of using game-like elements in various fields to create an engaging, interactive experience. Nguyen and Martinez (2022) refer to the integration of gaming strategies in non-game settings to improve user participation and learning. (Sotos-Martínez et al.,2023) describe gamification as employing game design techniques in diverse contexts to simulate a gaming experience and solve problems. (Jang, EJ et al.,2022) see it as the incorporation of game thinking in non-gaming tasks to make them more engaging and motivating. Brooks and Brown (2023) define gamification as using elements of game design to transform routine tasks into interactive and enjoyable activities. Muhammad and Uzair (2022) describe it as a method that applies gaming principles to non-game scenarios to enhance user involvement and achievement. Lastly, Chen, H. et al. (2023) view gamification as embedding game mechanics in various non-game applications to create a gameful experience. The subsequent section explains some relevant concept that evolves around the study in context and helps shape this study problem statement.

1.2 PROBLEM STATEMENT

The research problem centres on the under-explored area of emotions and their regulatory processes in the context of doctoral students' information-seeking behaviour. Despite emotions' critical role in cognitive functions and learning, there is a significant gap in empirical and exploratory research specifically addressing how these emotional dynamics manifest and influence doctoral students during their research journey.

Emotions play a crucial role in how individuals seek information, as highlighted in various studies, especially within library environments. Jiao, Q.G. and Onwuegbuzie, A.J.'s survey in 1999 revealed that negative emotions can impede effective learning and information searching, leading to the recommendation of library instruction programmes to alleviate library-related anxiety. Similarly, Onwuegbuzie and Jiao's research in 2004 demonstrated that library anxiety among students adversely impacts their information search efficiency and outcomes. Numerous investigations have focused on assessing how emotions influence users' approach to seeking information. Nahl's 1998 study delved into understanding information behaviour by examining the affective and cognitive aspects involved in searching.

Additionally, Lopatovska, in 2009, noted that emotional factors can shape search strategies, outcomes, motivation, and overall satisfaction with the search process.

Previous studies on emotional intelligence have also highlighted its importance in academic success. For instance, a survey by (Mayer, J., Roberts, R. & Barsade, S.G.,2008) established a correlation between emotional intelligence and academic success, indicating that better emotion management leads to improved stress management and performance. However, these studies often overlook the unique, self-directed nature of doctoral research. Similarly, Kuhlthau's (1991) Information Search Process model, which integrates affective, cognitive, and physical aspects of information seeking, points to the role of emotions like anxiety and uncertainty, yet it does not delve into the prolonged and complex journey of doctoral research.

Further, the concept of emotional labour, introduced by Hochschild (1983) and primarily applied to service occupations, can also be extended to understand the emotional

demands and management in academic settings, particularly in the doctoral context. Moreover, neuroscientific perspectives, as discussed by Immordino-Yang and Damasio (2007), reveal the deep interconnection between emotion and cognition, but again, the direct implications for doctoral students' research processes are not extensively covered. In the realm of stress and coping,

Lazarus and Folkman (2004) have elucidated how negative emotions impact decision-making and information processing. Yet, doctoral research's specific priorities and emotional challenges of doctoral study, such as isolation and the pressure of original contribution, are less explored. Additionally, the role of perceived social support in emotion regulation, as highlighted by Lakey and Cohen (2000), becomes particularly relevant given the often-isolated nature of doctoral studies.

Furthermore, the potential role of gamification in education, as explored by Deterding et al. (2011), opens avenues for managing emotions and enhancing motivation in learning. However, its specific application for emotional management in the doctoral research process remains largely uncharted territory.

This is intertwined with Zimmerman's (2002) insights on self-regulated learning, which highlight the importance of personal initiative and adaptive skills in academic success, but again, the link to emotion regulation strategies in the context of doctoral research is not well-established.

The gap in Literature:

This research addresses these gaps by focusing on the unique emotional challenges faced by doctoral students. It aims to understand how their emotional states and regulation strategies specifically impact their information-seeking behaviour; an area not extensively covered in existing studies. The findings will be instrumental in informing policy decisions and support systems that cater to the mental health and self-regulatory learning needs of doctoral students. This demographic often experiences unique stressors and challenges in their academic journey.

Obtaining a PhD is a complex journey filled with a range of emotions and intellectual challenges. Students often encounter a mix of positive and negative experiences throughout their journey. For some, it's a path filled with inspiration, temptation, and

rewards, while for others, it presents challenges like self-sacrifice, a disrupted life, academic hurdles, limited social support, and financial strain (Appel & Dahlgren, 2003; Jairam & Kahl Jr., 2012; Protivnak & Foss, 2009; Spaulding & Rockinson-Szapkiw, 2012). Additionally, doctoral candidates frequently grapple with feelings of incompetence, a tendency to consider dropping out, high attrition rates, and uncertainty about their future careers (Castelló, Pardo, Sala-Bubaré & Suñe-Soler, 2017). Thus, it's evident that PhD students undergo diverse experiences, leading to varied outcomes and raising questions about the nature of their educational journey. With these considerations in mind and by integrating theories of emotional intelligence, stress and coping mechanisms, gamification in education, and self-regulated learning, this study seeks to provide a comprehensive understanding of the emotional landscape of doctoral students during their research phase. While there is an understanding of the broader role of emotions and their regulation in learning and information seeking, doctoral students' specific experiences, challenges, and needs, who engage in a unique, often isolating, and self-directed research journey remain underexplored. This research aims to bridge this gap, providing insights that could inform more effective support systems and policies tailored to doctoral students' mental health and learning needs.

1.3 RATIONALE OF THE STUDY

The rationale for this study lies in addressing a critical and under-researched area: understanding how emotions and emotion regulation impact the information-seeking behaviour of doctoral students. This investigation is essential for several reasons, each adding significant value to the field of doctoral research and higher education.

Firstly, there needs to be more existing literature regarding the emotional aspects of doctoral students' research journey. While numerous studies have explored emotional intelligence and stress management in general student populations, only some have delved into doctoral research's unique, often solitary and self-directed nature of doctoral research. There is a growing awareness that emotions could positively and negatively influence the learning process (Fredrickson, 2001; Linnenbrink, 2007; Linnenbrink & Pintrich, 2000; Pekrun et al., 2007). This study aims to fill this gap by explicitly examining

doctoral students' emotional experiences and strategies of postgraduate students, providing insights that currently need to be improved in academic research.

Secondly, the study's focus on phenomenography offers a unique lens through which to explore these experiences. By examining the different ways doctoral students perceive and experience emotions during their research journey, the study will contribute to a deeper understanding of these phenomena. Phenomenography, with its emphasis on the variation in experiences and perceptions, is particularly well-suited to capture the diverse emotional landscapes of doctoral students. **Furthermore,** exploring the self-regulatory aspects of postgraduate students' research behaviours adds another layer of depth to this study. Self-regulation is a critical factor in academic success and understanding how doctoral students regulate their emotions during the research process can provide valuable insights into practical strategies for managing the challenges and stresses of doctoral work.

The study's findings are expected to reveal various themes related to emotion regulation, information-seeking behaviour, and doctoral experience. These themes will add to the academic discourse and have practical implications for doctoral training and support systems. By identifying specific emotional challenges and effective coping strategies, higher education institutions can develop targeted interventions and resources to support doctoral students' mental health and academic success.

Additionally, it addresses the complex interplay between emotional well-being, academic performance, and the research process, providing a comprehensive view that can inform policies and practices in higher education. The inclusion is in the form of a proposed gamified emotion model in this study which significantly enhances its rationale, offering a groundbreaking approach to understanding and managing emotions in the context of doctoral research. This model, centred on gamification principles, aims to transform the postgraduate students' information-seeking experience by making it more engaging, interactive, and focused on emotional well-being.

At the heart of this model is the application of gamification to the study of emotions. By introducing game design elements into the research process, the model proposes a

novel method to explore, understand, and manage the complex emotional landscape doctoral students navigate. This approach makes the process more engaging and helps break down the complexity of emotional experiences into more manageable and interactive segments. The definition of rationale helps in the identification of research aims and objectives.

1.4 RESEARCH AIMS AND OBJECTIVES

This work explores an interdisciplinary territory (Emotions, ISB, and gamification). The goal is to consider a more realistic understanding of the role of emotions in the researcher's search processes, to better address searcher self-regulatory needs and, in turn, to identify strategies which enhances emotional regulation. In particular, the aim is to:

The aim of this study is:

> *To examine the role of emotion and emotion regulation on information-seeking behaviour in doctoral students and to identify strategies to enhance emotional regulation based on findings.*

Based on the aims, the following objectives have been drawn

Objective 1: "To analyse the impact of emotion and emotion regulation on doctoral students' information-seeking behaviour."

Objective 2: "To explore self-regulation and learning in doctoral students in relation to emotion regulation strategies."

Objective 3: "To identify strategies for improving emotional regulation in doctoral students based on insights from the research findings."

1.5 RESEARCH QUESTION

This research is guided by a single, primary question that integrates the exploration of emotion and emotion regulation with the development of strategies to support doctoral students in their information-seeking journey:

"How does emotion and emotion regulation influence information-seeking behaviour in doctoral students, and what strategies can enhance emotional regulation to improve their research experience?"

In addressing this question, the research examines how emotional states impact doctoral student's ability to seek and engage with information effectively, as well as the role of emotion regulation strategies in promoting persistence and resilience in research tasks. The research further explores actionable strategies derived from these findings, specifically focusing on the potential of gamification techniques, like the Octalysis Framework, as tools for enhancing emotional regulation.

Rationale for Gamification as a Strategy: The Octalysis Framework, with its focus on motivational drivers, is proposed as a supportive tool for emotional regulation, offering a way to structure the research journey in a manner that reduces negative emotional states and enhances positive engagement. Gamification elements, including achievement milestones, progress tracking, and feedback loops, aim to mitigate emotional challenges by fostering a more engaging, rewarding experience for doctoral students in managing their information-seeking tasks.

1.6 RESEARCH METHODOLOGY

The research presented here delves into the emotional regulations and experiences of doctoral students during their information-seeking behaviour, particularly emphasising the learning processes in a doctoral programme. To unravel the intricacies of these experiences, the study employed a mixed-methods research design, combining a self-reported diary interview approach across three phases involving participants. This design choice is particularly suited for the in-depth exploratory nature of the research for several reasons. The *Table 1.1 Methodology Choice* are self-explaining all the background components and how this chosen research methodology is the best suitable research for the study under discussion.

Component	Description	Rationale	Application	References
Mixed-Methods Approach	Combines qualitative and quantitative data.	Mixed-methods research combines qualitative and quantitative data, offering a comprehensive understanding of research problems (Creswell & Clark, 2017).	Enables triangulation of data, ensuring robustness and depth in understanding the emotional regulations of doctoral students.	Creswell & Clark, 2017; Teddlie & Tashakkori, 2009
Self-Reported Diary Interview	Methods involving participants keeping diaries.	Provides insights into experiences and behaviours in real-time.	Captures the dynamic and evolving nature of emotional regulation and information-seeking behaviours of doctoral students.	Bolger, Davis, & Rafaeli, 2003; Wheeler & Reis, 1991
Phases Involving Participants	Research conducted in distinct phases.	Allows examination of changes and developments over time.	Captures the progression and transformation in learning and emotional regulation processes.	Maxwell, 2012; Patton, 2015
Analytical Significance	Statistical analysis in research.	Provides empirical grounding to qualitative observations.	Adds an empirical layer, lending credibility and generalizability to the findings.	Creswell, 2014; Bazeley, 2012
Phenomenographic Approach	Focuses on understanding variations in experiences.	Aims to understand different ways people experience or conceptualize phenomena.	Allows in-depth exploration of variations in experiences and perceptions of emotional regulation and information seeking.	Marton, 1986; Åkerlind, 2005

Table 1.1 Methodology Choice

The chosen methodology for this exploratory research, is exceptionally apt, as it not only accommodates the depth and breadth required to understand the complex emotional landscapes of doctoral students but also aligns with the emergent needs for personalised approaches in educational research explained in detail in Chapter 3. The rich, multi-layered data obtained through this approach provides invaluable insights for developing tailored support systems and interventions for doctoral students, significantly contributing to the field of doctoral education.

1.7 CONTRIBUTIONS OF THE RESEARCH

This study is anticipated to contribute to both knowledge and practice. The study's contributions to academic knowledge and practical applications in higher education, doctoral research, emotion management, and future trends can be better understood by comparing it with background studies and analysing its current work. Here is how:

Aspect	Background Study	Research Work
Theoretical Frameworks	Focused on cognitive and behavioural aspects of ISB, with limited emphasis on emotional factors.	Integrates emotions and emotion regulations into the ISB framework, offering a more holistic view of the doctoral research process. *Chapter 5*
Emotional Intelligence	Addressed emotional intelligence in general student populations or professional settings.	Illuminates specific emotional challenges and regulation strategies of doctoral students, adding depth to the field of emotional intelligence. Chapter *4*
Disciplinary Approach	Tackled ISB from singular disciplinary perspectives (e.g., information science or psychology).	Bridges multiple disciplines like information science, psychology, and education, providing a multifaceted view of ISB. *Chapter 2*
Gamification	Explored gamification in general education and user	Introduces gamification for emotional management in

	engagement.	doctoral research, a novel application in this field. *Chapter 6*
Research Methodology	Traditional methodologies with a focus on cognitive and behavioural data.	Employs innovative mix methodology that emphasise emotional aspects and students' personal experiences. *Chapter 3*
Insights into Student Experiences	Limited emphasis on the unique challenges of doctoral students.	Provides a refined understanding of the emotional dimensions of doctoral students' research journeys. *Chapter 4*
Practical Applications	Informed general education practices and student support systems.	Specifically tailored to improve support systems, curriculum design, and policy formulation in doctoral education. *Chater 7*
Policy and Support Systems	Focused on broad student populations and general educational settings.	Offers insights for creating targeted support and policies and technological systems for doctoral students, acknowledging their unique academic and emotional needs. *Chapter 7*

Table 1.2 Research Contributions

This table 1.2 highlights the advancements and novel contributions of the current work compared to previous studies, emphasising its significance in the field of education, research and futuristic tools and systems. All the research work are explained in the respective chapters.

1.8 LIMITATION OF THE STUDY

Because of the broad nature of the phenomenon of emotion and psychological impact, and because this research seeks only to uncover how students encounter and react

toward their own personal emotions, this allows for many branches and areas of future research. Along with these areas of future research are also areas of limitations. This research is within a small population group of full-time enrolled doctoral students.

Experiences of emotion regulation and its factors may vary among higher education students; therefore, results from this study may not translate to other areas of higher education. As with any mixed methodology research, the quality of responses is highly paramount to the result and output. The more open, honest, and transparent participants are with their responses, the higher the quality of research that will be produced.

It also does not seek to uncover any kind of underlying reasons why the student's emotions may be positive or negative; it simply asks them to relay whether or not their emotion regulation is positive or negative in nature. This research does not offer any intervention strategy to correct repetitive behaviour and patterns of negative emotions, which may be an excellent next step to continue this research. The explanatory information in Chapter 7.

1.9 STRUCTURE OF THE THESIS

The document is organised as follows in Table 1.1:

Chapter 1: Introduction - Sets the stage for the study by highlighting the core issue, providing the research aims, and detailing the research questions and objectives. This chapter also introduces the methodology used to tackle these questions and highlights the anticipated contributions of the research.

Chapter 2: Literature Review - Conducts an in-depth examination of existing literature pertinent to the research topic, including models and theories of information-seeking behaviour, particularly focusing on doctoral students. It explores the theoretical foundations of information-seeking behaviour and self-regulation, as well as examines the role of gamification in academic settings, especially in enhancing doctoral students' information-seeking behaviour.

Chapter 3: Research Methodology - Describes the methods employed in the research, focusing on the emotional experiences of doctoral students within the contexts of information-seeking behaviour and gamification. It details the research design, instruments, procedures, data collection methods, sampling techniques, and data analysis methods used.

Chapter 4: Research Findings - Presents the results obtained from the research, based on the methodologies applied.

Chapter 5: Discussion & Interpretation - This chapter analyses the findings in relation to the existing literature, interpreting the results and outlining the contribution of the research to the broader field of knowledge and theory.

Chapter 6: GEM Framework - Introduces the proposed GEM framework and discusses its potential in aiding emotional regulation and managing the information-seeking behaviour of doctoral students through game mechanics.

Chapter 7: Conclusion - Concludes the study by summarising the entire research and its conclusions. It offers recommendations based on the findings and suggests avenues for future research.

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                      Research Thesis

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   │
   ├────┐  Chapter 1: Introduction
   │    └── ☀️  Context, Problem, Aims, Methodology
   │
   ├────┐  Chapter 2: Literature Review
   │    └── 📊  Information Seeking, Doctoral Students, Emotions, Gamification, Self-
Regulations Theory
   │
   ├────┐  Chapter 3: Research Methodology
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|   └── 🔬 Methods, Data Collection, Analysis Techniques
|
├──┐ Chapter 4: Research Findings
|   └── 📊 Results and Exhibits
|
├──┐ Chapter 5: Discussion & Interpretation
|   └── 💡 Analysis, Interpretation, Contribution
|
├──┐ Chapter 6: GEM Framework
|   └── 🎮 Emotional Regulation, Game Mechanics, Applications of GEM Framework
|
└──┐ Chapter 7: Conclusion
    └── 🔚 Summary, Recommendations, Future Research
```

Figure 1.1 Thesis Chapters

1.10 PUBLICATIONS OF THE STUDY

Throughout the course of this research, a strategic approach was adopted to disseminate findings across a variety of academic platforms, ensuring both depth and breadth in outreach. Several research papers were meticulously crafted and submitted to esteemed peer-reviewed journals, recognized for their rigorous standards and academic prestige.

Concurrently, two chapters were contributed to a Springer publication, taking advantage of Springer's renowned status in the academic publishing world. This contribution allowed for a more comprehensive and detailed exposition of certain aspects of the research, reaching an audience that values the depth and detail that book chapters afford. Furthermore, the research was also presented at renowned conferences, which were selected for their relevance and stature within the academic community. These confereofes provided a dynamic platform for presenting the research findings, engaging

in real-time intellectual discourse, and receiving constructive feedback from peers and experts in the field. The title of them are as follows:

1. Game On: Revolutionizing Learning through Gamification in Future Education (In-preview)
    Conference:Teaching and Learning Conference 2024: Future-Focused Education: Innovation, Inclusion, and Impact-Oral presentation

2. Building Knowledge: Enhancing Doctoral Education through LEGO® Serious Play®(In-review)
    Conference:Teaching and Learning Conference 2024: Future-Focused Education: Innovation, Inclusion, and Impact-Interactive Workshop

3. Gamification as a way of facilitating emotions during information-seeking behaviour: A systematic review of previous research.
    In book: Diversity, Divergence, Dialogue, 16th International Conference, iConference 2021, Beijing, China, March 17–31, 2021, Proceedings, Part II.

4. A phenomenographic approach to the effect of emotions on the information behaviour of doctoral students: a narrative inquiry
    In book: Sustainable Digital Communities, 15th International Conference, iConference 2020, Boras, Sweden, March 23–26, 2020, Proceedings Chapter: Pages 874-883

5. Riding the emotional rollercoaster of a doctoral student through the lens of gamification
    Conference: UK council for graduate education - annual conference 2019 enhancing postgraduate research cultures 1st – 2nd July 2019 | MediaCity Campus, University of Salford.

6. Digitising Emotions through Gamification for interactive information seeking.
    Conference: NWCDTP: Human Technologies, Digital Humanities University of Salford, October 2018.

7. An investigation on the role of emotions in information-seeking behaviour of doctoral students: A mixed-method approach
    Conference: 10th Annual PGR Conference Provoking Discourse, March 2018.

8. Gamified Emotion Management (GEM) in shaping doctoral student information search behaviour.
    Conference: Workshop on Hybrid Human-Machine Computing (HHMC), September 2017.

1.11 CHAPTER SUMMARY

The doctoral research journey is a complex and often intense period of scholarly pursuit, characterised by intellectual challenges and a wide array of emotional experiences. This initial chapter introduces the multifaceted nature of this journey, exploring the interplay between emotions, emotion regulation, and information-seeking behaviour in doctoral students. The chapter positions the thesis at the intersection of psychological theories of emotion and academic information science, proposing an integrative approach to understanding and supporting doctoral students' research experiences.

The chapter begins by establishing the centrality of emotion in the doctoral process. Emotions are presented not as peripheral to the research experience but as integral to how doctoral students engage with their work. The affective dimension of the doctoral journey can encompass a spectrum of feelings, from excitement and passion for one's research topic to the stress and anxiety of meeting academic milestones or facing uncertain job prospects post-graduation.

Emotion regulation is the process by which individuals influence the emotions they experience, when they experience them, and how these emotions are expressed. The chapter explains how effective emotion regulation, a key determinant in a doctoral student's ability o navigate the research process successfully. It can enable students to maintain focus during information-seeking, enhance their resilience in the face of setbacks, and sustain motivation over long periods of intense work.

The chapter further delves into the role of information-seeking behaviour, defined as the strategies and methods employed by doctoral students to locate, access, and use information relevant to their research. This behaviour is influenced by the students' emotional states and their ability to regulate these emotions. For instance, feelings of overwhelm may impede the ability to search for information effectively, while feelings of curiosity may enhance it.

A theoretical framework is laid out, drawing on psychological theories of emotion and motivation, such as the Broaden-and-Build theory of positive emotions, which suggests that positive emotions broaden an individual's thought-action repertoire and build their personal resources. The thesis also compares the famous information seeking process model Kuhlthau's Information Search Process, which describes the feelings, thoughts, and actions of individuals throughout the information-seeking process.

The chapter outlines the primary research questions that the thesis aims to answer:

- What are the significant impacts of emotion and emotion regulations during the information-seeking behaviour of doctoral students during their research journey?
- What are the significant external factors related to emotion regulation during the information-searching process?
- How do emotion regulation processes benefit self-regulated learning during the research phases of doctoral students?
- The hypotheses posit that emotions directly impact information-seeking behaviour and that doctoral students' emotion regulation strategies are critical facilitators or barriers in this process.

An overview of the methodology is provided, indicating a mixed-methods approach that will be employed to address the research questions. This includes qualitative methods such as interviews and diaries to capture the depth and nuance of students' emotional experiences, as well as quantitative methods to measure and analyse patterns in emotion regulation and information-seeking behaviour.

The chapter underscores the significance of this research in contributing to our understanding of the doctoral experience, with potential implications for academic support services, supervisor training, and policy development in higher education. It also outlines the structure of the thesis, previewing the subsequent chapters that will build upon the foundations laid in this introductory chapter. In summary, Chapter 1 establishes the thesis's central tenets, weaving together the emotional tapestry of the doctoral experience with scholarly information-seeking behaviours, framed within an

academically rigorous methodological approach. It sets the stage for an exploration that is as relevant to educational practitioners and policymakers as it is to the doctoral students themselves, whose experiences lie at the heart of this study. The next Chapter 2 gives a comprehensive overview of literature.

CHAPTER 2
LITERATURE REVIEW
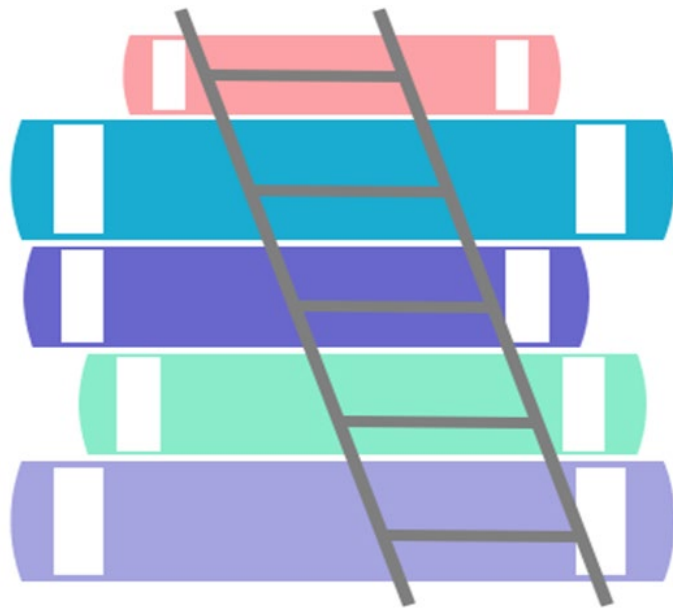
"To know what people really think, pay regard to what they do rather than what they say." –

René Descartes

CHAPTER 2: LITERATURE REVIEW

In Chapter 2 of this literature review, a detailed and systematic examination of the academic landscape regarding information-seeking behaviours among doctoral candidates is undertaken. This review highlights significant gaps and areas that have received limited attention in previous research, serving as a basis for the study's research questions. By focusing on the influence of emotional states, motivational factors, and technological tools, this chapter provides an integrated overview of both historical and modern perspectives. It underscores the multifaceted and interdisciplinary nature of information behaviour in academic contexts, bringing attention to the intricate dynamics that shape doctoral students' research processes. Additionally, the chapter synthesises historical and contemporary methodologies and frameworks deployed to interrogate the phenomena of information-seeking behaviours among doctoral candidates, particularly emphasising the roles of emotional states and motivational technologies in this intricate tapestry of academic investigation.

2.1 LITERATURE SEARCH STRATEGY

A rigorous search strategy underpins the literature review, combining digital and manual resources to ensure thoroughness and breadth. Key academic databases, including Google Scholar, the MMU University Library's electronic collections (EBSCO, Sage Journals, Dissertation databases), and platforms like Google Books, were pivotal in gathering relevant literature.

The precision of the search was enhanced through the strategic deployment of a set of carefully curated keywords, encompassing terminologies such as *'doctoral student,' 'information-seeking behaviour of students,' 'impact of emotions on information behaviour,' 'doctoral students' experiences during information retrieval,' 'barriers to doctoral students' success,' 'emotional management strategies for doctoral candidates,' 'guidelines for understanding students' learning trajectories,' 'emotional trajectories of doctoral candidates,' 'motivational tactics in information-seeking behaviours. ''role of gamification and intrinsic motivation', 'emotion management background study'*. It is noteworthy to mention that an exhaustive list of these keywords and their various permutations can be found in **APPENDIX A.**

This keyword-centric approach yielded a plethora of articles. Emphasis was placed on including peer-reviewed journals and scholarly texts to ensure the reliability and academic robustness of the sources. Stringent criteria were established to sift through the overwhelming volume of data, prioritising scholarly and peer-reviewed material. In the context of Google-driven searches, the focus was narrowed to resources exclusively available on Google Scholar and accredited university portals.

The selected articles were systematically organized using software tools like **Google Drive** for archiving and **EndNote** for citation management, ensuring accuracy in documentation and ease of retrieval. Alongside this, an annotated bibliography was carefully compiled, with each reference formatted according to the Harvard referencing style. To enhance the documentation process, EndNote was utilized, helping to ensure accurate citations and facilitating the organized tracking of research articles sourced from the MMU University Library, Google resources, and various books.

2.1.1 Conceptual Overview of the Search Strategy

The search strategy's structure is visually represented in Figure 2.1, an extensive concept map designed to illustrate the manifold approach adopted in this literature review. This map is centred on multiple key nodes, each representing fundamental aspects of the information-seeking and academic research process.

2.1.1.1 Central Nodes and Their Purpose

The concept map integrates several central nodes, each highlighting different facets of the information landscape and providing a multi-perspective view on information-seeking behaviour:

1. **Information**: This node lies at the heart of the map, symbolizing the focal point of information-seeking in the digital age. Linked to sub-nodes such as **World-wide-web**, **Internet**, and **Communication**, it underscores the variety of channels and resources through which information flows and is disseminated.

2. **Internet**: As a primary medium for information access, this node connects to elements such as **Web Behaviour** and **Information Behaviour**, which capture

how users, especially in academic contexts, interact with and navigate the internet.

3. **World-wide-web**: Representing the interlinked digital landscape, this node branches out to **Search Engines** (e.g., Google and Bing), **Information Retrieval**, and **User Interfaces**. It illustrates the infrastructure and tools that doctoral students and researchers use to acquire information.
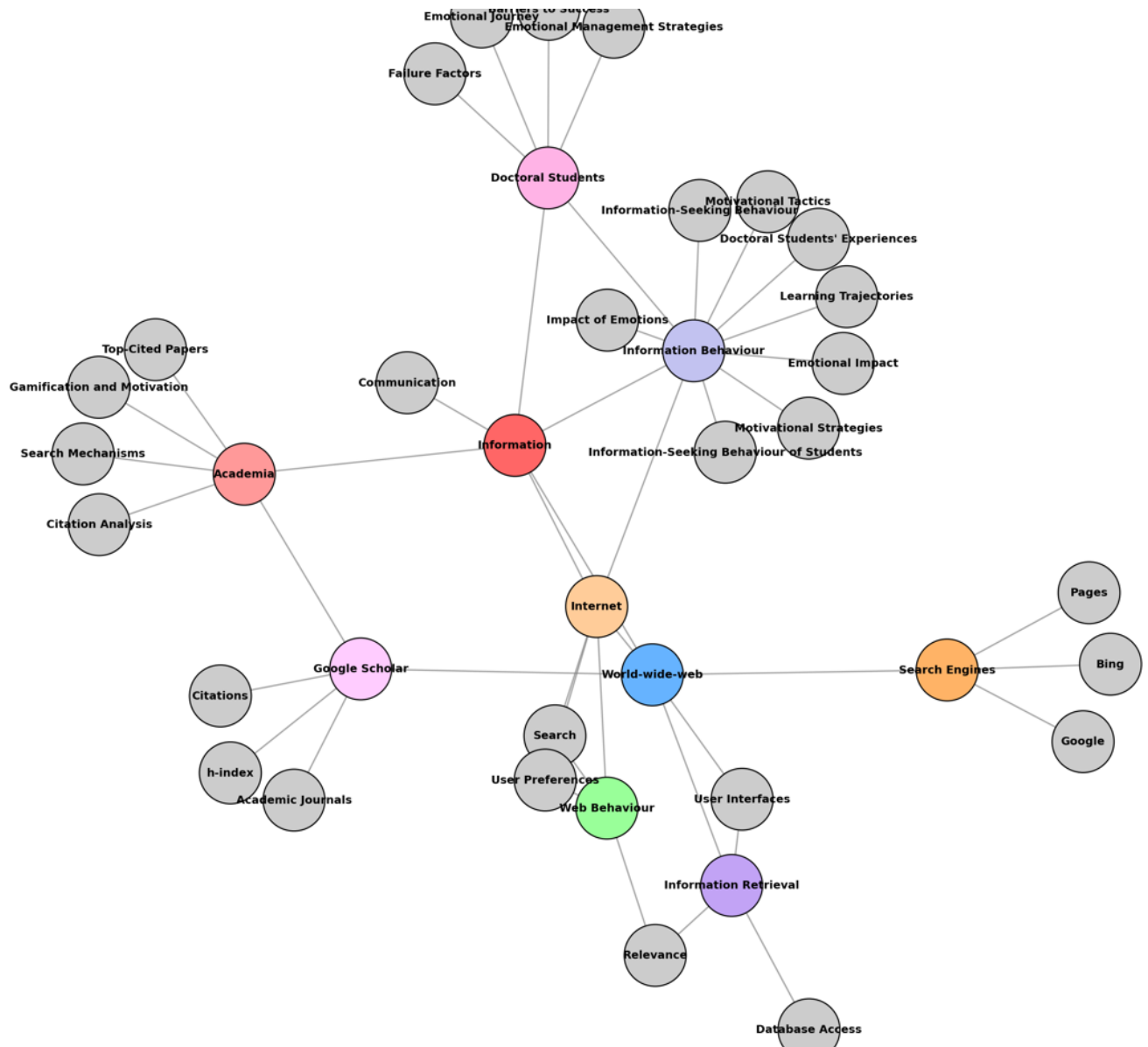
Figure 2.1 Schematic Representation of the Literature Review Process

4. **Web Behaviour**: Focusing on the patterns in which users interact with the web, this node links to **Relevance** and **Search**, emphasizing user engagement and information relevance, both critical in refining search strategies.

5. **Information Behaviour**: This node, central to the study, encompasses doctoral students' patterns in seeking information and connects to nodes representing **Doctoral Students**, **Motivational Strategies**, and **Emotional Impact**. It provides a comprehensive view of the factors influencing academic research behaviours.

6. **Academia**: Highlighting the academic context, this node links to resources and metrics like **Google Scholar**, **Citation Analysis**, **Top-Cited Papers**, and **Search Mechanisms**. It encapsulates the scholarly aspects of information behaviour, illustrating the tools and standards that define academic relevance and credibility.

7. **Doctoral Students**: Focused specifically on the unique challenges and needs of doctoral researchers, this node connects to aspects such as **Emotional Management Strategies**, **Barriers to Success**, and **Failure Factors**. It underscores the importance of understanding the academic, emotional, and motivational pressures faced by doctoral students.

2.1.1.2 Supporting Nodes and Their Interconnections

The concept map also incorporates detailed supporting nodes, reflecting different angles and factors in the literature search strategy:

- **Search Engines** and **Information Retrieval**: Represent tools like **Google**, **Bing**, and academic resources like **Google Scholar**. These nodes emphasize the variety of platforms used to obtain information and the critical role of user-centric design and relevance in search interfaces.

- **Emotional and Motivational Factors**: Nodes such as **Impact of Emotions**, **Motivational Tactics**, and **Intrinsic and Extrinsic Motivation** illustrate the psychological dimensions of information-seeking, particularly for doctoral students dealing with stress, motivation, and resilience in their research journeys.

- **Gamification and User Engagement**: By linking nodes like **Gamification and Motivation** and the **Octalysis Model**, the concept map highlights the role of gamification in fostering engagement and perseverance in information-seeking activities.

This concept map was developed using network visualization tools such as **Gephi** and **NVivo**, which allow for the creation of complex, multi-nodal visual representations. These software programmes are widely used in library and information science to analyse and visualize relationships between concepts, making them ideal for illustrating intricate search strategies.

Gephi is particularly powerful for mapping extensive networks due to its flexibility in node and edge customization, while **NVivo** excels in qualitative data analysis, enabling researchers to organize, analyse, and find insights in unstructured information, such as academic literature. Both tools support the structured and layered approach necessary to illustrate how each concept in the information-seeking behaviour framework interacts.

The extensive concept map serves as a guiding framework for understanding the multi-layered nature of academic information-seeking. By visually mapping the intersections between search mechanisms, user behaviour, emotional factors, and academic resources, this strategy enables a nuanced comprehension of how doctoral students navigate, process, and manage information. Each node and connection reflect not only the scope but also the depth of factors influencing doctoral students' research behaviours, highlighting the significance of both digital and emotional factors in effective information retrieval.

This holistic approach allows the literature review to address the complex interplay between digital tools, academic pressures, and personal motivations, offering insights into how search strategies can be refined to better support doctoral researchers.

2.2 BACKGROUND STUDY

To understand the interplay of Information Seeking Behaviour, Emotions and Gamification among doctoral students this research intricates several concepts and will

be divided into three sections. Figure 2.2 illustrates the pictorial presentation of these sections:
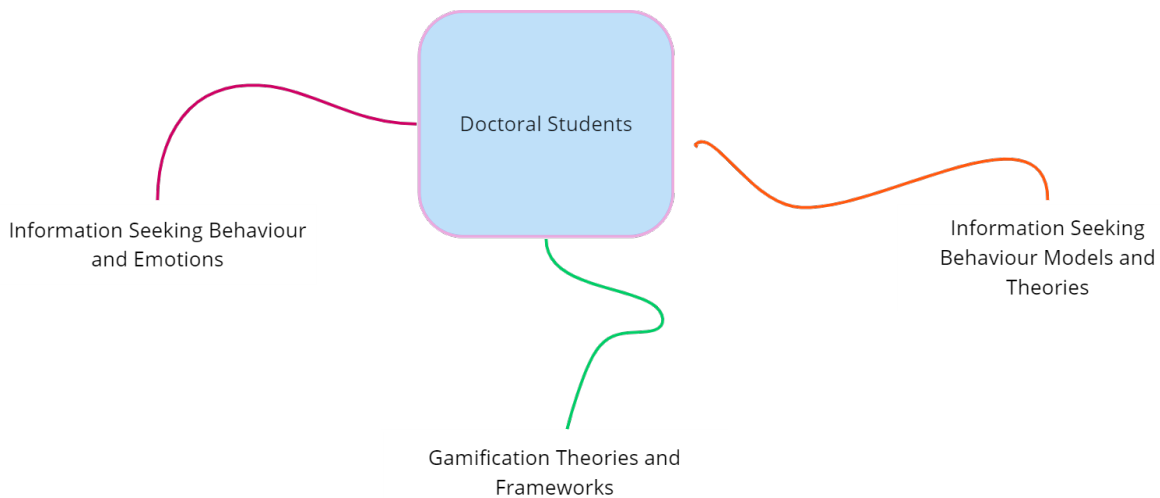
Figure 2.2 Background Research Sections

1) Doctoral Students

The central concept is 'Doctoral Students'. This group represents individuals undertaking advanced academic research, often characterized by self-directed study and a need for specialized information.

2) Information Seeking Behaviour Models and Theories

Over time, researchers have developed various models and theories to explain how individuals seek and use information. For doctoral students, these models explain the stages they go through when searching for academic sources, from identifying a need, seeking out resources, evaluating them, and using the information in their work. These models provide a structured way of understanding and predicting how doctoral students approach the task of information gathering.

3) Information Seeking Behaviour and Emotions

This represents the emotional journey and feelings experienced by individuals, particularly doctoral students when they are in the process of searching for information.

Information seeking is not just a cognitive task but also an emotional one. Doctoral students might feel frustration when they can't find the required information, satisfaction when they do, or anxiety about ensuring the sources they find are credible. Understanding this emotional journey is crucial because it can inform institutions and educators about how best to support doctoral students in their research endeavours.

4) Gamification Theories and Frameworks

Gamification refers to the application of game-design elements and game principles in non-game contexts. In the context of doctoral students, gamification is used to make the research process more engaging, motivate students to explore more sources, or even make the process of peer review more interactive. By understanding gamification theories and frameworks, educators can potentially create a more engaging and motivating research environment for doctoral students.

Interconnections:

The link between "Doctoral Students" and "Information Seeking Behaviour and Emotions" emphasizes the emotional experiences of these students during their information search process.

The connection between "Doctoral Students" and "Information Seeking Behaviour Models and Theories" indicates that the models and theories in place cater specifically to the unique requirements and challenges faced by doctoral students.

Lastly, the association between "Doctoral Students" and "Gamification Theories and Frameworks" suggests the potential benefits and applications of gamification strategies tailored for doctoral students to enhance their research journey.

In conclusion, the next sections shed light on the multifaceted nature of doctoral students' research journey. By understanding the interplay of emotions, establishing information-seeking models, and innovative gamification strategies.

2.3 DOCTORAL STUDENTS? WHO?

The term "Doctoral Students" is often used in the context of higher education and academic research. Doctoral students are typically involved in conducting original

research, teaching, and contributing to the academic community. They may also be involved in professional organizations and conferences related to their field of study.

The philosophy and background history of the Ph.D. degree can be traced back to medieval universities in Europe, where the doctorate was originally a license to teach (Clark, 1957). The modern PhD degree, as a research-based degree, has its roots in the German education system of the 19th century, where the emphasis was on creating new knowledge through original research (DiMaggio, 1985). According to the Higher Education Statistics Agency (HESA), there were 25,020 doctoral degree graduates in the UK in the 2018/19 academic year (HESA, 2020). Throughout this thesis, these terms will be used interchangeably to refer to individuals who are engaged in advanced academic study and research at the doctoral level.

In terms of references, the term "Doctoral Students" is widely used in academic literature and research. Several studies have explored the information behaviour of doctoral students, particularly in the context of their research activities and use of academic libraries and digital resources.

For example, Gardner (2007) conducted a study on the challenges faced by doctoral students in the United States, while Lovitts (2008) explored the factors that contribute to the success of doctoral students. Additionally, Golde (2005) examined the experiences of doctoral students in different academic disciplines.

One interesting study by Jamali and Nicholas (2008) explored the information behaviour of Ph.D. students in the UK and found that they are heavy users of electronic resources, particularly e-journals, and rely on the internet as their primary source of information. The study also found that Ph.D. students are more likely to use academic libraries for accessing electronic resources than for borrowing physical books.

Another study by George et al. (2006) examined the information-seeking behaviour of doctoral students in the field of education and found that they rely heavily on electronic databases, online journals, and other digital resources for their research. The study also found that doctoral students in education prefer to use online resources that are easily accessible and user-friendly. In the field of information behaviour, another study by

Mizrachi and Bates (2013) explored the information-seeking behaviour of doctoral students in information science and found that they use a variety of information sources, including academic libraries, online databases, and social media, to support their research activities. The study also found that doctoral students in information science are more likely to use online resources than traditional print resources.

Also, there are many other studies from (Appel & Dahlgren, 2003; Jairam & Kahl Jr., 2012; Protivnak & Foss, 2009; Spaulding & Rockinson-Szapkiw, 2012) which explored that obtaining a doctoral degree is emotionally and intellectually a difficult process since students experience various positive and negative incidents.

When all these studies are analysed, it is seen that few studies engage in the emotional context, self-regulation strategies and motivations of doctoral students in full time educational programmes. Nevertheless, having detailed insight about the positive and negative emotions of PhD students could not only help students to understand their researcher identity but also increase the quality of doctoral programmes by appropriately managing them (McAlpine, Jazvac-Martek & Hopwood, 2009).

2.4 INFORMATION-SEEKING BEHAVIOUR -ISB

Information-seeking, or information-seeking behaviour, refers to the process that individuals engage in when they identify a need for information and subsequently search for, locate, and use that information to satisfy their need (Case & Given, 2016). This process is fundamental to human learning and problem-solving and is a key area of study in the fields of information science, psychology, and education.

The term "information seeking" has been used in various contexts and has been studied from multiple perspectives. In the field of information science, information seeking is often studied in the context of how individuals interact with information systems and libraries. Researchers in this field are interested in understanding how people search for information, what strategies they use, and how they evaluate the information they find (Foster, 2004).

In psychology, information-seeking is studied as a cognitive process that involves the use of memory, attention, and problem-solving skills. Psychologists are interested in

understanding how individuals process information and how this process is influenced by factors such as motivation, cognitive style, and personality (Heinström, 2006).

In education, information seeking is studied in the context of how students search for and use information to support their learning. Researchers in this field are interested in understanding how students develop information literacy skills and how these skills can be taught and assessed (Johnston and Webber , 2003). The term "information-seeking behaviour" is often used interchangeably with "information-seeking," but some researchers make a distinction between the two. Information-seeking behaviour refers to the actions that individuals take when they are searching for information, such as querying a search engine, browsing a library catalogue, or asking a friend for help. Information seeking on the other hand, refers to the broader process that includes not only the actions taken but also the cognitive and emotional aspects of the process (Wilson, 2000).

In conclusion, information seeking is a complex and multilayered process that involves the identification of an information need, the search for and location of relevant information, and the use of that information to satisfy the need. The term has been used in various contexts and has been studied from multiple perspectives, including information science, psychology, and education. There are several models and theories that have been developed to explain information seeking behaviour, including the information search process model and the sense-making methodology. These models highlight the importance of cognitive, emotional, and contextual factors in the information-seeking process. The next section will explain information-seeking behaviour models and frameworks.

2.5 INFORMATION-SEEKING BEHAVIOUR MODELS & FRAMEWORKS

This section aims to provide a thorough examination of information-seeking behaviour in literature and drawing upon the latest theories and models, this piece offers an in depth understanding of the topic. Furthermore, a comparative analysis of different theories and studies is presented in tabular form, enhancing the clarity of the discussion.

2.5.1 Theoretical Frameworks in Information-Seeking Behaviour

First, a general overview of information-seeking behaviour models is given, then the models focus on the affective aspect of searchers in information-seeking behaviour, lastly the one considers the motivational factors as the central point. The next section explains all of this in detail.

Generally, the way people search for information is shaped by the specific situation they're in and the related factors (Abbas, 2018). Consequently, various models have been suggested over the years to clarify how individuals go about searching for information. Additionally, the development of these models can be linked to the transition from a focus on information systems to a focus on the needs and preferences of users (Abbas, 2018).

In the following sub-sections, the selected models undergo scrutiny due to their relevance in the context of the present study. The discussion of these models proceeds from the general to the specific. Put differently, the models under examination encompass diverse aspects of information searching, such as initial steps, motivating factors, obstacles, and the various phases of the information-seeking process. Additionally, the analysis extends to models that encapsulate the interaction between individuals and information systems, along with the associated phases of this facet of information seeking. Initially, the focus lies on describing generic models of information seeking behaviour.

2.5.1.1 Wilson's Model of ISB

Wilson's Model of Information Seeking Behaviour, as proposed by Wilson in (1981) Figure 2.3 and further developed in 1999, encompasses various facets of how individuals seek information. Initially, this model posited that information-seeking behaviour stemmed from a perceived need for information. To address this need, individuals would explore authorized or unauthorized sources and facilities in search of relevant information. The success of this inquiry in locating the required information could vary. If the search proved successful, the user would then utilize the obtained information to either fully or

partially fulfil their perceived need. However, if the information retrieved did not satisfy the need, the search process might need to be repeated.

Importantly, Wilson's early model acknowledged that information seeking could involve interactions with other individuals, including information exchange and transfer. This model featured three key entities: the information user, the user's need for information, and the environment in which the information search occurred.
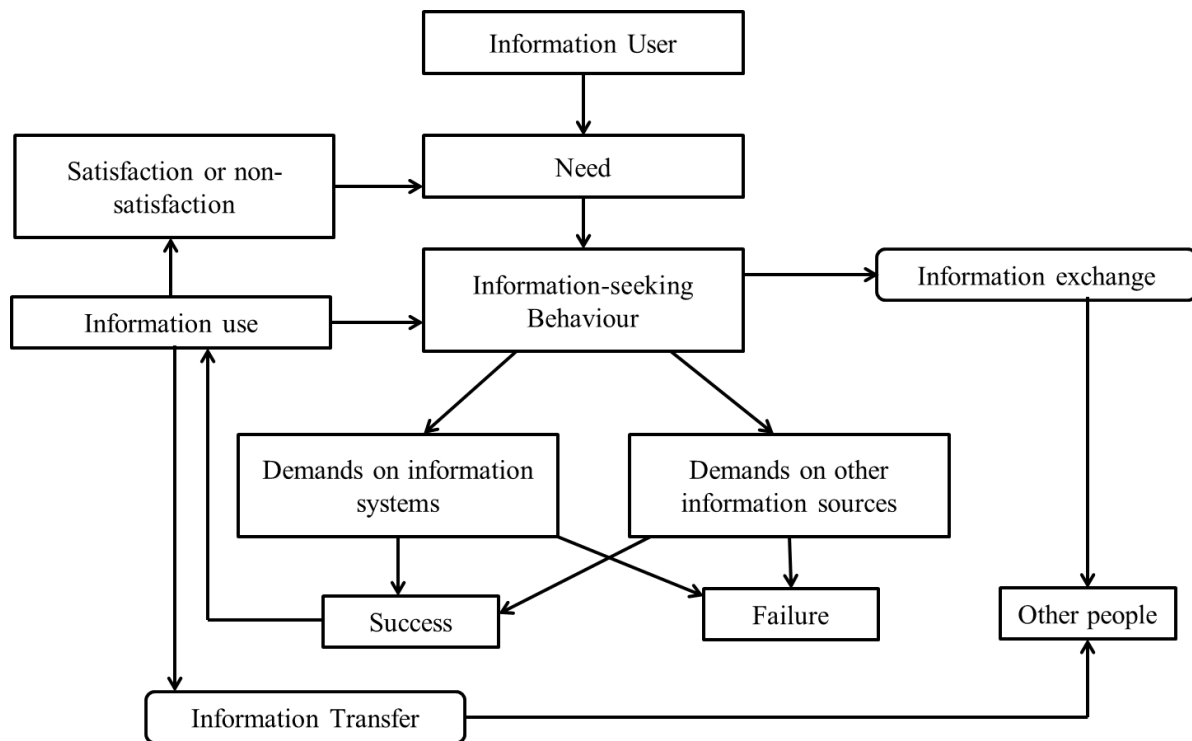
Figure 2.3 Wilson's 1981 model of information behaviour (Source: Wilson, 2006)

Wilson's model revolved around the concept that the need for information was shaped by various factors, including the individual's environment, role, and specific requirements, categorized as 'physiological,' 'affective,' and 'cognitive' (as illustrated in Figure 2.4).

Furthermore, it emphasized that the information need would influence the user's information-seeking behaviour, although potential barriers, whether personal, interpersonal, or environmental, could temper this process.

In essence, Wilson's model provides a comprehensive framework for understanding how individuals engage in information seeking, taking into account their needs, the sources

they consult, and the potential challenges they encounter during the process. This model has evolved over time and remains a valuable tool for researchers and practitioners studying information behaviour.

In a subsequent model introduced in 1996 (see Figure 2.5), the foundational structure of the earlier model was expanded to incorporate "intervening variables." These variables play a role in either facilitating or impeding the utilization of information. Furthermore, this updated model encompasses a wider array of information-seeking behaviours, moving beyond the confines of just "active search." Additionally, the processing and utilization of information are portrayed as integral components within the feedback loop pertaining to the satisfaction of information needs.
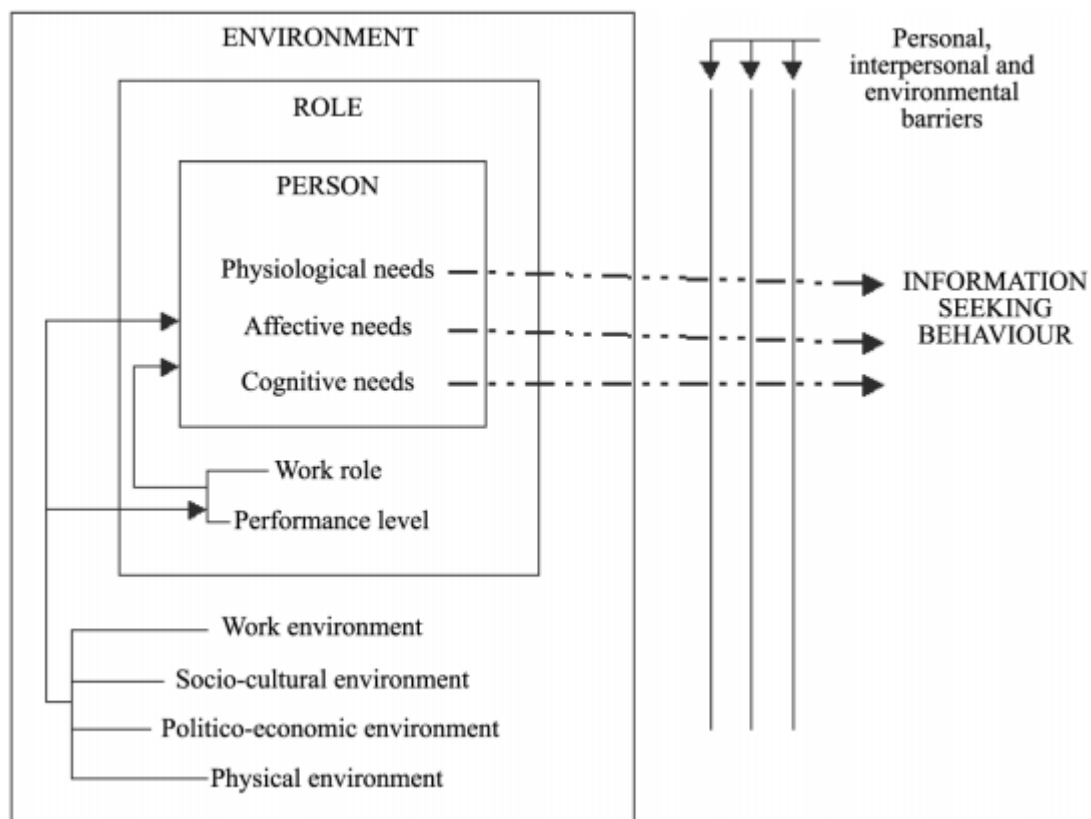
Figure 2.4 Wilson's 1981 model of information seeking behaviour (Source: Wilson, 2006, p.66)

Wilson's 1999 model introduces three key theoretical concepts to shed light on certain phenomena:

1. **Stress/coping theory** seeks to explain why some information needs do not trigger information-seeking behaviour.

2. **Risk/reward theory** offers insights into why certain individuals may prefer one information source over another.

3. **Self-efficacy theory** delves into the belief that an individual can effectively carry out the actions required to achieve desired outcomes.

2.5.1.2 Kuhlthau's Information Seeking Process Model

Kuhlthau's Information Seeking Process Model has been a cornerstone in the field of information science, shedding light on the complex interplay of cognitive, affective, and physical factors during information seeking. Figure 2.5:
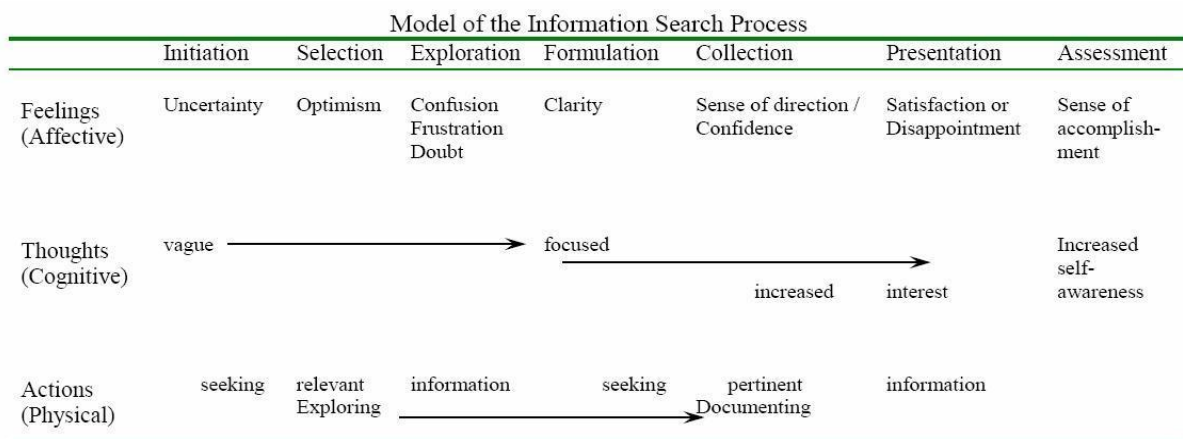
Figure 2.5 Kuhlthau's Model of Information Search Process (Source: Kuhlthau's, 1991, 2004)

Kuhlthau's ISP Model divides the information-seeking process into six distinct stages: initiation, selection, exploration, formulation, collection, and presentation. These stages represent a holistic view of the searcher's experience, encompassing cognitive, affective, and physical dimensions. It recognizes that individuals do not approach information seeking as emotionless automatons, but as complex beings influenced by their thoughts, feelings, and actions.

At the heart of Kuhlthau's model lies the "uncertainty principle." This principle suggests that a cognitive state of uncertainty is a driving force behind the emotional fluctuations experienced during the information-seeking process. Feelings of doubt and anxiety are associated with vague and unclear thoughts, while clarity of thought correlates with reduced emotional turmoil. However, Kuhlthau's model also highlights a crucial insight: information seeking is not a linear journey towards complete certainty. In the exploration

stage, there is another surge of uncertainty, challenging the notion that information always reduces uncertainty. Doctoral students may encounter new and conflicting ideas, leading to heightened uncertainty despite collecting more information.

Kuhlthau's model recognizes emotions as a factor influencing the information-seeking process. Still, it primarily views them as responses to cognitive states, particularly uncertainty. This approach, while valuable, leaves room for a more understanding of emotions as primary drivers of information needs.

Many studies have shown that emotions, both positive and negative, along with different arousal levels, can motivate individuals to engage in information-seeking behaviour. For instance, a doctoral student experiencing stress due to a tight research deadline may be motivated to seek information to alleviate this negative emotional state. On the other hand, a student feeling excitement and curiosity about a particular topic may be driven to explore further.

Kuhlthau's model, though groundbreaking, has certain limitations. One key limitation is that it interprets the affective side of searchers as only a secondary motivational source for information need. It views emotions as responses to cognitive processes, rather than recognizing them as distinct needs.

Furthermore, the model's primary focus on uncertainty as the central driving force neglects the broader landscape of emotions that can influence information-seeking behaviour. The study we are discussing aims to amplify Kuhlthau's model by recognizing emotions as separate and fundamental needs in the information-seeking process, especially for doctoral students. It contends that emotional needs go beyond being mere consequences of cognitive states; they can be primary motivators and influencers throughout the journey.

In this research, emotions are considered as a distinct category of needs, alongside the need for information itself. Doctoral students are not just seeking data and knowledge; they are also seeking emotional satisfaction and comfort to address the myriad feelings they encounter during their academic pursuits. To manage the negative emotions Nahl explicitly develop her theory of affect as explained in 2.5.1.3.

2.5.1.3 Nahl's Affective Approach

Diane Nahl's Affective Load Theory, proposed in 2005, builds upon Carol Kuhlthau's earlier work which introduced the concept of uncertainty in information-seeking processes (Nahl,2005). Kuhlthau's model, however, did not take into account the impact of time constraints on these processes. Recognizing this gap, Nahl expanded the theory by incorporating the relationship between emotions (affect) and thought processes (cognition), particularly under conditions of uncertainty and time pressure.

Nahl's theory is grounded in a social-behavioural perspective, emphasizing how both cognitive and affective elements influence information-seeking behaviour. She proposes three key social-behaviour.al principles:

- **Dual Influence of Cognition and Affect:** Information-seeking behaviour is influenced by both cognitive abilities (thinking, reasoning) and affective states (emotions, feelings). This means that how a person thinks and feels plays a critical role in how they seek and process information.
- **Primacy of Affective Behaviour:** Affective (emotional) behaviour triggers, sustains, and concludes cognitive (thought-based) behaviour. In essence, our emotions can initiate, maintain, and end our thought processes.
- **Bivalent and Multivalent Systems**: Affective and cognitive behaviours operate through different systems. The affective system is bivalent (bipolar), meaning it fluctuates between two poles (like happy and sad), while the cognitive system is multivalent (multiscale), indicating a more complex range of operations.

Central to Nahl's theory is the concept of 'affective load', defined as the product of uncertainty and perceived time pressure. Uncertainty itself is characterized by feelings like irritation, frustration, anxiety, and rage. When the affective load is high, it indicates ineffective cognitive behaviour, which can hinder successful task completion. Recognizing high affective load allows for interventions to alleviate negative emotions, thereby supporting more effective information seeking. Nahl also acknowledges the existence of emotional needs not directly linked to uncertainty. These needs might stem

from a desire to maintain a happy state or alleviate sadness, or to manage levels of arousal, whether low (like boredom) or high (such as stress). These emotional aspects are not fully addressed in either Kuhlthau's or Nahl's models. Addressing them necessitates treating emotional needs as distinct from simple information needs, acknowledging that emotions play a pivotal role in how we seek and process information, especially under pressure or uncertainty.

2.5.1.4 Ellis's Model of Information-Seeking Behaviour

The core aim of this model was to explore information retrieval from a social science viewpoint. Its primary goal was to introduce a behavioural approach to information retrieval, contrasting with a cognitive one. The model's development was based on semi-structured interviews conducted with research groups from various academic and industrial fields (Ellis, 1989; Ellis, Cox, & Hall, 1993; Ellis & Haugan, 1997).
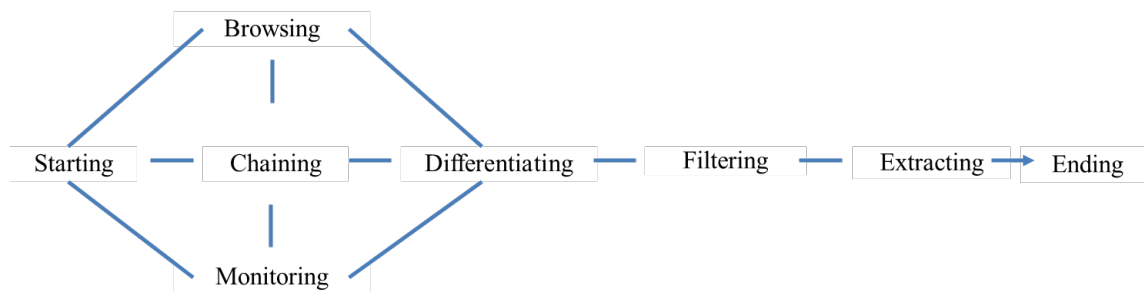
Figure 2.6 Ellis' model for Information System Design (Source: Knight & Spink, 2008)

Ellis' model (Figure 2.6) recognizes eight distinct activities in information seeking: **Starting/Surveying; Chaining; Monitoring; Browsing; Differentiating; Filtering; Extracting; and Ending**. Starting/surveying involves initial information search activities, while chaining (either backward or forward) involves using an initial resource as a reference for subsequent searches.

Browsing, the next activity, is a semi-directed search, now refined through contents, title lists, captions, and summaries. Filtering involves applying specific methods or criteria to ensure information relevance and precision. Differentiating involves sorting information based on the characteristics of the material examined. Monitoring involves keeping track of sources for updates in the field, and extracting involves systematically reviewing resources to identify relevant items. Lastly, verifying and ending refer to confirming the

accuracy of information and concluding the search process, respectively. The model emphasizes that the interrelationships and sequence of these activities can vary between projects and depend on the project's phase and stage (Ellis & Haugan, 1997, p.388).

2.5.1.5 Belkin et al.'s Information-Seeking Strategies (ISS)

Belkin, Marchetti, and Cool (1993) propose that information-seeking strategies can be viewed as interactions between a user and various elements of an information retrieval (IR) system. They pinpointed four key dimensions or aspects of these strategies: **Scanning-Searching; Learning-Selecting; Recognition-Specification; and the Interaction Between Information Items and Meta-Information**.

This implies that there's a specific approach and objective in user interactions, a method for retrieving information, and an engagement with the available resources. According to Belkin and his team (1993), a range of behaviours is observable during the information search process. These behaviours might include searching for specific, known items; looking for items similar to a known item; searching for items related to a particular topic; casually exploring to find something of interest; examining items and their contents closely; identifying valuable items through examination; and browsing through item descriptors and organizational schemes (p.325).

This model (illustrated in Figure 2.7) was assessed and refined based on observations and insights derived from various experimental studies.
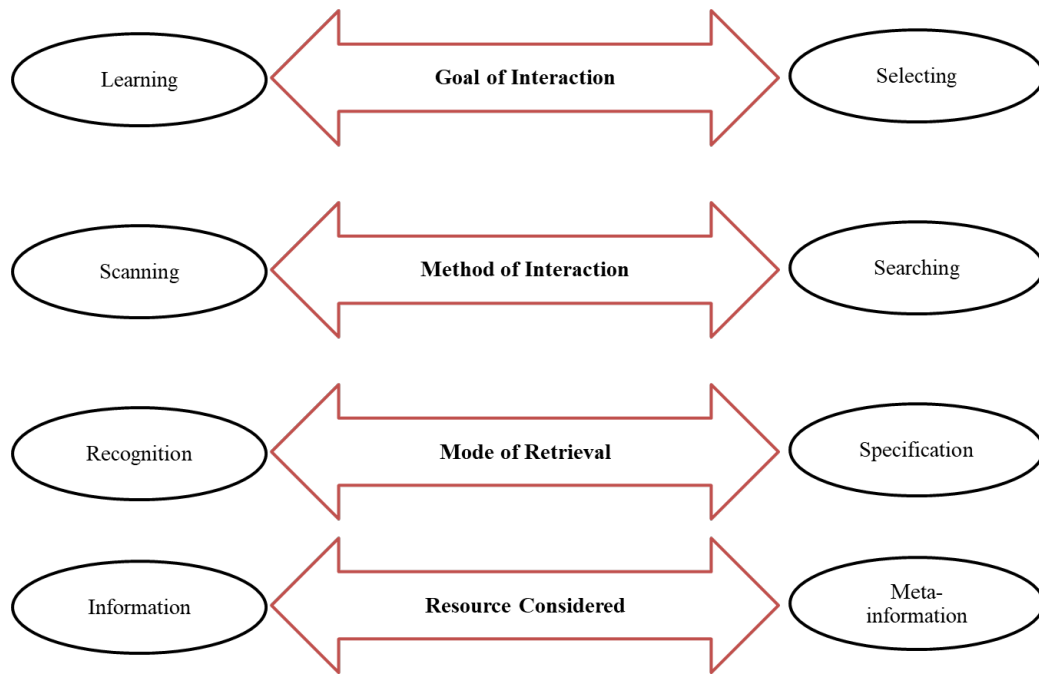
Figure 2.7 Information-Seeking Strategies (Adapted from Belkin et al., 1993)

The following sub-sections detail interactive models of information seeking behaviour, outlining how an individual might engage with information resources or systems to acquire the necessary information.

2.5.1.6 Bates' Berry-picking Model

Bates' Berry-picking Model, as outlined in 1989, portrays the process of seeking information as a dynamic, evolving sequence (Figure 2.8). This model suggests that information searching is a series of continuous stages involving exploration, contemplation, evaluation, and determination. It posits that while a search begins with a singular concept or subject, it naturally navigates through various sources. This journey through different information can spark new thoughts, leading to a possible shift in the direction of the initial query. This concept, further expanded by Knight and Spink in 2008, emphasizes how the original line of inquiry might transform significantly as new information is encountered.
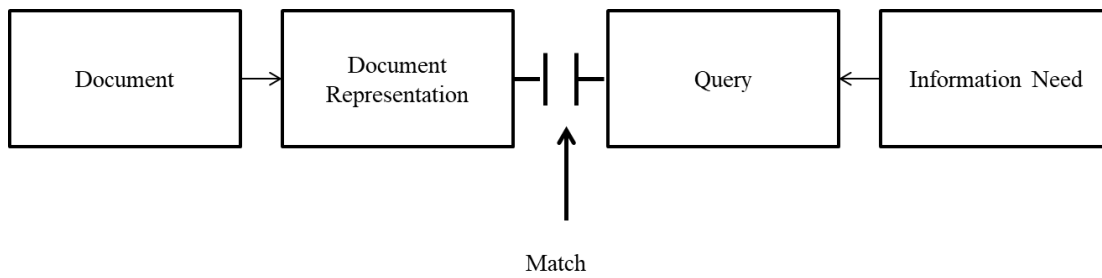
Figure 2.8 Illustration of a classic model of information retrieval (Source: Bates, 1989)

Bates (1989) proposed a non-linear perspective on information seeking (Figure 2.9), suggesting it as a dynamic process in which each query's results provoke a cognitive response from the searcher. This response can reinforce the original inquiry, extend or alter it, completely overhaul the search direction, or possibly lead to the abandonment of the search altogether. Knight and Spink (2008) further elaborated on this concept, highlighting the fluid and responsive nature of the information seeking process.
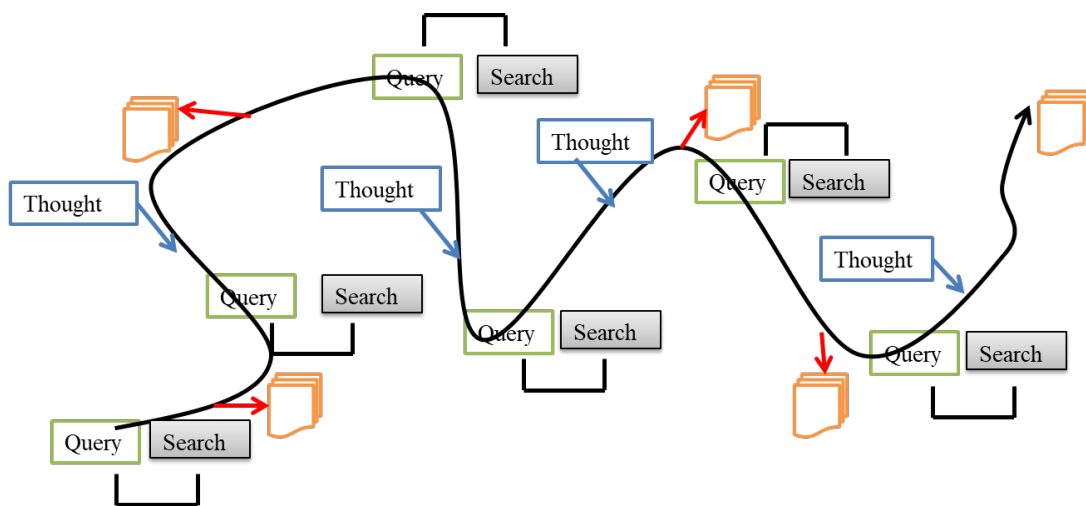
Figure 2.9 Illustration of a berry-picking search (Source: Knight & Spink, 2008)

2.5.1.7 Marchionini's Information-Seeking Model

Information search strategies, as categorized by Marchionini in 1995, are broadly divided into two types: analytical and browsing.

Analytical strategies are characterized by a more systematic and thoughtful approach, while **browsing strategies** tend to be more random and less structured. Marchionini's model primarily views the process of seeking information as a linear one, as illustrated in Figure 2.10.
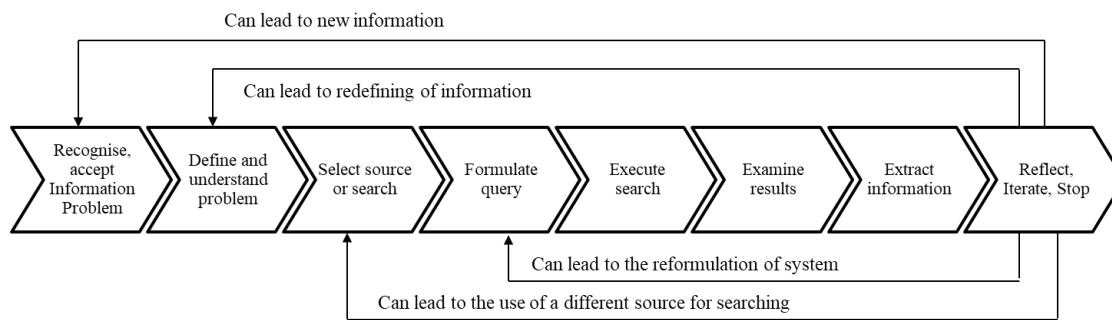
Figure 2.10 Information-Seeking Model (Source: Marchionini, 1995)

This suggests that, despite a phase for reflection, iteration, and potentially stopping, an individual seeking information typically continues to evaluate their information needs independently. The search begins with recognizing a problem and continues until the issue is either resolved or abandoned. This model's effectiveness was analysed through various personal and contextual factors and processes. It serves to illustrate the experience of a user interacting with a digital resource, as noted by Abbas in 2018.

2.5.1.8 Comparing the Models of Information Seeking/Searching Behaviour

The seven models presented in previous sections have significant contributions in explaining the process and factors involved in information seeking. The examination and comparison of various information-seeking behaviour models, especially in the context of a doctoral student's thesis investigating the emotional journey of students, here's a comparative analysis of the models discussed, focusing on their distinct features, merits, demerits, and relevance to your study. This comparison is summarized in a tabular form to provide clarity: shown in Table 2.1.

Model	Key Concepts	Merits	Demerits	Relevance to study in context

Wilson's Model of ISB (1981)	Focuses on the interaction between the user's need, the information environment, and obstacles	Comprehensive; considers various factors influencing information seeking	Overlook the complex emotional aspects of information seeking	Does not deeply explore the emotional journey or its impact on information seeking
Kuhlthau's ISP Model (1991;2004)	Six-stage process emphasizing cognitive, affective, and physical factors	Highlights emotional fluctuations during information seeking	Emotions are primarily seen as responses to cognitive states	Relevant for understanding the emotional journey in each stage plus provides insight into emotional changes during the research process
Nahl's Affective Approach (2005)	Expands on Kuhlthau's model to include affective load under time pressure and uncertainty	Addresses the impact of emotions and time constraints on information seeking	Limited in addressing a broader range of emotions	Provides insights into the role of stress and time in research
Ellis's Information Search Process Model (1989)	Eight distinct activities in information seeking, emphasizing behavioural aspects	Comprehensive in identifying different information-seeking activities	Less emphasis on cognitive and emotional aspects	Useful for identifying specific behaviours in doctoral research
Belkin et al.'s ISS (1993)	Focuses on interactions between a user and information retrieval systems	Broad view of different user behaviours in information retrieval	Less focus on the emotional or cognitive processes behind these behaviours	Helps in understanding the interaction with information systems
	Non-linear approach, suggesting an evolving	Captures the dynamic and changing nature of	May not fully address the emotional aspects of this	Useful for conceptualizing the evolving nature of a

	process in information seeking	information seeking	non-linear process	thesis
Bates's Berry-Picking Model (1989)				
Marchionini's Information-Seeking Model (1995)	Divides strategies into analytical and browsing, viewing the process as mostly linear	Distinguishes between different types of search strategies	Linear view may not capture the complexities and emotional journey in doctoral research	Helps in identifying types of strategies used in thesis research

Table 2.1 ISB Model Comparison

This table demonstrates how each model contributes to understanding the emotional aspects of information-seeking behaviour among doctoral students, albeit to varying degrees and from different perspectives. Some models, like Kuhlthau's and Nahl's, directly address emotional factors, while others, such as Ellis's and Belkin et al.'s, are more focused on behavioural or interactional elements but can indirectly relate to emotional experiences. Bates' Berry-picking Model and Marchionini's Model provide frameworks that can imply emotional responses based on the nature of the information-seeking process.

This comparison highlights the importance of considering a range of models to fully grasp the emotional journey of doctoral students in their information-seeking endeavours'. For this next the Kuhlthau's model will be base point to explore emotions encounter through different phases of doctoral research. The next section provides a comprehensive discussion of what how emotions are perceived in social sciences with many different angles of information-seeking behaviour and emotions in academic and doctoral students.

2.6 EMOTIONS IN SOCIAL SCIENCES

The nature and significance of emotions have been subjects of substantial inquiry in the field of psychology and its applications to human behaviour. A plethora of theories have emerged, often presenting contradictory viewpoints. Some scholars argue that the concept of emotion is dispensable when studying human behaviour (Damasio, 1994;

Keltner & Lerner, 2010), while others, like Izard (1971) and Tomkins (1963), contend that emotions constitute the fundamental motivational system for human beings.

Schachtel (1959) posits that emotions are fleeting phenomena, but contrasting views suggest that emotions are an integral facet of human existence (Ekman, 2016). Lazarus (1991) argues that emotions disrupt and disorganise behaviour, attributing them as a source of human problems, whereas proponents like Izard (1971) and Tomkins (1963) assert that emotions function as organising and motivating forces that sustain behaviour (Gross, 2015; Van Kleef, 2016).

This thesis aligns with the perspective that emotions serve as motivators and organisers of behaviour, with a particular emphasis on their role in Information-seeking behaviour (ISB). Consequently, it becomes imperative to differentiate between various emotions, both in terms of their impact on information-seeking behaviour and strategies for their management. The following sections are explained one by one

- **Emotion Theories: An Ontological Overview**
- **Emotion Theories : IR Application**
- **Relationship between Emotions & ISB**
- **Emotion's Research in Scholarly Research**

2.6.1 Emotion Theories: An Ontological Overview

To comprehend the intricate relationship between emotions and information seeking, it is essential to delve into the rich landscape of emotion theories. Various frameworks have been proposed, each shedding light on distinct facets of emotional experiences and expressions. These theories offer diverse perspectives on how emotions might shape reactions and decisions in information-seeking scenarios (James, 1884; Cannon, 1927).

One of the most prominent models of emotions is the James-Lange theory, which posits that emotions result from physiological responses to external stimuli (James, 1884). This theory suggests that the experience of an emotion is a consequence of the bodily changes that occur in response to a particular situation.

Another influential model is the Cannon-Bard theory, which argues that emotions and physiological responses occur simultaneously and independently of each other (Cannon, 1927). This theory emphasizes the role of the brain in the emotional experience, suggesting that emotions are generated by the brain's interpretation of a situation.

The Schachter-Singer two-factor theory of emotion combines elements of both the James-Lange and Cannon-Bard theories, proposing that emotions are the result of a combination of physiological arousal and cognitive interpretation of that arousal (Schachter & Singer, 1962). This theory emphasizes the importance of cognitive processes in the emotional experience, suggesting that the way we interpret our physiological responses can influence the emotions we feel. Here is the comparison diagram illustrating the differences between the James-Lange Theory, Cannon-Bard Theory, and Schachter-Singer Theory of emotions Figure 2.11:
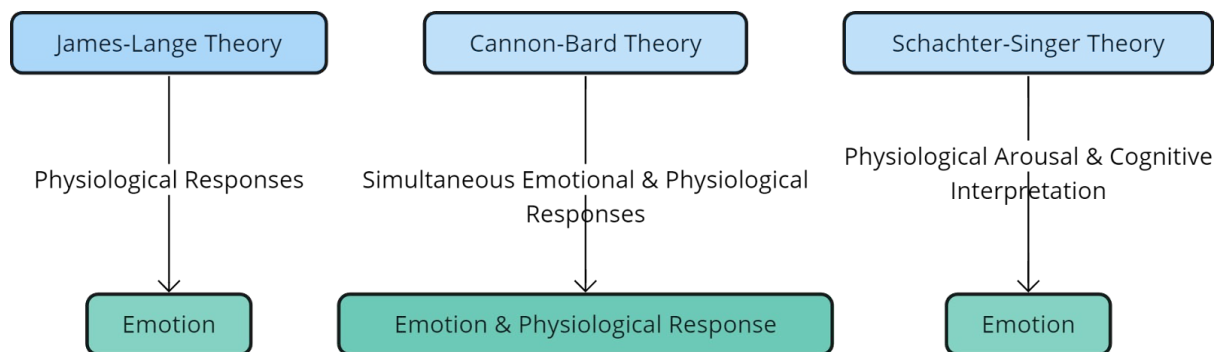
Figure 2.11 Emotion theories comparison

Emotions play a crucial role in social interactions and relationships, influencing our behaviour and decision-making processes. They are also integral to our sense of self and identity, shaping our perceptions and interpretations of the world around us. This is further explored by organising emotion's research into two classes.

2.6.2 Emotion's Theories: IR Application

The field of emotion research, while historically focused, lacks a unified understanding of what emotions are. This summary provides an overview of the two primary classes of

emotion theories and their relevance in the context of information research, as outlined by various scholars.

2.6.2.1 Cognitive Theories of Emotions

Emotions are closely tied to cognitive processes, either intentional or unintentional, conscious or unconscious.

Key Theorists and Contributions

Lazarus (1984): Stressed the importance of cognitive evaluations in interpreting stimuli. Fridja (1994): Emphasized awareness of the emotional object, its appraisal, action readiness, and unconscious arousal. Scherer (2005): Described the componential theory, viewing emotions as a coordination of perpetual, bodily, and cognitive processes. These theories have been explicitly and implicitly applied in studies on affective aspects of information.

2.6.2.2 Somatic Theories of Emotions

Focuses on bodily responses and emotional expressions rather than cognitive judgment.

Key Theorists and Contributions

Tomkins (1984): Highlighted the affect system as a primary motivator influencing bodily functions. Ekman (1984): Proposed that emotions are psychosomatic states evolved for their adaptive value in life roles. Suggests that emotions mobilize organisms to respond quickly to events.

- **Discrete Emotion Theory:**

Proposes six universally recognized emotions (surprise, disgust, fear, anger, sadness, happiness). Researchers like Lopatovska and Arapakis (2011) consider variants of these emotions (e.g., loneliness as a form of sadness). Arapakis et al. (2008, 2009): Analysed the impact of search task complexity on users' emotions and relevance of video content. Lopatovska and Cool (2008): Investigated facial expressions in digital library searches.

- **Continuous Emotion Theory**

Supports the idea of multiple dimensions in describing emotions. Researchers like Barrett and Russell (1999) propose independent bipolar dimensions (arousal, pleasure-displeasure, dominance-submissiveness).

Hanjalic and Xu (2016): Developed a model for presenting video content based on valence and arousal. Soleymani et al. (2008): Modeled an approach to affective ranking of movie content.

These emotion theories offer diverse perspectives on how emotions are experienced and expressed. Their application in information research spans across various models and methodologies, contributing significantly to our understanding of emotional responses during information-seeking processes.

To appreciate the impact of emotions on Information Seeking behaviour, emotions also researched into the impact on individuals at both **individual (personal) and social levels.**

At the **individual level**, emotions are pivotal in rational decision-making during information seeking (Lerner et al, 2015). Emotions guide our preferences, influencing the information we choose to seek and consume. Additionally, emotions influence attention (Phelps,E.A., 2006) and memory retrieval processes (Talarico et al., 2004), shaping the effectiveness of information retrieval. In terms of its impact on individuals, emotions can have a profound effect on mental and physical health. Positive emotions such as happiness and love have been linked to improved health outcomes, while negative emotions such as stress and anger can have detrimental effects on health (Fredrickson, 2001).

At the **social level,** emotions are instrumental in communication (Scheufele & Krause, 2019), fostering empathy (Decety & Jackson, 2004), and enabling coping mechanisms (Tamir & Ford, 2012) during information exchange. Moreover, emotions drive entertainment-based information-seeking behaviours (Suler, 2004), further underscoring their societal significance.

Information-seeking behaviour is a complex process that involves the active search, acquisition, and utilisation of information to fulfil specific needs and goals. In academic

and doctoral contexts, students are often required to engage in extensive information-seeking activities as part of their research and learning processes. These activities are not only influenced by cognitive factors but also by emotions, which play a crucial role in shaping how students approach and navigate the information landscape.

Understanding the interplay between information-seeking behaviour and emotions is essential for educators, researchers, and support services in higher education institutions. This knowledge can help design more effective interventions, support systems, and educational strategies tailored to the emotional needs of academic and doctoral students.

- a) focuses on a background study which explores the emotional aspects involved in the information-seeking process for doctoral students.
- b) It sheds light on how emotions such as anxiety, frustration, and stress can impact the efficiency and effectiveness of information-seeking behaviour.
- c)Additionally, the positive emotions such as satisfaction and relief experienced by students when they successfully find the information, they are looking for are examined with self-exploration and regulation theories.

2.6.3 Relationship between Emotions & ISB

The relationship between emotions and information-seeking behaviour has been a significant focus in early information behaviour research. Mellon (1988) discovered that negative emotions could impede learning and effective information seeking. Extending this, Lopatovska (2009) noted that emotions influence search strategies, outcomes, motivation, and satisfaction. Nahl (1998) explored the affective and cognitive components of searching, finding a positive link between affective factors and satisfaction, performance, and motivation. Conversely, Wang et al. (2000) identified a reciprocal connection between affective elements and search efficiency, with positive emotions encouraging further search, while negative ones hinder it.

Investigating novice users, Nahl and Tenopir (1996) observed that emotions like the need for confirmation, hesitation, surprise, and fear significantly impact search strategies. For example, surprise could trigger a reconciliation of search expectations with reality.

Similarly, Butler and Cartier (2005) found that emotions like low interest, low self-esteem, and high-stress levels could lead to avoidance behaviours, negatively impacting activities like reading and researching. Nahl (2005) suggested that positive emotions like optimism and self-efficacy could counteract frustration and irritation, often linked with uncertainty in information seeking.

Safahieh and Singh (2006) define information-seeking behaviour as involving actions in articulating, searching, evaluating, and applying information. Kakai et al. (2004) described it as the process of searching and utilizing information, underlining that it aims to fill knowledge gaps. Devi and Dlamini (2013) found that factors like course, age, level, native language, and religion significantly influence college students' information-seeking behaviour, with many relying on trial and error due to a lack of basic information skills.

Several studies have compared information-seeking behaviours among university students. Abdoulay (2002), Dalglish and Chan (2005), Deumert et al. (2005), Jeong (2004), and Liu Redfan (1997) focused on the differences between local and international students, noting that cultural disparities pose unique challenges for international students. For instance, Deumert et al. (2005) highlighted difficulties in accessing and selecting relevant information. Hughes (2005) added that self-confidence, emotions, and understanding of the problem could influence information-seeking behaviour.

Liu and Redfarn (1997) at San Jose State University found that international students' confidence in seeking help increased with their length of stay in the country. Fidzani (1998) at the University of Botswana observed a predominant reliance on library textbooks and journals, with low utilization of library assistants. Abdoulay (2002) at the International Islamic University of Malaysia reported a heavy dependence on textbooks and internet services provided by the library.

Callinan (2005) compared first-year and final-year biology students, noting that the level of study influenced their information-seeking confidence and channels used. Song (2005) at the University of Illinois found significant reliance on library databases, especially among international students, and a preference for remote electronic resources among local students.

Qureshi (2008) identified that cultural and educational backgrounds, student participation, and the environment positively affect Pakistani students' information-seeking behaviour. Diamond et al. (2014) proposed that cognitive limitations could lead students to make satisfactory rather than optimal decisions. They also discussed how the first piece of information obtained could create an "anchoring effect" resulting in availability bias and how information overload could result in information anxiety.

Shafique and Mahmoud (2013) examined the information-seeking behaviour of academics, noting their extensive use of external sources and online materials. Du Preez (2008) contrasted this with professionals like engineers who rely more on internal information sources. Palmer (cited in Heinstrom 2005) categorized information behaviour based on factors like anxiety or relaxation, and control needs, emphasizing that an internal locus of control can lead to active, problem-focused information searches. However, Hatchard and Crooker (date not provided) argued that external factors might be more influential in library information-seeking behaviours.

In summary, research has explored various aspects affecting information-seeking behaviour, from cultural differences and reliance on help desks to the impact of cognitive abilities and emotions like anxiety. Here, the research also explores the emotional influence on *motivation, barriers, and strategies for self-regulations*.

2.6.3.1 Emotional Influences on Motivation

Emotions play a significant role in motivating individuals, especially in the context of education and information seeking. Drawing from the self-determination perspective, Deci, Vallerand, Pelletier, and Ryan (1991) emphasise the importance of intrinsic motivation, which is driven by one's internal desires and interests. In the realm of education, intrinsic motivation is closely tied to positive emotions such as curiosity, excitement, and enthusiasm.

Deci et al. (2017) argue that when individuals feel genuinely interested and engaged in a topic, they are more likely to be intrinsically motivated to seek out information and engage with various information sources. This aligns with the idea that positive emotional

states can act as powerful motivators, compelling students to explore new subjects and dive into information-seeking.

Furthermore, Pekrun, Goetz, Frenzel, Barchfeld, and Perry (2011) have developed the Achievement Emotions Questionnaire (AEQ) to measure the emotions experienced by students during their learning and performance activities. Their research highlights the intricate connection between emotions and educational contexts. Positive emotions, such as enjoyment, are associated with increased motivation and engagement in learning. The AEQ allows researchers to assess the emotional aspects of students' experiences, shedding light on the impact of emotions on motivation.

Ainley and Ainley (2011) conducted a study on student engagement with science in early adolescence, emphasising the pivotal role of enjoyment in sustaining students' interest in learning. Their findings demonstrate that the positive emotion of enjoyment contributes significantly to students' continuing engagement with science subjects. This suggests that fostering positive emotions, like enjoyment, can be a valuable strategy for educators to enhance motivation and information-seeking efforts.

In summary, Deci et al. (1991), Pekrun et al. (2011), and Ainley and Ainley (2011) collectively emphasise the importance of positive emotions, such as curiosity and enjoyment, in driving motivation and engagement in educational contexts. These emotions not only encourage students to seek out information but also contribute to their long-term interest in learning.

To illustrate this, consider a doctoral student embarking on a research project. If they feel a sense of curiosity and passion for their topic, they are more likely to be motivated to seek out information, explore various sources, and persist in their research. Conversely, if they experience anxiety or frustration due to challenges in the research process, their motivation may wane.

2.6.3.2 Emotional Barriers in Information Seeking

Emotional barriers can present substantial challenges to effective information seeking, affecting both educational contexts and work-related training. A meta-analysis conducted by Sitzmann and Ely (2011) explored the concept of self-regulated learning in

work-related training and educational attainment. This comprehensive study shed light on the intricacies of how emotions intersect with the learning process. While not focusing explicitly on emotions, it emphasized the importance of self-regulation, which includes managing emotional responses during the learning journey.

Pajares (2003) delved into the concept of self-efficacy beliefs, motivation, and achievement in the context of writing. Self-efficacy beliefs, which are closely tied to one's emotional state and confidence, were found to play a pivotal role in influencing motivation and achievement. Individuals with firm self-efficacy beliefs often exhibit greater motivation and persistence in information-seeking and learning endeavours. Conversely, individuals struggling with self-doubt, an emotional barrier, may find it challenging to engage effectively with information sources (Pajares, 2003).

In the broader context of information seeking, (Case,D.O., 2002) conducted a survey of research on information seeking, needs, and behaviour. Although the primary focus of this work is on the behaviour of information seeking, it indirectly acknowledges the emotional dimension. For instance, the fear of information overload, a common emotional barrier, was alluded to in the survey findings. Information overload can trigger feelings of overwhelm and frustration, hampering one's ability to engage effectively with information sources.

Incorporating insights from these studies, it becomes evident that emotional barriers like fear of failure, self-doubt, perfectionism, and information overload can significantly impact information-seeking behaviours. These barriers can impede individuals from seeking out challenging information, evaluating sources effectively, and maintaining motivation throughout the process.Doctoral students, in particular, may experience heightened emotional barriers due to the demands and expectations associated with their research.

Fear of failure can lead students to avoid seeking information that might challenge their existing knowledge or hypotheses. Self-doubt can erode confidence in their ability to evaluate and use information sources effectively. Perfectionism can create unrealistic expectations, causing stress and anxiety. Information overload, a common issue in the digital age, can lead to feelings of overwhelm and frustration.

2.6.3.3 Emotional Regulation and Coping Strategies

To navigate the emotional landscape of information seeking, students often employ emotional regulation and coping strategies. These strategies can vary widely among individuals but may include.

Positive self-talk and encouraging oneself to stay motivated and focused on the task at hand. Bandura's concept of self-efficacy is central to understanding how positive self-talk can impact one's ability to engage in information-seeking effectively. Self-efficacy refers to an individual's belief in their own capability to achieve specific goals (Bandura, A.,1997).

Stress management: Engaging in relaxation techniques or physical activities to alleviate anxiety and stress. The Lazarus and Folkman's Transactional Model of Stress and Coping provides a framework for understanding how individuals assess and manage stress during information-seeking, (*Biggs, A., Brough, P. and Drummond, S., 2017).*

Goal setting: Breaking down information-seeking tasks into smaller, manageable goals to maintain a sense of achievement. Locke and Latham's Goal Setting Theory (2002) is widely cited in the context of motivation and task performance. It can be applied to information seeking by breaking down the process into manageable goals.

Seeking support: Reaching out to mentors, peers, or support services for guidance and emotional support. Vygotsky's sociocultural theory Scott, S. and Palincsar, A., (2013) emphasises the role of social interactions and support in cognitive development. Seeking support during information-seeking aligns with this theory.

Mindfulness: Practicing mindfulness techniques to stay present and reduce emotional reactivity.Jon Kabat-Zinn's work on mindfulness-based stress reduction is relevant to understanding how mindfulness techniques can be applied during information seeking to reduce emotional reactivity Kabat-Zinn, J. (2003).

Understanding which strategies are most effective for different individuals and contexts is crucial for improving emotional well-being during information seeking.

2.6.4 Emotion's Research in Scholarly Research

The journey of doctoral students through their research, particularly in areas like information-seeking and gamification, is intricately linked with their emotional experiences. These emotional states are shaped by various factors such as the surrounding environment, personal mood swings, engagement intensity, individual motivational drives, and the natural capacity for emotional expression.

The exploration of emotions in scholarly research has seen a remarkable evolution over time. Initially, the focus was on the more observable aspects of emotion. However, as psychology and neurology have advanced, comprehension of emotions as multi-faceted and intricate phenomena has deepened.

This development has called for a more varied array of research methods to fully capture the broad spectrum of emotional experiences. The significant progress in disciplines like psychology, neurology, and technology has been pivotal in this transformation.

2.6.4.1 Early Research: behaviourism and Basic Emotions

Behaviourist Approach: In the early 20th century, influenced largely by behaviourism, emotion research primarily revolved around external expressions and physiological reactions. Key figures like John B. Watson championed the idea of focusing on observable behaviour rather than internal experiences, as seen in Watson's seminal work (Watson, J.B., 1913. "Psychology as the behaviourist views it." Psychological Review).

Theory of Basic Emotions: The 1960s and 1970s marked a significant shift with Paul Ekman's research. Ekman proposed a theory of universal emotions, identifiable through facial expressions, thereby introducing the concept of basic emotions such as happiness, sadness, anger, fear, surprise, and disgust (Ekman, P., 1972 & J. Cole (Ed.)).

2.6.4.2 Advancements in Psychology: Cognitive Appraisal Theory

Cognitive Appraisal Theory The 1980s brought a paradigm shift with the introduction of the cognitive appraisal theory by Lazarus and others. This theory centres around the idea that emotions are the result of an individual's cognitive assessment of a situation,

emphasizing the internal processes leading to emotional responses (Lazarus, R.S., 1991).

These theories argue that it is not the situation itself that determines the emotional reaction, but rather the individual's interpretation and evaluation of the situation. The appraisal process evaluates whether the situation is congruent with the individual's goals, how well they can cope with the situation, and what the implications are for their well-being.

Neuroimaging Studies: The advent of neuroimaging techniques like fMRI and PET scans has allowed for direct observation of brain activity in response to emotional stimuli. Notably, Antonio Damasio's research on the prefrontal cortex and amygdala has been crucial in understanding how emotions are processed in the brain (Bechara, A., 2000).

Neurochemical Studies: Investigations into neurotransmitters and hormones, such as serotonin and oxytocin, have broadened our understanding of the biochemical underpinnings of emotions (McEwen, B.S., 2004).

However, this approach has faced criticism for potentially limiting participant mobility and causing distractions from emotional reactions. Moreover, changes in physiological characteristics due to ageing or unexpected events (like accidents or surgery) can add noise to the measurement of neurophysiological signals (Chandra and Calderon, 2005).

- **Current Trends in Emotion Research**

Contemporary trends in emotion research are pivoting towards a deeper understanding of the subtle ways emotions are experienced and expressed across various cultural, social, and individual settings. Moving beyond traditional models that perceive emotions as universally expressed and recognised, this field is now embracing the complexity brought forth by cultural differences, intersectionality, and technological breakthroughs. Notable trends include.

- **Cultural Influences on Emotions**

Current studies are examining emotions within the framework of cultural norms and values, which significantly shape both the experience and expression of emotions. For

instance, Lim's 2016 study contrasts how East Asian cultures, unlike Western ones, often favour low-arousal positive emotions like calmness over high-arousal states like excitement.

- **Intersectionality and Emotional Experiences:** There's growing recognition of how overlapping social identities impact emotional well-being, with a focus on how factors like race, gender, and sexual orientation interplay. Garnett et al. (2014) delved into the unique emotional challenges faced by LGBTQ individuals of colour.

- **Emotion Regulation in Diverse Contexts:** Investigations into emotion regulation are increasingly considering varied sociocultural backgrounds and their influence on how individuals manage emotions. English et al. (2020) studied how social context and personal goals shape individuals' emotion regulation strategies.

- **Technological Integration in Emotion Research:** The integration of technology, including artificial intelligence, virtual reality, and mobile applications, is revolutionizing the study and management of emotions. Kross et al. (2019) utilized emotion-related language on Facebook as a tool to gauge emotional states, illustrating the potential of social media in emotion research.

The next section will explore Information-seeking behaviour and emotions in academic context in detail.

2.7 INFORMATION-SEEKING BEHAVIOUR AND EMOTIONS IN ACADEMIC CONTEXT

In academic settings, information-seeking is a core skill for students. This section examines how information needs, technology, and academic resources impact the information-seeking behaviour of undergraduate and graduate students.

2.7.1 Information Needs and Academic Goals

Academic students, whether pursuing a bachelor's degree or engaged in doctoral research, have specific and evolving information needs closely tied to their coursework, assignments, and research projects (Dervin, 1996). These needs are influenced by

various factors, including course requirements, research objectives, and personal interests (Kuhlthau's, 1993;2004).

Undergraduates often seek information to complete assignments and establish foundational knowledge within their respective disciplines (Bruce, 2008). They frequently exhibit information needs characterised by the desire for accessible and introductory materials. Doctoral students, conversely, engage in more extensive and specialised information-seeking activities aimed at advancing their research and contributing new knowledge to their discipline (Hemminger et al., 2007). Their information needs are more complex and nuanced, necessitating access to cutting-edge research and scholarly discourse.

The emotional dimensions of information-seeking activities can significantly differ across academic levels and research intensity (Vakkari, 2003). Undergraduates may experience excitement when discovering new information relevant to their coursework but may also encounter challenges and frustrations as they navigate unfamiliar research terrain. Doctoral students often struggle to make original contributions to their fields, which can manifest as a unique blend of excitement, intellectual curiosity, and occasional anxiety or self-doubt.

2.7.2 Impact of Technology on Information Seeking

The digital age has ushered in profound transformations in how academic students seek information. Technological advancements have made abundant resources available through online databases, search engines, e-books, and academic journals (Case, 2012). This accessibility has fundamentally altered the landscape of information-seeking for academic students, offering unprecedented convenience.

However, technology has also introduced new challenges (Nicholas et al., 2008). The sheer volume of available information can lead to information overload, where students may find it overwhelming to sift through copious search results to identify relevant sources (Barreau & Nardi, 1995). Additionally, the digital realm demands a level of digital literacy, and students may experience frustration and stress when encountering technical difficulties or grappling with complex search strategies (Xie & Joo, 2012).

For academic students, technology can evoke a wide range of emotions. The ease of access to online resources can elicit feelings of excitement and empowerment, as students harness digital tools to enhance their learning and research endeavours. Simultaneously, the challenges associated with information overload and the need for digital literacy skills can lead to moments of frustration and stress.

Learning how to harness technology for information-seeking effectively is a crucial aspect of academic success, requiring students to cultivate both technical competencies and information evaluation skills (Savolainen, 2008).

2.7.3 Academic Libraries and Information Resources

Academic libraries remain integral to supporting students' information-seeking behaviour, offering a rich array of physical and digital resources, research assistance, and dedicated study spaces (Hider, 2014). Librarians, as information professionals, serve as invaluable guides in the complex and evolving landscape of information resources (Julien & Barker, 2009).

The emotions associated with utilising academic libraries can be multifaceted. Students often experience a sense of comfort and security, knowing that libraries provide ready access to authoritative information sources, including books, journals, and databases (Dervin, 1996). They may also feel gratitude for the expertise and support provided by librarians, who assist in locating resources, navigating library systems, and refining research strategies (Radford, 1999). Nevertheless, students may also grapple with anxiety or apprehension when interacting with academic libraries, particularly if they are unfamiliar with library catalogues and resources (Connaway et al., 2013). Navigating the complexities of library systems and finding relevant materials can be daunting, especially for those new to academic research.

The study of emotions in academic research is a dynamic and multifaceted field. Below is a table comparing five recent research papers that delve into various aspects of emotion research. This Table 2.2 outlines their methodologies, focus areas, and key findings.

Author(s)	Year	Research Methodology	Foucs Area	Key Findings	References
Gross, J.J., & John, O.P.	2003	Quantitative; Survey-based approach using the Emotion Regulation Questionnaire (ERQ)	Emotion Regulation Strategies	Identified two major emotion regulation strategies: cognitive reappraisal and expressive suppression, and their differing impacts on mental health	Gross, J.J., & John, O.P. (2003). "Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being". Journal of Personality and Social Psychology, 85(2), 348-362. DOI:10.1037/0022-3514.85.2.348
Mauss, I.B., & Robinson, M.D.	2009	Review; Comprehensive analysis of various emotion measurement tools	Emotion Measurement Methods	Evaluated the strengths and limitations of different methods for measuring emotions, including self-report, physiological measures, and behavioural coding	Mauss, I.B., & Robinson, M.D. (2009). "Measures of emotion: A review". Cognition and Emotion, 23(2), 209-237. DOI:10.1080/02699930802204677
Lindquist, K.A., et al.	2012	Meta-analysis; Analysis of neuroimaging studies on emotion	Neurological Basis of Emotions	Provided evidence for the brain regions involved in emotion, emphasizing the networked nature of emotional processing in the brain	Lindquist, K.A., et al. (2012). "The brain basis of emotion: A meta-analytic review". behavioural and Brain Sciences, 35(3), 121-143. DOI:10.1017/S0140525X11000446
Barrett, L.F., et al.	2016	Qualitative; Critical review and analysis of existing emotion research	Facial Expressions and Emotions	Argued against the universality of emotional expressions, emphasizing the context-dependency and cultural variability of facial expressions	Barrett, L.F., et al. (2016). "Emotional expressions reconsidered: Challenges to inferring emotion from human facial movements". Psychological Science in the Public Interest, 17(1), 1-68. DOI:10.1177/1529100616632956

| Kross, E., et al. | 2019 | Mixed-methods; Quantitative analysis of emotion words in Facebook posts and qualitative surveys | Emotion Expression on Social Media | Found a moderate correlation between the use of emotion words in social media posts and individuals' reported emotional experiences | Kross, E., et al. (2019). "Does counting emotion words on online social networks provide a window into people's subjective experience of emotion? A case study on Facebook". Emotion, 19(1), 97-107. DOI:10.1037/emo0000424 |

Table 2.2 Emotions in Academic Research

These aforementioned studies showcase the variety of methods used in emotion research, from quantitative surveys and social media analyses to qualitative reviews and neuroimaging meta-analyses. Each approach offers unique insights into how emotions are experienced, expressed, and processed, reflecting the complexity and multi-dimensionality of emotional phenomena in academic research.

2.8 DOCTORAL STUDENTS' INFORMATION-SEEKING BEHAVIOUR

Doctoral students are at a unique stage in their academic journey, facing both exciting opportunities and distinct challenges in their information-seeking behaviour. This section delves into the intricacies of these challenges and outlines strategies for effective information seeking.

2.8.1 Unique Challenges Faced by Doctoral Students

Doctoral students often encounter heightened emotions as they embark on their research journey. The pressure to make original contributions, publish, and defend a dissertation can result in various emotional challenges, including stress, anxiety, and imposter syndrome (Smith et al., 2018; Richardson, 2017). These emotional states can significantly impact how they approach information seeking, including their ability to evaluate sources critically and synthesise information (Charmaz, 2006).

Moreover, the extensive nature of doctoral research necessitates students to engage in comprehensive literature reviews, navigate intricate databases, and collaborate with peers and mentors (Murray & Newton, 2009). The emotional toll of this process can be substantial, potentially leading to burnout or feelings of isolation (Evans et al., 2018).

2.8.2 Strategies for Effective Information Seeking

To navigate the emotional challenges associated with doctoral research, students can employ various strategies:

a. **Time management:** Creating structured schedules and setting boundaries to prevent overwhelm (Whitton, N. and Langan, M., 2018).

b. **Collaboration:** Engaging in peer collaboration and seeking mentorship to share the emotional burden (Gardner et al., 2018).

c. **Self-care:** Prioritizing physical and mental well-being through exercise, relaxation, and self-compassion (Kyndt et al., 2016).

d. **Seeking institutional support:** Utilizing counselling services and academic support programmes to address emotional challenges (Barnes et al., 2017).

Additionally, doctoral programmes can benefit from providing emotional support resources and fostering a culture of well-being among their students. This includes workshops on stress management, peer support groups, and access to mental health services (Lomas et al., 2017).

2.8.3 Role of Mentors and Advisors

Doctoral advisors and mentors play a pivotal role in shaping students' information-seeking behaviour and emotional experiences. Supportive and knowledgeable mentors can provide guidance on effective research strategies, help students navigate emotional challenges, and offer a supportive presence throughout the research journey (Nerad & Cerny, 2008).

Effective mentorship can positively impact students' confidence, motivation, and overall emotional well-being. Research has shown that strong mentorship relationships can

enhance doctoral students' productivity and satisfaction (Austin, 2002). Conversely, inadequate mentorship or conflicts with advisors can lead to emotional distress and hinder information seeking (Lee & Dennis, 2018).

2.9 DOCTORAL STUDENTS AND SELF-REGULATION LEARNING AND GOAL ACHIEVEMENT

Self-regulation refers to how individuals manage and direct their thoughts, emotions, and actions to achieve their goals. In academic settings, self-regulation is paramount as it impacts students' ability to focus, persist through challenges, and succeed in their studies. This study also aims to delve into the intricacies of self-regulation theories and emotions, particularly emphasising their application to academic and doctoral students.

2.9.1 Self-Regulation Theories and Models

This section provides a general overview of theories and models in self-regulation and then has a comparison to explain these in the context of doctoral students.

2.9.1.1 Bandura's Social Cognitive Theory (1986)

Albert Bandura's social cognitive theory posits that individuals learn from observing others in their social environment, which plays a crucial role in the development of self-regulation (Bandura, 1986). A vital component of this theory is the concept of self-efficacy, which is the belief in one's capabilities to achieve desired outcomes. Bandura argued that higher levels of self-efficacy contribute to better self-regulation, as individuals are more likely to set challenging goals, persevere in the face of difficulties, and succeed in their endeavours.

2.9.1.2 Zimmerman's Self-Regulation Model (2013)

Barry J. Zimmerman's (Zimmerman, 2013) self-regulation model is a comprehensive framework that has significantly influenced the understanding of how learners manage their thoughts, feelings, and actions to achieve their goals. This model is particularly relevant for university doctoral students, who are often faced with complex, self-directed learning tasks. In this detailed exploration, the model's components, strengths, and its application to the context of doctoral students.

Zimmerman's model of self-regulation is rooted in social cognitive theory and emphasizes the role of self-regulated learning (SRL) as a process that involves personal, behavioural, and environmental factors. It is structured around three cyclical phases: forethought, performance, and self-reflection shown in Figure 2.12.

Forethought Phase: This phase precedes learning and involves processes like goal setting, strategic planning, and motivational beliefs. For doctoral students, this involves setting research goals, planning their study timeline, and fostering beliefs in their ability to succeed. The strength of this phase lies in its proactive approach, enabling students to anticipate challenges and prepare strategies to overcome them.

Performance Phase: Here, focus shifts to self-control and self-observation. Students engage in learning activities, monitor their performance, and adjust their strategies as needed. For instance, a doctoral student might use specific research methods, keep track of progress, and adapt methods based on the results. This phase is critical for doctoral students as it involves active engagement with the learning material and the adjustment of strategies based on real-time feedback.

Self-reflection Phase: This final phase involves self-judgment and self-reaction. Students evaluate their performance and react emotionally to the outcome. They might feel satisfied with their progress or identify areas for improvement. This reflective practice is particularly beneficial for doctoral students, fostering a deeper understanding of their learning process and promoting continuous improvement.
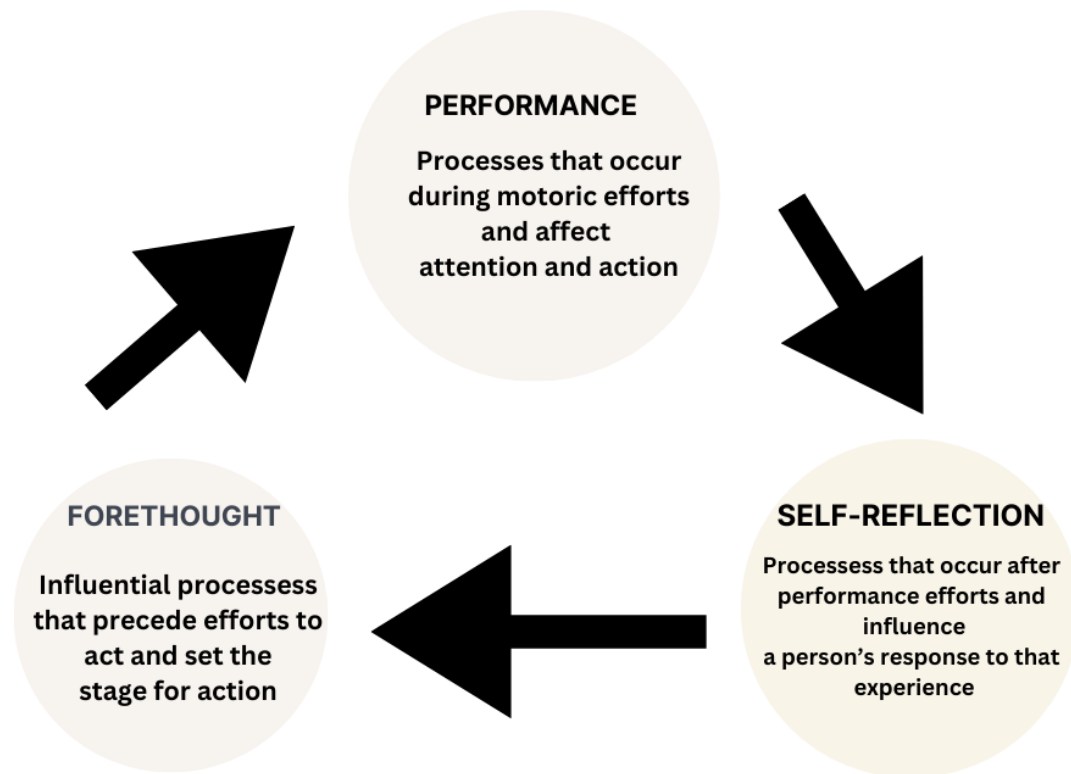
Figure 2.12 Zimmerman self-regulation theory 3 stage model

Each phase of Zimmerman's model feeds into the next, creating a continuous loop of self-regulation. This cyclical nature is particularly advantageous for doctoral students, as it supports ongoing development and refinement of research skills.

The model's strength lies in its holistic approach, considering not just cognitive strategies, but also motivational and behavioural aspects. For doctoral students, who often work independently, the model provides a framework for understanding how to maintain motivation, develop effective learning strategies, and reflect on their learning process.

2.9.1.3 Pintrich's Model of Self-Regulated Learning (2000)

Paul R. Pintrich introduced a model of self-regulated learning that incorporates both motivational and behavioural components into the self-regulation process (Pintrich, 2000). This model is particularly relevant to doctoral students as it highlights the significance of intrinsic motivation, self-efficacy, and cognitive strategies in facilitating

self-regulated learning. Pintrich argued that these components are crucial for doctoral students to navigate the complex demands of their academic programmes successfully.

2.9.1.4 Comparison as relevance to doctoral students and academic settings

These models and theories have been compared to explain the comprehension comparison in the below Table 2.4:

Theory/Model	Key Components	Application to Academic Settings	Relevance to Doctoral Students
Bandura's Social Cognitive Theory	Observational learning, imitation, modelling, self-efficacy	Enhances motivation and self-regulation through observation of successful peers.	High self-efficacy can improve research and thesis writing processes.
Zimmerman's Self-Regulation Model	Forethought, performance, and Self-reflection	Encourage goal setting, strategic learning, and performance reflection.	Helps in managing research projects and academic workload effectively.
Pintrich's Model of Self-Regulated Learning	Intrinsic motivation, self-efficacy, and cognitive strategies	Focus on the role of motivation and cognitive strategies in learning.	Highlights the importance of intrinsic motivation in completing a doctoral thesis.

Table 2.4 Comparison of Self-Regulation Theories

Despite the strong evidence supporting the importance of self-regulation in academic success, there are some criticisms and limitations to these theories. One limitation is that they often focus on individual factors and do not consider the social and contextual factors that can influence academic achievement. For example, Wentzel (1999) argued that social relationships and support from teachers and peers are crucial for academic success and should be considered in self-regulation and goal-setting models.

Another criticism is that these theories may not be applicable to all students, as individual differences can play a significant role in academic achievement. For example,

some students may naturally be inclined towards self-regulation and goal setting, while others may struggle with these processes. This suggests that interventions and strategies should be tailored to the individual needs of students.

In conclusion, self-regulation theories are essential for understanding academic success. Research has shown that self-regulation and goal setting are significant predictors of academic performance. However, it is important to consider the limitations and criticisms of these theories, such as the need to consider social and contextual factors and individual differences among students. This research focused on developing interventions and strategies that are tailored to the individual needs of students and consider the social and contextual factors that can influence academic achievement's this research will explain self-regulation learning through Zimmerman's cyclic model which helps explains the doctoral student research project success and how to overcome work overload.

2.9.2 Goal Achievement Emotions & Relative Theories

Goal achievement emotions refer to the feelings experienced when one progresses towards or achieves a goal. These emotions are typically positive and include feelings of joy, pride, and satisfaction. However, negative emotions such as frustration, disappointment, and sadness can also be experienced if one fails to achieve a goal or faces obstacles in the process.

In academic contexts, goal achievement emotions are often studied using various research models. One common model is the **control-value theory of achievement emotions,** which posits that emotions are influenced by the individual's control over achievement activities and the value they place on the achievement (Pekrun, 2006). This theory has been used to explain the emotions experienced by students in educational settings and how these emotions can impact their motivation and academic performance.

Another model that has been used to study goal achievement emotions is the **goal-setting theory**, which emphasizes the importance of setting specific, challenging goals and providing feedback on progress towards these goals (Locke & Latham, 2002).

Research has shown that goal setting can lead to higher levels of motivation and performance and that the emotions experienced during the goal-setting process can play a significant role in this relationship.

There are also several other models and theories that have been used to study goal achievement emotions, such as the **self-determination theory,** which focuses on the role of autonomy, competence, and relatedness in motivation and emotion (Deci & Ryan, 2000). Each of these models provides a unique perspective on the relationship between goals, emotions, and achievement, and can be used to inform interventions aimed at improving academic performance and emotional well-being. Figure 2.13 depicts the connections between it.
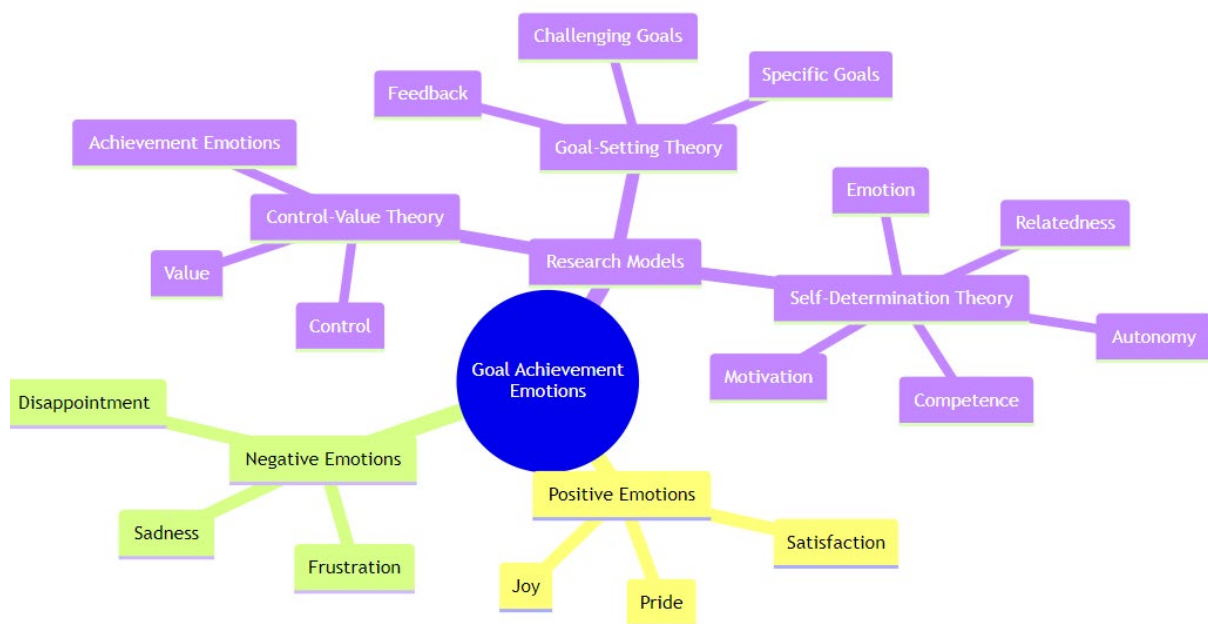
Figure 2.13 Goal Achievement Theories Comparison

In conclusion, goal achievement emotions are a complex and multifaceted topic that has been studied using various research models in academic contexts. These models provide valuable insights into the factors that influence emotions during the goal setting and achievement process and can be used to inform interventions aimed at improving academic performance and emotional well-being.

However, further research is needed to fully understand the relationship between goals, emotions, and achievement, and to develop effective strategies for promoting positive goal achievement emotions in educational settings.

2.10 GAMIFICATION THEORIES AND FRAMEWORKS

This extensive segment explores the notion of gamification and its significance in augmenting how doctoral students seek information. Gamification is a progressive strategy that utilises elements and mechanics found in games to render the process of seeking information more captivating and pleasurable.

This focuses on the following:

- a) definition and gamification concepts and different theories and frameworks in literature
- b) explore gamification and information-seeking behaviour tools and technologies currently applied and context
- c) how gamification can mitigate negative emotions and amplify positive emotions linked to information-seeking, with the ultimate aim of enhancing the overall research journey for doctoral students.

This preliminary investigation delves into various gamified tools and platforms, assesses contemporary theories and frameworks, and furnishes an in-depth examination of pertinent research papers.

2.10.1 Definition and Concept of Gamification

Gamification is an intricate concept that has gained prominence in various fields, including education, marketing, and employee engagement. At its core, gamification involves integrating game elements, such as competition, rewards, and challenges, into non-game contexts to motivate, engage, and influence behaviour (Deterding et al., 2011).

In the context of education, gamification seeks to make learning and information-seeking more enjoyable and effective by leveraging the inherent appeal of games (Anderson et al., 2017). Gamification goes beyond the mere use of games in education. It incorporates elements like points, badges, leaderboards, and narratives to create an immersive experience that fosters motivation, engagement, and learning (Hamari et al., 2014).

By tapping into individuals' intrinsic motivations, gamification aims to make tasks that may be perceived as mundane or challenging more enticing and rewarding (Ryan & Deci,

2000). This approach aligns with Self-Determination Theory (SDT), which suggests that people are motivated when they feel a sense of autonomy, competence, and relatedness (Ryan & Deci, 2000). Gamification strives to create a learning environment where students feel in control of their progress (autonomy), can improve their skills (competence), and are connected to a larger community of learners (relatedness) (Deci et al., 2017).

2.10.2 Elements of Gamification

To effectively implement gamification, it is essential to understand its key elements:

1. **Game Mechanics**

Game mechanics are the rules and systems that govern how the game operates. They are crucial in creating a structured and engaging experience for the user. Points, levels, quests, and challenges are all examples of game mechanics that can be employed to motivate and engage users (Werbach & Hunter, 2012).

2. **Game Dynamics**

Game dynamics refer to the interactions and feedback mechanisms within the game that drive player engagement and influence behaviour. They are the processes that take place due to the game mechanics. Game dynamics include competition, cooperation, and rewards, all of which can be used to engage and motivate users (Deterding et al., 2011).

3. **Game Components:**

Game components are the tangible elements within the game, such as avatars, rewards, and badges. These components serve as motivators and markers of progress for the user, helping to keep them engaged and motivated to continue playing the game (Hamari, Koivisto, & Sarsa, 2014).

4. **Narrative and Storytelling:**

A compelling narrative can immerse players in the gamified experience, providing context and purpose. Storytelling can help to create an emotional connection between

the user and the game, making the experience more memorable and engaging (Erenli, 2013).

5. **Feedback and Progress Tracking:**

Providing timely feedback and allowing players to track their progress are crucial elements for maintaining engagement. Feedback helps users understand how they are doing, and progress tracking allows them to see how far they have come and what they need to do to reach their goals (Caponetto, Earp, & Ott, 2014).

6. **Competition and Social Interaction:**

Incorporating competition or collaboration with others can enhance motivation and create a sense of community. Competing against or collaborating with others can make the experience more enjoyable and motivate users to engage more deeply with the game (Deterding et al., 2011). Figure 2.14 illustrates the visual presentation of all gamification elements.
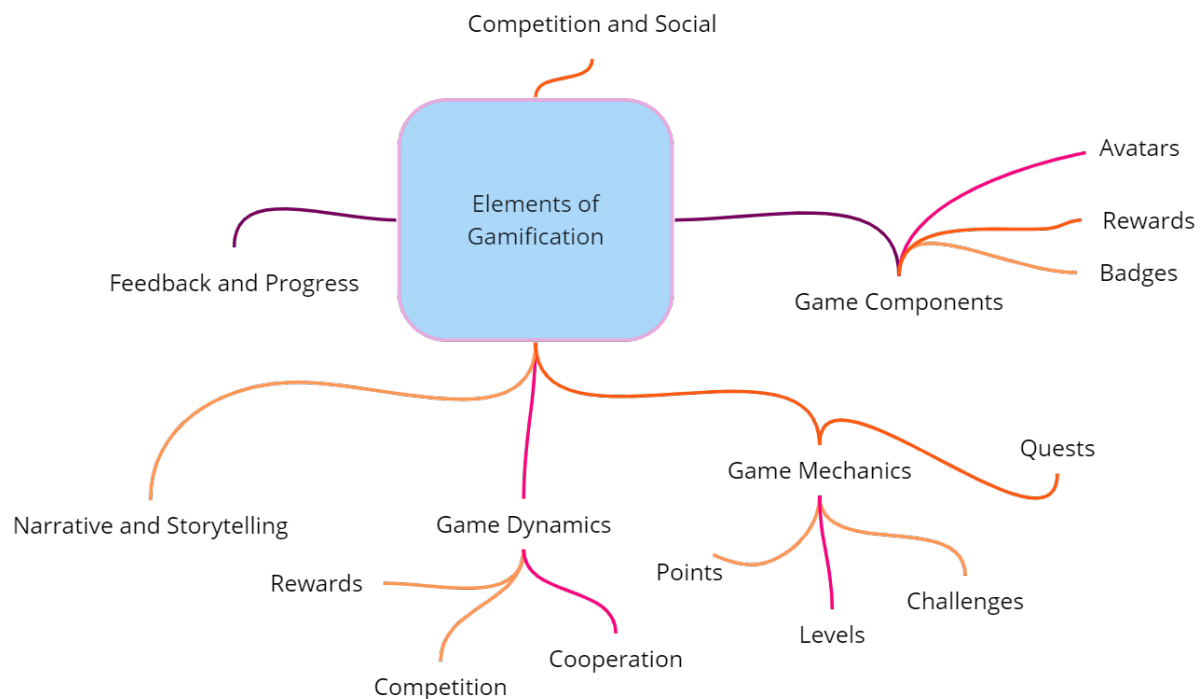
Figure 2.14 Gamification Elements

2.10.3 Gamification in Motivation & Learning

Gamification refers to applying game-design elements and game principles in non-game contexts such as education and research. It has become a popular method to enhance student engagement, motivation, and learning outcomes. In the next section, the research explores various frameworks, models, and research studies in the field of gamification in academia.

2.10.3.1 Octalysis Framework

The Octalysis framework, developed by Yu-kai Chou, is a popular gamification framework that identifies eight core drives that motivate people to take action see Figure 2.15. Yu-kai Chou's Octalysis gamification framework (Chou, 2016) is a comprehensive model developed to enhance user motivation and behaviour through gamification. This framework integrates principles from motivational psychology and behavioural economics, categorized into eight core drives:

1. **Epic Meaning & Calling:** This drive, according to Chou (2016), aims to make users feel they are part of something greater than themselves, instilling a sense of purpose or destiny.

2. **Development & Accomplishment:** Chou (2016) emphasizes this drive as key to fostering users' intrinsic desire for progress, skill development, mastery, and overcoming challenges.

3. **Empowerment of Creativity & Feedback:** Chou (2016) notes that this drive engages users in creating new things and experimenting, coupled with the opportunity to receive feedback and respond.

4. **Ownership & Possession:** As Chou (2016) describes, this drive motivates users by instilling a sense of ownership or control, encouraging them to acquire more or enhance what they own.

5. **Social Influence & Relatedness:** This drive includes social elements that Chou (2016) identifies as crucial for encouraging users to connect, compete, or relate to others.

6. **Scarcity & Impatience:** Chou (2016) describes how arranging scarce, unique, and hard-to-obtain items can motivate users to act.

7. **Unpredictability & Curiosity:** According to Chou (2016), this drive maintains users' interest by creating a sense of unpredictability and eagerness to discover what comes next.

8. **Loss & Avoidance:** Chou (2016) explains that this drive operates by motivating users to act to avoid losing opportunities or experiencing negative events.
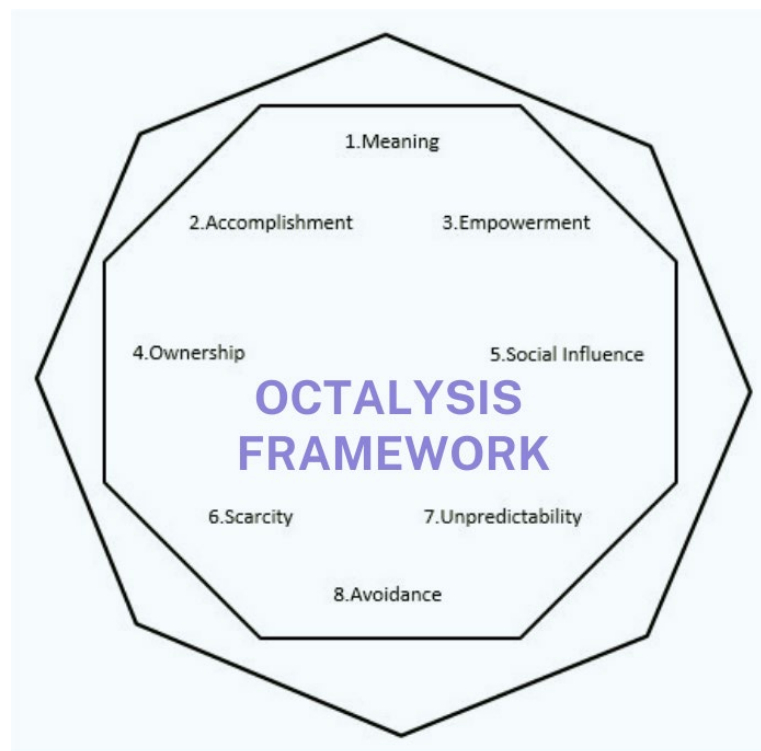
Figure 2.15 Octalysis Framework Chou (2016)

Chou (2016) further categorizes these motivators into intrinsic and extrinsic types. "Development & Accomplishment," "Ownership & Possession," and "Scarcity & Impatience" are extrinsic motivators, while "Empowerment of Creativity & Feedback," "Social Influence & Relatedness," and "Unpredictability & Curiosity" are intrinsic.

Moreover, the framework differentiates between "White Hat Gamification" and "Black Hat Gamification" (Chou, 2016). The former uses positive motivators, while the latter

employs negative motivators, which can be effective but may lead to negative feelings if overused.

The relevance and effectiveness of Chou's Octalysis framework (2016) have been recognized in various domains, particularly in education (Weber et al., 2022; Ouariachi et al., 2020; Reyes et al., 2021; Seifert & Gez, 2021; Tomcho et al., 2019; Marisa et al., 2020; Araújo & Carvalho, 2022; Cunha et al., 2018; Mårell-Olsson, 2019; Sanchez et al., 2020; Toasa et al., 2020), demonstrating its utility in designing engaging and motivating games and learning activities.

2.10.3.2 Self-Determination Theory (SDT)

Self-Determination Theory (SDT), formulated by Deci and Ryan in 2000, is a significant psychological framework that has found extensive application in various domains, including education and gamification. SDT focuses on three fundamental psychological needs: autonomy, competence, and relatedness, which are crucial for fostering intrinsic motivation.

1. **Autonomy** refers to the need for self-control and personal choice. In an educational context, when students feel that they have control over their learning process and can make choices relevant to their interests and goals, their intrinsic motivation tends to increase.

2. **Competence** involves the need to feel capable and effective in one's activities. In academia, this translates to providing students with challenges that are neither too easy nor too difficult, coupled with constructive feedback, to enhance their sense of achievement and skill development.

3. **Relatedness** represents the need to feel connected to others, to care for and be cared for, and to have a sense of belonging. In educational settings, fostering a sense of community, collaboration, and meaningful relationships between students and teachers can fulfill this needs.

Various studies and applications have highlighted the effectiveness of SDT in enhancing student motivation and learning:

- **Educational Technology & Online Learning:** SDT has been applied to understand how digital tools and online environments can support students' autonomy, competence, and relatedness. For instance, studies have shown that online learning platforms that offer personalized learning paths, interactive content, and community features can effectively engage students (Ryan & Deci, 2000; Chen & Jang, 2010).

- **Classroom Dynamics:** Research applying SDT in classroom settings has focused on how teacher-student interactions and classroom management strategies impact students' intrinsic motivation. Emphasizing student choice, providing challenging yet achievable tasks, and fostering a supportive classroom environment have been key findings (Niemiec & Ryan, 2009).

- **Gamification in Education:** SDT has been particularly influential in the design of gamified learning experiences. Gamification elements like choice-based activities, progressive challenges, and social features align with the principles of autonomy, competence, and relatedness, respectively. Studies have found that well-designed gamified systems can significantly increase student engagement and motivation (Dichev & Dicheva, 2017; Sailer et al., 2017).

- **Student Assessment:** SDT has informed approaches to assessment, advocating for methods that support students' feelings of competence and avoid undermining their autonomy. This includes formative assessments and feedback mechanisms that are constructive and encouraging (Black & Deci, 2000).

- **Physical Education & Extracurricular Activities:** Beyond the classroom, SDT has been applied to understand student engagement in physical education and extracurricular activities. Programmes that provide autonomy support, skill-appropriate challenges, and opportunities for social interaction have been shown to increase students' intrinsic motivation to participate (Standage, Duda, & Ntoumanis, 2005).

In summary, SDT offers a robust framework for understanding and enhancing student motivation across various educational contexts. Its focus on meeting psychological

needs has proven effective in creating more engaging, satisfying, and effective learning experiences.

2.10.3.3 Gamification Research in Academia

Gamification in academia refers to the integration of game elements and principles into educational environments and activities with the aim of enhancing student engagement, motivation, and learning outcomes. The studies mentioned provide valuable insights into the potential benefits of gamification in educational settings.

- **Caponetto et al. (2014) - Improving Student Motivation and Engagement**

Objective: This study aimed to explore the impact of gamification on student motivation and engagement in learning activities.

Methodology: The researchers implemented game-like elements such as points, badges, and leaderboards in educational activities and assessed their impact on student motivation and engagement.

Findings: The study found that gamification significantly improved student motivation and engagement in learning activities. The game-like elements created a more interactive and enjoyable learning environment, which in turn encouraged students to participate more actively in the learning process.

Implications: The findings suggest that gamification can be an effective strategy for enhancing student engagement and motivation in academic settings. Educators can incorporate game elements such as rewards, challenges, and competition to create a more dynamic and interactive learning experience.

- **Hamari et al. (2016) - Positive Effects on Student Performance, Satisfaction, and Motivation**

Objective: This study aimed to investigate the effects of gamification on student performance, satisfaction, and motivation.

Methodology: The researchers implemented gamified elements in educational activities and assessed their impact on student performance, satisfaction, and motivation through surveys and performance metrics.

Findings: The study found that gamification positively affected student performance, satisfaction, and motivation. The game-like elements created a sense of achievement and competition, which motivated students to perform better. Additionally, the interactive and enjoyable nature of gamified activities increased student satisfaction.

Implications: The findings suggest that gamification can be a valuable tool for improving student outcomes in academic settings. By incorporating game elements that foster a sense of achievement and competition, educators can motivate students to excel in their studies while also enhancing their overall satisfaction with the learning experience.

In conclusion, the studies by Caponetto et al. (2014) and Hamari et al. (2016) provide valuable insights into the potential benefits of gamification in academia. The integration of game elements such as points, badges, leaderboards, and challenges can create a more interactive and enjoyable learning environment, which in turn can improve student motivation, engagement, performance, and satisfaction. As such, educators should consider incorporating gamification strategies in their teaching methods to enhance the overall learning experience for students.

2.10.3.2 Comparison of Frameworks, Models, and Research

Table 2.5 presents a comprehensive comparison of various frameworks, models, and research studies in the realm of gamification, focusing specifically on their key components and their suitability for application in academia.

Framework/Model/Research	Description	Key Components	Application in Academia
Octalysis Framework	Identifies eight core drives that motivate people to take action.	Epic Meaning & Calling, Development & Accomplishment, Empowerment of Creativity & Feedback, Ownership & Possession, Social Influence &	Can be used to design educational games that tap into students' intrinsic motivations.

		Relatedness, Scarcity & Impatience, Unpredictability & Curiosity, and Loss & Avoidance.	
Self-Determination Theory	Psychological theory that emphasizes the importance of autonomy, competence, and relatedness	Autonomy, Competence, and Relatedness.	Can be used to design educational games that foster intrinsic motivation among students.
Caponetto et al. (2014)	Study on the impact of gamification on student motivation and engagement.	Gamification, Motivation, Engagement.	Provides evidence that gamification can improve student motivation and engagement.
Hamari et al. (2016)	Study on the impact of gamification on student performance, satisfaction, and motivation.	Gamification, Performance, Satisfaction, Motivation.	Performance, Satisfaction, Motivation.Provides evidence that gamification can positively affect student performance, satisfaction, and motivation.

Table 2.5 Comprehensive comparison of various gamification frameworks and models

2.10.4 Gamification in Information-Seeking & Doctoral Study

Gamification has become an innovative approach to enhancing educational experiences by integrating game elements into non-game contexts (Deterding et al., 2011). In the context of information-seeking behaviour among doctoral students, gamification can potentially address challenges and improve the overall research experience (Smith & Anderson, 2017).

Gamification in information-seeking activities is a burgeoning area that can significantly enhance doctoral students' learning and research experiences. By incorporating game mechanics and elements into traditional research tools and platforms, students can be more engaged and motivated in their quest for knowledge. This section explores various gamified tools and platforms relevant to doctoral students' information-seeking journey.

2.10.4.1 Gamified Tools and Platforms

Numerous tools and platforms with the advancement of gamification concepts are applied to the non-gaming context. Business and healthcare are top-list sections, but now gamified tools are implemented in various ways such as:

● **Gamified Databases**

Certain academic databases have integrated gamified elements to incentivise and encourage effective search strategies. For instance, students may earn badges or rewards for completing comprehensive searches or participating in information literacy tutorials (Morales et al., 2020). This approach not only adds an element of fun and competition but also provides tangible recognition of the student's efforts in mastering important research skills.

● **Learning Management Systems (LMS)**

Learning Management Systems are pivotal in the academic journey of doctoral students, serving as the primary platform for course delivery and interaction. Some LMS platforms have incorporated gamified modules or courses to teach information literacy skills, Somova et al , 2022. These gamified elements can include quizzes, interactive scenarios, and rewards, which add an engaging and interactive dimension to the learning process.

● **Virtual Research Environments**

Virtual Research Environments (VREs) offer a unique opportunity for gamification in information-seeking. Gamified VREs can simulate the research process, providing students with a risk-free environment to practice their information-seeking skills (Barker,2019). This immersive experience allows students to explore various research

methodologies and tools in a supportive and engaging setting, thereby enhancing their confidence and competence in conducting research.

- **Serious Games**

Serious games represent a significant development in gamified learning, designed explicitly for educational purposes. These games encompass various information-seeking skills and can be tailored to address specific learning outcomes. In the context of doctoral research, serious games can simulate real-world research scenarios, providing students with the opportunity to apply their information-seeking skills in a practical setting (Zhonggen, Y., 2019). This hands-on approach not only facilitates a deeper understanding of the research process but also promotes critical thinking and problem-solving skills.

In conclusion, the integration of gamification in information-seeking activities has the potential to revolutionise the way doctoral students approach their research. By leveraging the engaging and interactive elements of games, students can develop a deeper understanding and mastery of essential research skills. The gamified tools and platforms discussed in this section represent just a few examples of how this innovative approach can be implemented in the academic setting.

2.11 CHAPTER SUMMARY AND RESEARCH GAP

The chapter critically evaluates the foundational principles and connotations surrounding information-seeking behaviour (ISB) and delineates various models and frameworks integral to this domain. This is complemented by a comprehensive review of extant literature that draws parallels and distinctions between recent studies and existing paradigms, thereby revealing the intricacies of ISB.

Moreover, the chapter delves into the intersectionality of emotions and social sciences, unravelling the pivotal role they play in shaping information-seeking behaviours. The nexus between ISB, emotional states, and academic settings is further explored, with particular emphasis on the experiences of doctoral students. This exploration encompasses the unique challenges faced by this demographic, their corresponding information-seeking strategies, and the overarching impact of self-regulation and goal

orientation on their academic journey. In addition, the chapter probes into the potential integration of gamification within academic spheres, pinpointing its relevance and applicability to doctoral research and ISB (Deterding et al., 2011).

The review employs the Information Search Process (ISP) model as a central reference point, recognising its pertinence in guiding both the literature review and the subsequent interviews and thematic analysis. The study posits that all models under review are integral to fully comprehending the complexities of ISB, particularly in relation to emotional responses and academic environments.

Furthermore, the chapter identifies uncertainty as a prevalent emotional trigger during information seeking. The consensus among various studies suggests that positive emotional states are conducive to more effective research outcomes, underscoring the necessity for support mechanisms when negative emotions emerge during the information-seeking process (Kuhlthau's, 1993;2004).

The study aims to elucidate the emotional trajectories of doctoral students during their information search, with a focus on the following aspects:

Uniqueness of Doctoral Students: Delve into the distinctive characteristics of doctoral students' ISB in comparison to other student demographics.

Emotional Factors: Investigate the specific emotional catalysts influencing doctoral students' ISB.

Academic Context: Examine the external academic variables impacting doctoral students' ISB.

Self-Regulation and Goal Achievement: Probe the symbiotic relationship between self-regulation, goal attainment, and ISB within the realm of doctoral studies.

Gamification in Doctoral Studies: Explore the customization of gamification strategies to meet the informational needs of doctoral students.

The next Chapter 3 explains how the background study acts as a catalyst and strengthens the research methodology for in-depth research on the topic of discussion.

RESEARCH METHODOLOGY AND TECHNIQUES

CHAPTER 3: RESEARCH METHODOLOGY AND TECHNIQUES

The primary aim of this dissertation is to explore and understand the perspectives of doctoral candidates on emotional intelligence – how they identify, nurture, and evolve this skill set. The previous chapter delved into the relevant academic discourse, examining research that intersects the realms of emotional dynamics, digital technologies, and patterns of seeking information.

This included a look at motivational digital tools, like gamification and its models within self-motivation and self-learning, especially in the context of doctoral students' learning experiences and their drive for information gathering. The review identified specific areas that lack research and presented opportunities for studying how doctoral students interpret emotions and how these perceptions influence their quest for information throughout their doctoral journey.

This segment of the thesis delves deeper into the research objectives. It scrutinizes the philosophical underpinnings that are inherent to all research methodologies, discusses the ongoing debate between quantitative and qualitative research paradigms, and connects these discussions to the philosophical foundations. It evaluates how these elements are relevant to this study and assesses the suitability and efficacy of using a mixed methodology, combining exploratory and phenomenographic research methods. The methodology's limitations are also acknowledged.

The chapter begins with an overview of research methodologies and strategies (Section 3.2) and a discussion of the ontological and epistemological stances of the researcher and the research project. (Section 3.3) is about suitable research methods and design of the instrument, and the relevance of the research (Section 3.4). It then explores the actual lived experiences of doctoral students engaged in research (phenomenographic study) and details the methodology used (Section 3.4), the participants (Section 3.5), and the methods of data gathering and analysis (Section 3.6), along with the challenges inherent in the methodology (Section 3.7).

3.1 NUMBERS OR NARRATIVES? DIVERGENT PATHS IN RESEARCH METHODOLOGIES

Research methods are broadly categorized as either quantitative or qualitative, each seeking levels of knowledge and truth. Traditionally, these methods are seen as distinct and opposing, each with its own philosophical assumptions, purposes, and goals. Researchers often prefer one method, sometimes neglecting the other. It's vital to explore both methods and the contexts in which one might be more suitable than the other. Table 3.1 compares these approaches (Creswell,J.W.,2017), focusing on how each achieves knowledge and truth:

- **Ontological Assumptions:** Quantitative research posits that reality has an objective, singular nature that can be studied independently of the researcher. In contrast, qualitative research suggests that reality is subjective and can exist in multiple forms, shaped by human perception and experience.

- **Epistemological Assumptions:** Quantitative research aligns with the methods of natural sciences, maintaining an independent relationship between the researcher and the subject of research. In qualitative research, the methods are different from natural sciences, and the researcher has a dependent relationship with the subject, influenced by personal and social contexts.

- **Methodological Approach:** In quantitative research, the approach is deductive, aiming to collect quantitative data, formulate hypotheses, and test for associations or causality. Qualitative research, however, is inductive, gathering qualitative data for holistic analysis to understand patterns and perceptions.

Assumption	Questions	Quantitative approach	Qualitative approach
Ontological	Quantitative research asserts a single, factual reality that stands apart from the observer, while qualitative research embraces a reality that is varied and shaped by individual viewpoints.	Objective and Singular

Generally, yes | Subjective and Multiple

Generally, no |
| **Epistemological** | Quantitative research utilizes structured, scientific methods that keep the observer detached, whereas qualitative research employs a more fluid approach that acknowledges the observer's impact. | Using the methods of the natural sciences

Independent | Using methods different from those of the natural sciences

Dependent |
| **Methodological** | The quantitative approach works from a theory to data (deductive), seeking to quantify and test relationships, whereas the qualitative approach develops understanding | **Deductive** Data collected is quantitative Independent variables Objective facts and hypothesis formulation Analysis seeks associations or causality | **Inductive** Data collected is Qualitative Holistic analysis Perceptions Analysis seeks patterning |

Assumption	Questions	Quantitative approach	Qualitative approach
	from data to theory (inductive), focusing on the meaning behind the data.		
	What is reliability?	Replication	Multiple researchers make similar observations and interpretations on different occasions
	What is validity?	Accurate measurement of the phenomena	Full access to the knowledge, experiences and meaning of those involved in the phenomena
	What is generalisability?	Accurate application of the research results from the sample to the population The extent to which the study confirms or contradicts existing findings in the same field	Accurate application of the research results (concepts and constructs) from one setting to another

Table 3.1 Linking philosophical assumptions and research methodologies (Source: adapted from Creswell 2017)

- **Reliability and Validity:** Quantitative research seeks replicability, where multiple researchers can observe and interpret the same phenomenon consistently. It also aims for accurate measurement of phenomena (validity). On the other hand, qualitative research values the richness of understanding the knowledge,

experiences, and meanings of those involved (validity) and may not always emphasise replicability (reliability).

- **Generalizability:** Quantitative research focuses on the accurate application of results from a sample to a broader population, while qualitative research emphasises the accurate transfer of concepts and constructs from one context to another, valuing the depth over breadth of understanding.

- **Philosophical Assumptions**: A common thread in research is that the researcher's methodological choices influence the portrayal of 'truth'. These choices are, in turn, shaped by the researcher's underlying assumptions. Numerous scholars, including Burrell and Morgan (1979) and Guba and Lincoln (1994), have delved into the complexity of these assumptions and their impact on research. Easterby-Smith, Thorpe, and Lowe (2002) stress the importance of being aware of these philosophical underpinnings before embarking on research. The researcher's ontological and epistemological beliefs - their views on the nature of reality and knowledge - play a crucial role in determining how research is conducted. Ryan et al. (2002) emphasizes that selecting a research methodology is intrinsically linked to these philosophical assumptions. Understanding these assumptions is crucial for gathering and interpreting evidence effectively and for formulating meaningful answers to fundamental questions.

Research is not just about collecting data; it's about the philosophical foundations that guide how we interpret and understand the world. This understanding is vital for choosing the most appropriate methodology, which will be further explored in the next section that will focus on several methodological choices available to an emotion researcher, namely the choices related to a study's setting, data collection instruments and data interpretation. This section further elaborates on the method selection and what will be the best suitable method for this study under observations.

3.2 IMPORTANCE OF METHOD SELECTION IN EMOTIONAL RESEARCH

Choosing the right method for eliciting emotions in the context of information-seeking behaviour is crucial. This selection not only shapes the data collection but also influences the interpretation and validity of the findings. The intricacies of emotional experiences, especially in an academic setting, require methods that capture both the depth and breadth of these experiences.

Historically, various methods have been employed to study emotions in information-seeking contexts. Section 2.8.3 gives a detailed overview of various researches for emotion research. For instance, Kuhlthau's seminal work in 1991 marked a significant step in understanding the emotional states of students during information searches by employing **journal** entries. This approach provided rich, qualitative insights into the students' emotional journeys.

Similarly, (Meghabghab, G. and Kandel, A., 2008) study on school librarians highlighted the value of documenting not just the actions but also the emotional states during information searches. This method acknowledged the intertwined nature of cognitive and emotional processes in information-seeking behaviour. Participants were asked to document their actions, feelings and thoughts on **log sheets** and **work activity sheets. (**Betella, A. and Verschure, P.F., 2016) study further underscored the importance of self-assessment in emotional research, where participants provided self-ratings on satisfaction **scales,** offering a more introspective view of the emotional impact of their searches. (Khoo, E. and Forret, M., 2011) examined the **semester-long affective** development of senior college students learning to use the internet.

Affective states experienced by children and graduate students' during an online search were compared in a study by (Reis, R.C.D. et al, 2018). **Self-report data** were collected through journals (for students) and interviews (for children). Karahasanović, A. et al, 2018) studied the searching behaviour of novice database users by recording their **think-aloud reports**, including interactions with the study monitor, and using screen logging software to record their search activities.

Another popular technique of studying affect and emotion in information science is the **interview**. In most of the reviewed studies, interviews with participants were conducted before and after participants' engagement in search activity. While most studies conducted one-on-one interviews, a few used group interviews to collect data on users' emotional experiences. Wilson et al. (2002) administered pre- and post-search interviews in the longitudinal study of uncertainty involved in information seeking. (Catalano, A., 2013.) conducted individual **pre-search interviews** to generate patterns of graduate students' information seeking behaviour.

3.2.1 Criteria for Method Selection

A large selection of potential methods was determined by considering approaches commonly employed in emotion elicitation, cognitive investigations, and search for information-seeking behaviour, as discussed in the above section. When selecting a suitable method for this kind of research, three critical criteria were identified:

1. **Depth of Information:** The method must facilitate a deep understanding of participant behaviour.
2. **Temporal Freedom:** It should allow participants to record their behaviours and emotions over a specified duration, capturing the dynamism of their emotional journey.
3. **Incident Thinking:** The method should focus on the participants' spontaneous thoughts and reactions rather than being influenced by the researcher's preconceptions.

These criteria are essential in ensuring that the chosen methods align with the study's objectives of exploring and understanding the emotional nuances of doctoral students during their information-seeking activities. The next section explores the comparative analysis and method selection which goes along with this research.

3.2.2 Comparative Analysis and Method Selection

To illustrate the process of method selection, past studies were analysed, and their methodologies were compared against the identified criteria. For instance:

1. **Diary studies,** as used by Kuhlthau and others, offer rich, temporal data that align with all three criteria.

2. **Semi-structured interviews**, employed in studies like Wilson et al. (2002) and Catalano (2013), provide in-depth data and capture incident thinking effectively.

Based on these considerations, a three-stage process was devised to evaluate and eliminate methods that did not fully meet the criteria as illustrated by Table 3.2.

Stage	Methods Considered	Methods Eliminated	Reason for Elimination
1	Diary Studies, Interviews, Questionnaires, Observational Methods, Physiological Measures	Observational Methods, Physiological Measures	Lack of depth and temporal freedom
2	Diary Studies, Interviews, Questionnaires	Questionnaires	Limited in capturing incident thinking
3	Diary Studies, Semi-Structured Interviews	_____	_____

Table 3.2: Elimination of methods using a three-stage process

3.2.3 Mixed Methodology Approach in the Current Study

Two primary methods, diary studies and semi-structured interviews, were selected as they satisfy the study's three essential criteria: **depth**, **temporal freedom**, and **incident thinking**. However, beyond selecting these specific methods, the underlying **methodology** or the rationale behind the research approach is foundational, shaping how these methods are applied and interpreted within the context of the study's objectives.

The **methodology** refers to the philosophical framework and theoretical stance guiding the study's approach. This study adopts a **mixed-methods methodology** that aligns with

its descriptor-explanatory design, chosen to provide a comprehensive understanding of the emotional experiences associated with information-seeking behaviour among doctoral students. The methodology is driven by the need to explore both measurable patterns in emotional responses and deeply personal accounts, which collectively offer a holistic view of the emotional landscape. A mixed-methods approach is ideal in this context, as it combines objective insights with subjective narratives, ensuring that the study captures the complexities of emotion regulation as students navigate research tasks.

The **methods** are the specific tools or techniques used to implement the mixed-methods methodology. For this study, **diary studies** and **semi-structured interviews** were selected for their ability to capture both immediate, real-time emotional responses and detailed personal reflections, respectively. Each method contributes uniquely to the study:

Diary Studies: Diaries allow participants to document their emotional experiences in real-time, providing a temporal snapshot of their emotional responses during various phases of information-seeking. This method satisfies the criteria of **temporal freedom**, enabling participants to reflect on their emotions as they occur without the constraints of a formal interview setting. Diaries capture spontaneous, unfiltered responses that provide depth to the data and illustrate how emotions fluctuate over time. This method aligns with the study's objective of understanding the temporal aspects of emotion regulation in research.

Semi-Structured Interviews: Semi-structured interviews offer a flexible yet structured format, encouraging participants to elaborate on their experiences and clarify insights documented in their diaries. This method satisfies the criterion of **depth** by enabling participants to discuss their thoughts in detail and to explore topics that diaries may only briefly mention. The interviews are guided by a set of open-ended questions but allow for the exploration of unanticipated themes, which ensures that the study captures both predetermined topics and emergent themes that may arise.

As illustrated in Figure 3.1, the mixed-methods approach leverages both diary studies and semi-structured interviews, integrating the subjective and objective dimensions of

the emotional landscape. This combination of methods ensures a holistic view, allowing the study to achieve its aims of capturing not only participants' real-time emotional experiences but also their reflective, subjective interpretations.
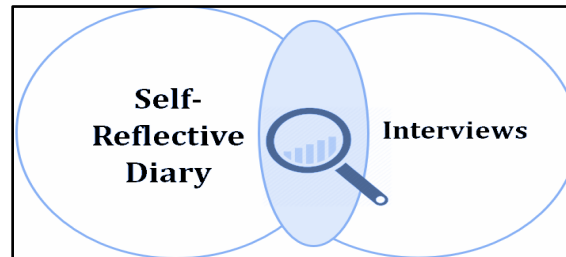
Figure 3.1 Mixed Methodology

In sum, the methodology provides the philosophical and theoretical rationale for the study's approach, while the methods—diary studies and semi-structured interviews—are the practical tools that execute this approach. Together, they ensure a comprehensive and nuanced understanding of the emotional dynamics in doctoral students' information-seeking behaviour, addressing the unified research question from multiple perspectives.

3.3 RESEARCH DESIGN AND JUSTIFICATION

The research design for this study employs a mixed-methods approach to comprehensively explore how emotions and emotion regulation influence doctoral students' information-seeking behaviour. This design was chosen to address the complexity of emotional experiences in academic research, allowing for both measurable data on behavioural trends and rich, qualitative insights into individual experiences.

The **mixed methods design** effectively supports the study's aim of understanding the multifaceted emotional landscape of doctoral research, as it combines quantitative data to reveal patterns in emotional responses with qualitative data to capture personal narratives. Quantitative methods provide measurable trends in emotion regulation, while qualitative methods allow for an in-depth exploration of unique emotional

challenges faced by doctoral students. This approach ensures a comprehensive answer to the unified research question, with the following aims and objectives:

Aims:

To examine the role of emotion and emotion regulation on information-seeking behaviour in doctoral students and to identify strategies to enhance emotional regulation based on findings.

Objectives:

- To analyse the impact of emotion and emotion regulation on doctoral students' information-seeking behaviour.
- To explore self-regulation and learning in doctoral students in relation to emotion regulation strategies.
- To identify strategies for improving emotional regulation in doctoral students based on insights from the research findings.

The **data collection methods** were chosen to gather both broad and specific data:

- **Quantitative Component**: Questionnaires with Likert-scale questions were used to identify trends in emotional impacts and external influences affecting emotion regulation. This component enables the study to quantify common patterns, such as the frequency of anxiety or motivation during research tasks.

- **Qualitative Component**: Semi-structured interviews and reflective diaries provided detailed accounts of participants' emotional regulation strategies, capturing a nuanced picture of their challenges and responses. The reflective diaries allowed students to document their emotions in real time, offering insights into the ways they managed stress, motivation, and other emotions over extended periods.

Data analysis was structured to ensure that both quantitative and qualitative insights contributed meaningfully to answering the research question:

- **Quantitative Analysis**: Descriptive statistics were employed to capture broad trends and prevalent emotions. Given the ordinal nature of Likert scale data, the analysis focused on distributions to present a reliable summary of findings.

- **Qualitative Analysis**: Thematic coding was used to identify recurring themes in participants' reflections. Codes were refined through iterative analysis and supervisor oversight, ensuring consistent interpretation of subjective data. This approach enabled a deeper understanding of emotional regulation strategies and identified the need for structured support mechanisms.

Also, the choice of a mixed-methods design was informed by feedback received during a **conference presentation** and subsequent **pilot study**:

1. **Conference Presentation Feedback**: Feedback from the conference (An investigation on the role of emotions in information-seeking behaviour of doctoral students: A mixed-method approach Conference: 10th Annual PGR Conference Provoking Discourse, March 2018) emphasized the need for practical solutions that could be implemented as emotional support for doctoral students. This led to the development of the G.E.M. (Gamified Emotion Management) Framework, which incorporates principles from the Octalysis Framework to offer structured, gamified strategies for emotion regulation. The G.E.M. Framework addresses common challenges identified in both the quantitative and qualitative data, providing a structured approach to managing emotions and enhancing intrinsic motivation.

- **Pilot Study Adjustments**: The pilot study helped refine the research design, particularly in the data collection methods. Interview questions were adjusted to better capture participants' specific emotion regulation techniques, and the diary format was modified to prompt daily reflections on emotional states. These adjustments improved the data's relevance and depth, ensuring a targeted approach to analysing the emotional impact of doctoral research.

In summary, the chosen research design supports the study's aims and objectives by combining statistical trends with in-depth personal narratives, allowing for a comprehensive exploration of how emotions affect doctoral students' research

processes. The mixed methods approach not only reveals patterns in emotional responses but also highlights the individualized support needs that led to the development of the G.E.M. Framework as a practical outcome.

3.3.4 Research Approach Positioning

The essence of this research lies in its interpretive framework, which prioritizes understanding the subjective realities of doctoral students as they navigate their emotional experiences in information-seeking behaviour. In this context, the researcher's role transcends mere observation; it involves delving deeply into the participants' inner worlds. As articulated by Kleinschmidt, E.J & Cooper (1991;1996) according to Table 3.3, the pursuit of knowledge and truth demands an exploration of the 'inner life' of individuals. This study, therefore, situates itself within this paradigm, actively seeking to comprehend reality as it is constructed and experienced by the doctoral students themselves, not as an external, detached phenomenon.

Epistemology	Theoretical Perspective	Methodology	Methods
Subjectivism	Phenomenology	Phenomenological Research	Self-Report Methods
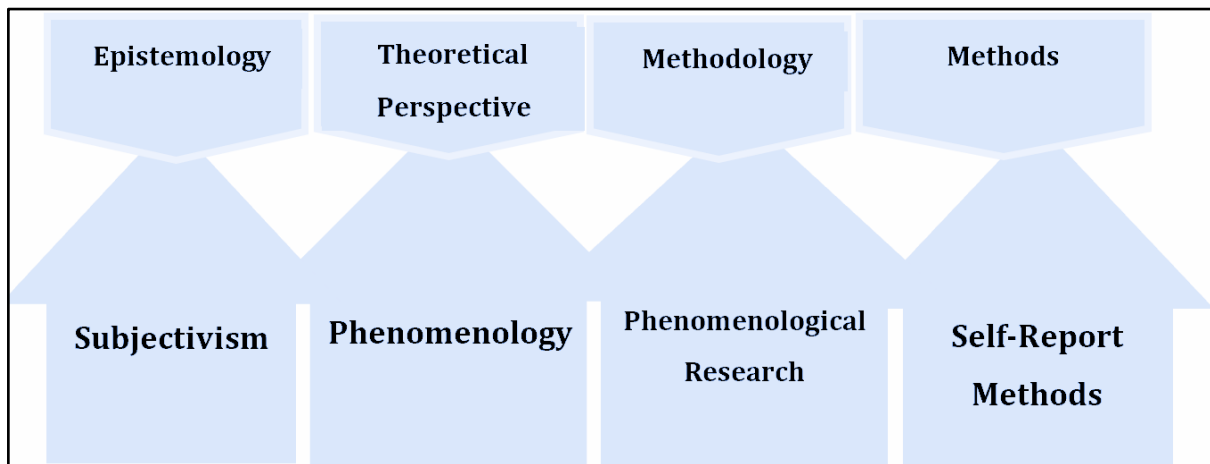
Table 3.3 Crotty's (1998, p.5) Four research design elements for this research

➔ **Methodological Alignment with Interpretivism**

In line with this interpretive stance, the research zeroes in on individual perceptions, experiences, and interpretations regarding emotional competence in the realm of academic research. This approach aligns with the subjectivist tradition within the social sciences, championing the notion that reality is a construct of individual consciousness, subject to variability and personal interpretation. It acknowledges and explores the

richness of individual experiences, moving away from the search for universal laws or causal relationships.

➜ Ontology and Epistemology in Research

The study's ontological position is rooted in nominalism, recognizing the fluidity of reality as perceived differently by each individual. This perspective is coupled with an anti-positivist epistemology, emphasizing the need to understand the world through the individual viewpoints of the subjects. It appreciates the voluntary nature of human interactions, shaped by personal interpretations, social meanings, motives, and beliefs. Therefore, the research does not aim to establish causality extensively but instead focuses on gaining a deep, ideographic understanding of personal experiences and how these inform and enhance competence in the individuals' lived world.

➜ Theoretical Framework and Methodological Coherence

Following Crotty's (1998) framework, this research approach is systematically structured, beginning with its epistemological stance. Our understanding of the world, reality, and knowledge – epistemology – is viewed here through a subjectivist lens, consistent with Ladson-Billings' (2003) advocacy for deeply contextualized understandings of social phenomena. This epistemological approach is congruent with the study's ontology and is vital in shaping the theoretical perspective that guides the methodology.

➜ Methodological Justification and Approach

Crotty's framework also emphasizes the theoretical perspective's role in informing the research methodology, providing a coherent context for the research process. This study's lack of prior research into the emotional journey of doctoral students justifies the adoption of a mixed-method approach, as discussed earlier. This approach is particularly suited to exploring the nuanced meanings and experiences of participants, in contrast to methods focused purely on measurement.

➜ Adopting a Phenomenographic Approach

Given the diversity in individual perceptions, experiences, and meanings, a phenomenographic approach is selected for analysing self-report methods data. This methodology aligns with the phenomenological tradition, which will be elaborated in section 3.5, and adopts an interpretivist, subjectivist perspective. The methodology is designed to enter and understand the unique 'worlds' of the research participants, offering a comprehensive view of their experiences and the meanings they derive from them. The methodology of this study is phenomenological and adopts an interpretivist phenomenographic subjectivist perspective. Within the phenomenological approach, two distinct strands are discussed below: phenomenology and phenomenography. These will be discussed in more detail in section 3.4 & 3.5 .This chapter will further outline why researcher argument phenomenography is the most appropriate methodology.

3.4 THE HISTORY AND USES OF PHENOMENOGRAPHY

Phenomenography, a research method originating in Swedish educational studies during the late 1960s and early 1970s, prioritizes the individual's perspective in understanding their interaction with the world (Hasselgren & Beach, 1997). This approach, stemming from the Greek meaning 'description of appearances,' focuses on personal experience as a reflective and discussable entity (Ashworth & Lucas, 1998). It views personal perception as the foundational element of knowledge (Moustakas, 1994), aligning with Smith,D.W.,(2013) concept of accessing truth through individual experience.

This methodological approach is distinct in its focus on the diversity of individual understandings rather than the phenomena themselves (Dahlberg, H.,2019;Errasti-Ibarrondo,B.,2018; Cibangu, S.K., 2023). Phenomenography is a response to and an alternative to the prevalent positivistic, behaviouristic, and quantitative research methods (Stolz, S.A., 2020), often being described as a specialized research strategy (Dabengwa, I.M.,2023) that combines both orientation and methodology (Feldon, D.F. and Tofel-Grehl, C., 2022).

Table 3.4 delve into to showcase studies that have utilized phenomenography as a methodology can provide a clear and structured overview of how this approach has been applied in various research areas.

Study Title/Author(s)	Year	Research Area/Focus	Key Findings/Contributions
Understanding Student Learning" by Marton & Säljö	1976	Educational Psychology	Explored how students approach learning tasks, introducing the distinction between deep and surface learning.
Phenomenography — Describing conceptions of the world around us" by Ference Marton	1981	Educational Research	Discussed the foundational principles of phenomenography, highlighting its focus on the qualitative differences in people's experiences and understandings.
Conceptions of Learning and Knowledge in Higher Education: Relationships with Study Behaviour and Influences of Learning Environments by Eklund-Myrskog	1998	Higher Education	Investigated students' conceptions of learning and knowledge, and how these relate to their study behaviours in different learning environments.
Learner's Experiences of e-Learning: A Phenomenographic Study by Smith & Oliver	2001	Educational Technology	Analysed learners' experiences with e-learning platforms, categorizing different approaches and attitudes towards digital learning.
Understanding the	2008	Health and Nursing	Examined the lived

Patients' Lived Experience of Dialysis by Gill and Lowes			experiences of patients undergoing dialysis, offering a deeper understanding of their emotional and psychological challenges.
Engineers' Conceptions of Sustainable Development: A Phenomenographic Study by Daniels	2009	Environmental Engineering	Explored how engineers conceive sustainable development, aiding in the integration of sustainability concepts in engineering education.
Understanding Art: A Phenomenographic Approach to Visual Art Education by Newby	2014	Art Education	Investigated different ways in which art is experienced and understood by students, contributing to teaching strategies in art education.

Table 3.4 Studies using Phenomenography.

This table presents a diverse range of studies that have effectively employed phenomenography, showcasing the methodology's versatility across various disciplines. Each study contributes uniquely to its respective field, emphasizing phenomenography's strength in uncovering the variations in human experiences and understandings. The next section explains the steps involved in the essence of this phenomenographic methodology.

3.4.1 The Essence of Phenomenographic Methodology

Phenomenography is a distinctive qualitative research method focused on examining the diverse ways individuals perceive and interpret the world around them. It aims to uncover how different people understand the same phenomena, emphasizing the variability and depth in human thought processes.

Central to this approach is the abstraction of the fundamental aspects of concepts, while also considering their contextual relevance. This methodology acknowledges the dynamic nature of human conceptions, which are shaped by individual contexts and perspectives. There are three phases in this approach to capture the phenomenon essence which is explained in next section.

➔ **Phase 1: Essence and Contextualization**

Phenomenography emphasizes capturing the core essence of experiences or concepts, focusing on abstracting the main elements while retaining their significance within the collective whole. This methodology recognizes the fluidity of human interpretations, which shift with changing contexts and awareness perspectives (Dahlberg, H.,2019; Errasti-Ibarrondo,B.,2018; Cibangu, S.K., 2023) reinforce this, stating that experiences are inherently contextual and individualistic.

➔ **Phase 2: Categorization and Outcome Space**

At its core, phenomenography is an empirical investigation into the various qualitative ways in which individuals perceive and understand the world (Marton, 1994). This involves categorizing these perceptions into 'categories of description' that logically relate and often form hierarchical structures, known as the 'outcome space'. These categories reflect both the essence ('what') and structure ('how') of the phenomena (Daniel, S., 2022).

➔ **Phase 3: Analytical Approach**

The analytical process in phenomenography, while not universally standardized, generally focuses on qualitative categorization, seeking out similarities and differences within the 'outcome space' (Cossham,A.F., 2017; Feldon, D.F. and Tofel-Grehl,C., 2022). This requires researchers to detach from pre-existing theories and biases (Ashworth and Lucas, 2000), while simultaneously acknowledging their inherent connection to the subject matter (Dahlberg and Dahlberg, 2004).

In concluding this discussion on phenomenography, it is clear that it provides an effective tool for the current study, specifically to examine how doctoral students understand and engage with the phenomenon of 'emotions and their impact on information-seeking behaviour.

Furthermore, following the arguments for phenomenographic research and it's facilitating the description of such conceptions offers the possibility of using the research outcome in studying students' competence development and engagement with learning. Ultimately this enables phenomenographic research to not only describe conceptions and provide a tool for generating such insight but also to apply the findings to explore new ways of working and to enhance the management of (doctoral students') emotions in a better way.

3.5 DESIGN AND CONDUCT OF THE STUDY

The current study leverages phenomenography to delve into doctoral students' perceptions of emotions and their impact on information-seeking behaviours. This approach aligns with two key phenomenographic research lines relevant to this study: exploring learning variations and individual conceptions within disciplinary contexts (Marton, 1986; Cossham,A.F., 2017). The study aims not just to describe these conceptions but to utilize these insights for educational interventions and competence development. Figure 3.2 showing the relationship and object of study.
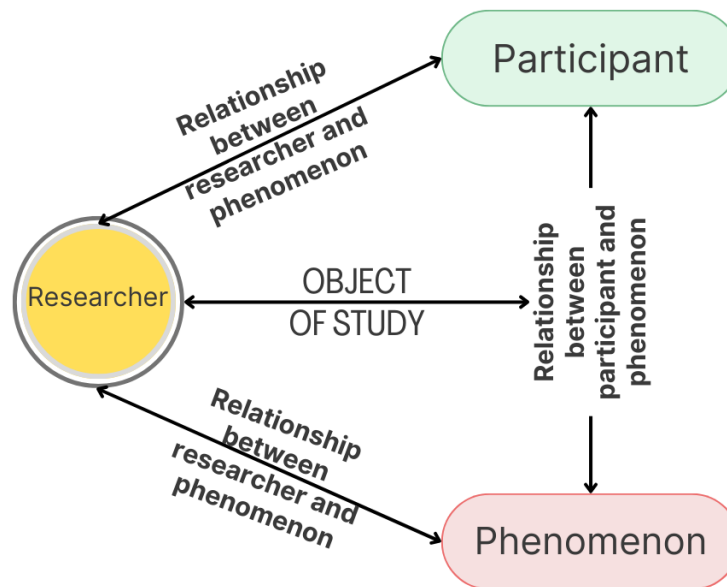
Figure 3.2 The object of study in phenomenography

The 'phenomenon' under investigation is the 'emotions and doctoral students'. Given that this phenomenon's meaning may differ for each research participant, a very 'open' view of this phenomenon has been the starting point of this research, and the overall thrust is that of a discovery process rather than a search for predetermined categories. Therefore, the overall objective of the research is to understand what different type of emotional phases means to individual doctoral research participants and how these impacts the management and learning competence during their information-seeking.

3.5.1 Research approach - entering the participant experiences.

There are many accepted variations in how phenomenographic research are conducted and analysed (Ahmed et al. 2020; Pang 2003; Åkerlind 2005; Marton, Carlsson, and Halász 1992; Dahlgren and Fallsberg 1991; Säljö 1997; Han and Ellis 2019). It is generally acknowledged that the most appropriate means of obtaining an account within phenomenographic research should allow research participants to describe their experiences, i.e. it places human experience at the centre of the research and acknowledges the legitimacy of 'self-verified experience' (Cheetham et al 2015). The preferred mixed method in this study is the **Self-reporting method,** as explained in 3.2.3. The more specific ones are one week diary study and a follow-up interview method. The overview of research methods is shown in Figure 3.3.
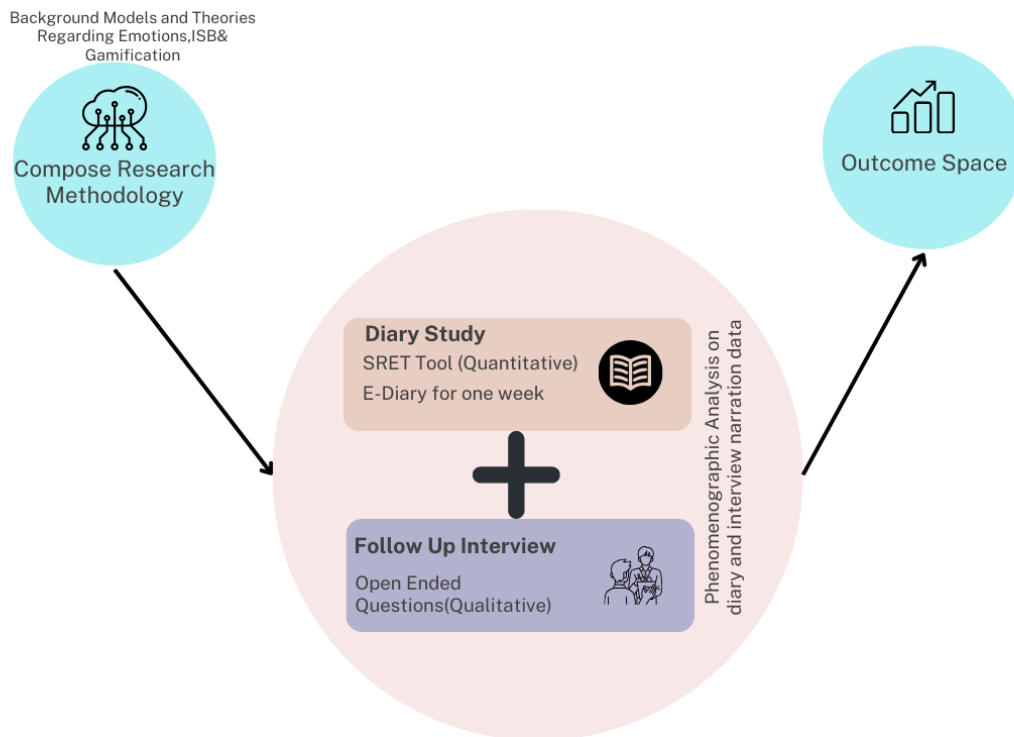
Figure 3.3 Research Design

This adopted method provides a means of entering the participants' lifeworld's and is set out in more detail in the following sections.

3.5.2 Stage 1 -Diary Interview Method

The diary-interview method, rooted in the work of Zimmerman and Wieder (1977), has been embraced in social sciences for its utility in subjective research (Chapter 2 Section 2.9.4). It empowers participants to record experiences on their terms, thereby reshaping power dynamics typically found in interview settings (Bartlett, R., 2012.). Diaries are posited to yield emotional insights because they are often recorded soon after the event and in the privacy of the participant's home, away from the researcher's influence.

Following Spowart (2014), the self-reporting diary is seen as a 'performance of subjectivity', with follow-up interviews acting as a 're-enactment of subjectivity', a process encapsulated by Butler's (2019) concept of performativity. The diary-interview method is described as a 'jointly told tale', integrating doctoral participants' voices at various research stages, shaped by multiple literature contexts. This tri-component

method involves an initial interview, independent diary entries, and a concluding in-depth interview (e.g., Jacelyn & Imperio, 2005; Lewis & Massey, 2004; Meth, 2003).

In this study, a semi-structured diary approach was implemented, drawing on the framework established by Spowart (2014) and visually represented in Figure 3.4. This figure provides a visual overview of the diary-interview method, illustrating how diary entries are structured and how they align with subsequent interviews to capture participants' reflections over time.
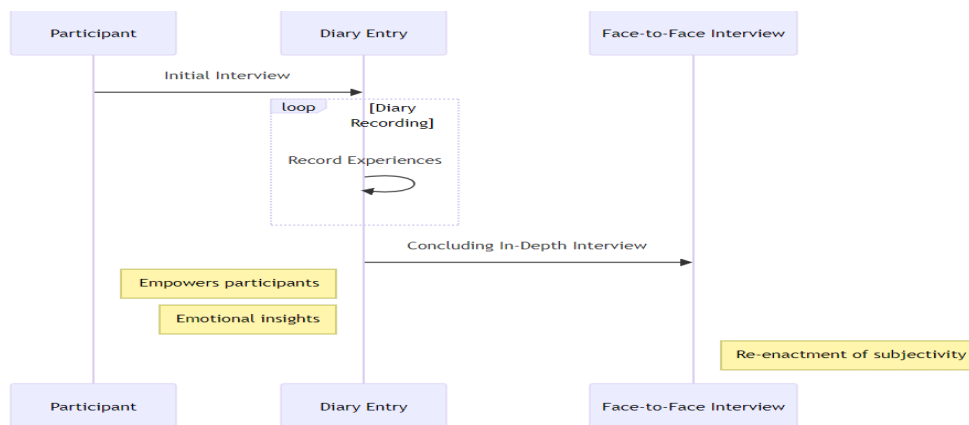
Figure 3.4 Diary Interview Method

3.5.2.1 Self-Reporting Emotion Tool (SRET)

The quantitative data collected in this study were from an electronic, diary-like tool developed for the research and completed by doctoral students throughout the week. It comprises a customised the **Self Reporting Emotion Tool (SRET)** which encourages students to engage in self-regulated information seeking by (a) looking for information for upcoming research work by setting a goal and understanding the challenge level of the goal by keeping emotions as a central point and how it affects attaining the goal and (b) reflecting on the activity session by reporting how well they attained their goal in the previous week and what challenges they encountered **(APPENDIX F).**

3.5.2.2 Background and Rationale for SRET Development

The **Self-Reporting Emotion Tool (SRET)** was developed to address the unique emotional dynamics that doctoral students encounter during research, focusing on

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capturing the wide spectrum of achievement-related emotions that play a crucial role in their information-seeking behaviours and academic progress. Drawing on foundational research tools such as the **Achievement Emotions Questionnaire (AEQ)** by Pekrun, Goetz, & Perry (2015) and the **Positive and Negative Affect Schedule (PANAS)**, SRET was tailored specifically for the self-regulated tasks involved in doctoral research. This tool is structured to provide insights into students' weekly emotional patterns, associated goals, and external factors influencing their emotional states, which are integral to understanding and enhancing their research experiences.

- **Inspiration from Achievement Emotions Questionnaire (AEQ)**: The AEQ has been widely used to study achievement-related emotions, such as enjoyment, anxiety, and pride, that are directly linked to goal-oriented tasks in educational contexts. Pekrun et al.'s work emphasized the importance of these emotions in shaping student motivation and performance, especially in self-driven tasks like doctoral research. The SRET was designed to capture these emotions systematically, focusing on how they influence information retrieval and dissertation-related tasks.

- **Adapting PANAS**: The PANAS scale, which measures positive and negative affect, was also foundational in creating SRET. Its dual focus on positive and negative emotions provided a balanced approach that SRET adopted to analyse how doctoral students manage the emotional ups and downs inherent in the research process. By combining elements from both AEQ and PANAS, SRET was tailored to cover a broad range of emotions, from positive emotions like pride and relief to negative ones like anxiety and hopelessness, providing a comprehensive emotional profile for each participant.

3.5.2.3 Structure and Purpose of SRET Questions

SRET consists of structured questions and scales aimed at capturing the participant's research goals, the emotions experienced during goal pursuit, and the regulatory strategies they used. Each question was carefully crafted to elicit specific emotional and behavioural information that could be linked back to information-seeking behaviour.

- **Research Goal and Goal Achievement**: The tool starts by asking participants about their research goals and perceived success in achieving them. This provides context for the emotions that follow, as research has shown that goal achievement (or lack thereof) is a strong predictor of emotional response (Pekrun et al., 2002).

- **Emotional Intensity Ratings**: Participants then rate their emotional intensity for a list of predefined emotions—enjoyment, hope, pride, relief, anger, anxiety, shame, hopelessness, and boredom—along with an option to specify additional emotions. This approach, inspired by AEQ and PANAS, is designed to capture both the breadth and intensity of emotions felt during dissertation activities, providing data on which emotions are most strongly associated with certain information-seeking behaviours.

  - *Example Scale*: Emotional intensity is measured on a scale (e.g., 1-5), where participants can indicate how strongly they felt each emotion. This scaling allows for nuanced data analysis, revealing patterns such as the correlation between high anxiety and certain research phases, or the persistence of hope and pride when goals are successfully met.

- **Causal Attribution of Emotions**: To understand why certain emotions arose, SRET asks participants to reflect on possible reasons for their emotions during information-seeking. This question taps into attribution theory, where individuals ascribe causes to their emotions (Weiner, 1985). This data provides insights into whether emotions are linked to internal factors (like confidence in research skills) or external factors (like advisor support or resource availability).

- **External Influences on Information Retrieval**: This section focuses on external factors that may have affected the participant's emotional state or information retrieval behaviours, such as academic advisor support, institutional resources, or work-life balance. This helps in understanding the broader context of their emotional experiences and how environmental and social factors impact their academic work.

- **Emotion Regulation Strategies**: Participants are asked to describe how they regulate their emotions while working on their dissertation. This element was inspired by self-regulation theories (Zimmerman, 2000) and emphasizes the ways doctoral students cope with emotional challenges. Responses to this question provide valuable data on self-regulation strategies that can be used to support other students facing similar challenges.

- **Final Reflections and Additional Insights**: The tool concludes with open-ended questions that allow participants to share any additional thoughts or unasked insights about their emotions. This open format captures unique emotional experiences that may not be covered in the predefined categories, providing rich qualitative data.

3.5.2.4 How Does SRET Collect Data from Participants?

The SRET tool is organized as a **week-long diary study** format, enabling participants to record their emotional states over several days. This approach allows the collection of data from **Day 1 to Day 7**, capturing multiple data points rather than a single momentary snapshot. The intention behind collecting entries over a full week is to avoid a narrow or potentially biased dataset that might only reflect transient emotions. Instead, the week-long diary entries help create a more nuanced and reliable emotional profile for each participant. By structuring the tool to gather data across several days, SRET captures the *dynamic and evolving nature of emotions*, which can vary significantly over time, especially in a high-stakes academic context such as dissertation work.

Participants are instructed to log their emotions on any day they work on their dissertation. This flexibility in data entry ensures that the emotions reported are directly related to research tasks, minimizing irrelevant data that might skew results. The daily entries, taken across a variety of work sessions, provide a realistic representation of the emotional fluctuation's doctoral students experience, encompassing both intense and routine moments of the research process.

The SRET tool achieves this by:

- **Providing 7 Google Document links** for each participant, one for each day of the week, to serve as their daily diary entry. Participants access a separate document each day, where they detail their emotional states, thoughts, and reactions to their research activities.

- **Enabling flexibility** so that participants are not constrained by a rigid schedule but can log entries whenever they engage in dissertation work. This flexibility makes the data more authentic and closely aligned with actual research-related emotional experiences.

Once collected, each participant's diary entries are compiled and stored in an Excel file. This consolidated format allows for easy access and comparison across entries, ensuring a straightforward process for analysing emotional patterns and trends. The data saved in Excel not only serves as a **record of individual emotional journeys** but also provides a foundation for advanced analysis techniques, such as **emotional heatmaps** and **emotion clusters**. Heatmaps visually represent the intensity of various emotions over time, while clustering helps identify groups of related emotions, offering deeper insights into complex emotional patterns.

The SRET tool's diary data also plays a crucial role in preparing for follow-up interviews. Since each participant's entries are unique, the recorded emotions serve as a bridge, or **"linking behavior,"** to further discussion. By using the diary entries as a basis for interview questions, the researcher can explore specific emotional episodes or recurring patterns in more detail, prompting participants to elaborate on their recorded experiences. This structure creates a cohesive and insightful connection between the data collection phases (diary and interview), allowing for a deeper exploration of how emotions influence doctoral students' research activities and attitudes.

In summary, the SRET tool offers a comprehensive and structured approach to capturing doctoral students' emotional experiences over time. Its design is aligned with the research goals of understanding how emotions affect information-seeking behavior, dissertation progress, and overall research engagement. By allowing for flexible entries, capturing longitudinal data, and serving as a basis for in-depth interviews, the SRET tool supports a thorough and contextually rich analysis of doctoral students' emotional

journeys, offering insights that can inform future emotional support frameworks and interventions for students in similar research-intensive environments.

3.5.2.5 Semi Structure Interview

Semi-structured interviews were conducted followed by the diary study as a method for sampling data from doctoral students. This approach was chosen because it provides interviewees with the flexibility to explore topics of their choice and delve into various dimensions, while also offering sufficient guidance to address the research questions efficiently (Stenfors-Hayes, Hult, and Dahlgren, 2013; Sherman and Webb, 2004). Additionally, sending questions ahead of time allowed participants to prepare and contemplate relevant examples.

Participants were encouraged to elaborate on their responses and share anecdotal evidence, recognized methods for enhancing the quality of data in interviews (Abrandt, 1997). The interviews continued until it seemed that all avenues of inquiry had been thoroughly explored, ensuring a deep understanding of the participants' perceptions (Entwistle, 2004).

To refine the interview technique, two pilot interviews were initially conducted. Feedback from these sessions was used to revise the interview schedule, which mainly involved rephrasing questions for neutrality and removing some to prevent the interview from feeling rushed. In line with the standard practices in phenomenography, verbatim transcription was employed, omitting hesitations and repetitions (Trem, 2017). The initial transcription was performed using the digital service (Otter.ai,2021) followed by a thorough review and correction by the researcher to rectify any inaccuracies.

The decision to transcribe both spoken words and gestures was informed by the subjective nature of the research. Other transcription methods, such as manual transcription by the researcher, using professional services, or alternative software, were considered but ultimately not chosen. This decision was made to foster a deeper understanding of the transcripts and due to the less satisfactory accuracy of other software options (Dortins, 2002).

The transcribed data was then copied into a Word document and shared with participants, giving them the opportunity to review and request the removal of any content they did not want included in the study. After this, the transcripts were ready to be entered into the data analysis phase. For the analysis, a 'Google Sheet' was utilized as the primary tool ("Google Sheets," 2022). All meetings and interviews in this study were recorded using an audio recording device, and the data gathered from diaries were systematically organized using NVIVO-14 and SPSS software. This organization was crucial for developing an effective coding scheme, as highlighted by Bogdan and Biklen (1998). Transcription of the data was essential to make it more accessible and analysable for the researcher. The second step involved securely storing all documents, ensuring compliance with ethical standards. In total, 36 participants were interviewed in this study (Chapter 3.6.4 and Table 3.5). The entire narrative data set comprised 36 hours of audio footage, 320 lines of quotations and some trajectory graphs produced by students. After the interviews were transcribed and checked for accuracy, the data analysis was conducted.

3.5.3 Stage 2 - Selection of research participants

The participant selection process for this study employed a hybrid sampling strategy, combining theoretical and convenience sampling approaches to ensure both methodological rigour and practical feasibility. Theoretical sampling, as conceptualized by Grbich (2010), guided the overarching participant selection framework, aiming to capture the full spectrum of doctoral students' emotional experiences and their associated information-seeking behaviours. This approach aligns with phenomenographic principles that emphasize variation in experiences rather than population representativeness (Marton & Booth, 1997).

The implementation of theoretical sampling manifested in several key decisions:

- Deliberate inclusion of students across different stages of doctoral study
- Selection from diverse disciplinary backgrounds
- Consideration of varying research methodologies employed by participants
- Inclusion of both full-time and part-time students

- Representation of different demographic characteristics

Within this theoretical framework, convenience sampling was employed as a practical mechanism for participant recruitment, acknowledging both resource constraints and accessibility considerations (Suen et al., 2014). Multiple recruitment channels were systematically utilized. **APPENDIX D** for Participant Recruitment Flyer.

- **Digital Communications:** Email broadcasts to postgraduate researchers, Announcements on university graduate websites, Social media platforms specific to graduate students
- **In-Person Recruitment :** Information stands at PGR fairs, Departmental poster displays, Network-Based Recruitment, Peer referral systems, Supervisor recommendations, Departmental administrative support networks

This comprehensive recruitment strategy yielded a final sample of 36 doctoral students, representing various disciplines and research approaches (detailed demographic and disciplinary distribution provided in Chapter 4, Section 4.2). The sample size was determined based on both phenomenographic research conventions, which typically recommend 20-30 participants (Trigwell, 2000), and the point of theoretical saturation, where additional interviews ceased to yield substantially new perspectives.

The final participant cohort demonstrated sufficient variation across key parameters:

- Demographic characteristics (age, gender, nationality)
- Disciplinary backgrounds (spanning humanities, social sciences, and natural sciences)
- Research stages (from first year to near completion)
- Country of origin (representing both domestic and international students from various geographical regions including Asia, Africa, Europe and Middle east)

This careful balance between theoretical sampling principles and practical recruitment strategies enabled the study to capture a rich variety of emotional experiences and information-seeking behaviours while maintaining feasibility within the research constraints.

3.5.4 Stage 2a – Introduction to Study and Obtaining Consent: Data Collection Planning

In Stage 2a of the research, focusing on participant introduction and consent for data collection, 36 doctoral students from various stages of their studies volunteered. They were divided into three categories based on their academic progress: beginners (in their 1st or 2nd year and not yet started data collection), middle stage (in their 2nd or 3rd year, having completed data collection and in the analysis phase), and final stage (in their 3rd, 4th, or 5th year, having completed most of their work and nearing submission). This categorization is detailed in Table 3.5.

Participant Study of Year	Phase
Year 1 &2 who have not started their data collection or experiments	Early
Year 2 & 3 who have finished data collection and are in the analysis phase	Middle
Year 3 & 4 or 5 who have finalised ¾ work and are near to submitting or have already submitted	Final

Table 3.5 Categorizing of Participants

The study commenced in the second week of October 2018 and continued for fourteen months, concluding in December 2019. This is depicted in Figure 3.6, which outlines the data collection process.
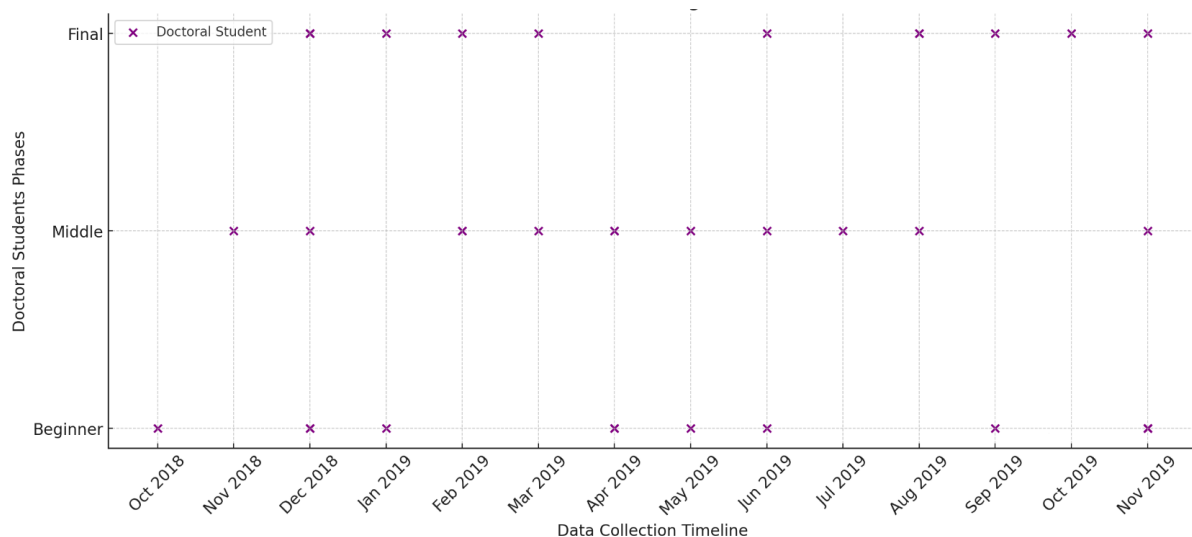
Figure 3.6 Data collection timeline

The initial plan was to start with beginner doctoral students and then proceed sequentially to analyse the data before moving to the next group. However, due to the practicalities of participant availability, data collection often occurred in parallel with other stages. In phenomenographic studies, the process of data collection is characterized by its recursive nature rather than a straightforward, linear progression. Essential activities like taking notes, creating memos, coding, and analysing the data typically happen concurrently. This overlapping method enables the ongoing analysis to shape and direct the continued gathering of data, thereby aiding in the gradual emergence and development of key themes. While this approach is iterative and cyclical, it is still possible to recognize distinct phases within the timeline of data collection and analysis.

All interested participants were invited to an initial meeting if they would like otherwise the emails were sent where the research was introduced, consent forms (as seen in **APPENDIX D)** were distributed, and research diaries were handed out. This was followed by individual face-to-face interviews. During these meetings, participants were briefed about the research objectives and asked to provide background information including age, gender, nationality, marital status, and details about their doctoral studies.

Participants were encouraged to record as many emotions as they experienced in their diaries, with the understanding that it was acceptable if they missed some. The importance of their participation was emphasized, regardless of the completeness of their emotional recording. Following the diary entries, participants were interviewed, with the researcher employing probing techniques and the critical incident method.

Although some participants were initially anxious about writing the correct content in their diaries, the researcher reassured them and highlighted that even seemingly mundane details were of interest. Participants were also informed they could reach out via phone or email for any further queries, addressing a common challenge in diary studies as identified by Tomitsch and Javadian (2010): ensuring participants understand the value of recording everyday activities.

3.5.5 Stage 2b – Obtaining participant responses: conducting the diary interview method.

In Stage 2b, the researcher focused on gathering participants' responses using a diary interview method, which involved several essential steps to ensure a supportive, engaging, and unbiased process.

Initial Contact and Support

A week after participants received their diaries, we contacted them via email to discuss their progress and arrange interview times. This step served as a motivational boost and a check-in to address any questions, helping participants stay engaged in the study—a challenge often encountered in diary-based research, as noted by Toms and Duff (2002). Many participants shared that writing in their diaries felt enjoyable and gave them a chance to reflect on their research journey.

Interview Introduction and Setting the Tone

At the start of each interview, the researcher expressed gratitude to participants, restated the study's purpose, and emphasized confidentiality and anonymity to ensure a comfortable environment. This initial phase, following Skinner's (2012) guidance, was crucial for building rapport. We also explained the semi-structured nature of the interview and provided a guide if requested, so participants would feel informed and prepared.

Conducting the Interview

During interviews, the researcher aimed to listen actively and ask follow-up questions as needed to encourage deeper insights without imposing personal biases. To achieve this, the researcher practised "bracketing," or setting aside pre-existing ideas, to ensure responses were interpreted as authentically as possible. Prior to conducting interviews, the researcher reflected on their own experiences with information-seeking and research-related emotions, minimizing potential personal biases.

Creating a Comfortable and Open Environment

The researcher approached interviews with a supportive, non-judgmental attitude, similar to a trusted peer, which allowed participants to share openly. This welcoming atmosphere was critical for obtaining honest, detailed responses about their research experiences and emotions. Interviews ranged from 35 minutes to just over an hour, wrapping up with an invitation for participants to share any final thoughts or topics that hadn't been covered.

Recording for Accuracy and Engagement

Interviews were digitally recorded, following Baker et al.'s (2021) recommendations, allowing the researcher to focus on listening rather than taking notes. This approach ensured that subtle details, such as tone and phrasing, were captured, providing a rich dataset for later analysis. It also helped the researcher maintain an attentive presence throughout the interviews, fostering a deeper connection with participants.

Overall, the diary interview method was designed to create a respectful and empathetic setting, allowing for a genuine, in-depth exploration of participants' experiences. This approach facilitated a well-rounded understanding of their perspectives, free from bias, and enriched the data collected for analysis.

3.5.6 Stage 3 – Data collection in NVivo

In this research, a five-phase analytical approach was applied to systematically explore and interpret the participants' emotional experiences in their doctoral studies, particularly focusing on information-seeking behaviour. Each phase utilized NVivo software to manage and code data, aligning with the study's aims of understanding emotional patterns and influences during research. Below is an explanation of each phase with specific examples of NVivo's functions used and Figure 3.5 shows the visual representation of phases.

The Five Phases of Analysis

Compile Data
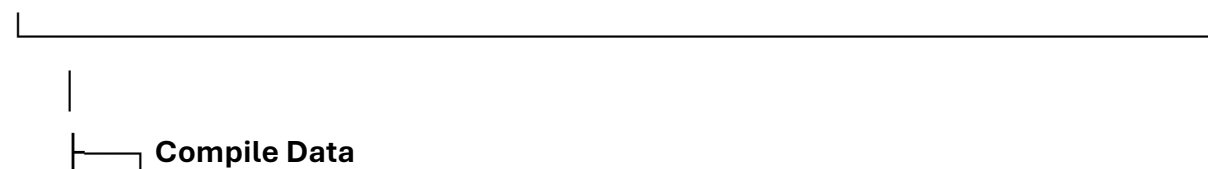
```
│ └── Organize all diary entries and interview transcripts in NVivo, structuring data
```
with participant attributes for systematic analysis.
```
│
├──┐ Disassemble Data
│ └── Break down data by performing open coding, and creating initial nodes to
```
capture key emotions, support types, and other themes.
```
│
├──┐ Reassemble Data
│ └── Group-related codes under parent categories, establishing relationships
```
between themes to reveal patterns in emotions and behaviours.
```
│
├──┐ Interpret Data
│ └── Use NVivo queries to analyse coded data, uncovering deeper insights, such as
```
recurring emotional themes across research stages.
```
│
└──┐ Conclude
    └── Summarize findings into a report, compiling key insights and conclusions
```
that inform the study's objectives and suggest areas for future research.

Figure 3.5 The Five Phases of Analysis and their Interactions.

Phase 1: Compile Data

In the initial phase, all data from diary entries and interviews were gathered and organized into a structured format in NVivo. This step involved importing the text files for each participant into NVivo as separate "Sources," allowing for easy navigation and organization. The objective of this phase was to ensure a coherent structure that could be consistently referenced throughout the analysis. The diary entries, interview transcripts, and any additional notes were each tagged with attributes such as participant ID, study phase (early, middle, final), and data source (interview or diary), which provided a foundational dataset ready for detailed examination.

Phase 2: Disassemble Data

In this phase, the data was broken down into smaller, meaningful parts for more granular analysis. Using **open coding** in NVivo, text segments were coded line-by-line, creating initial "nodes" for each concept relevant to the study. For example, instances where participants mentioned feeling overwhelmed were coded under "Anxiety," while discussions of productive research days were coded under "Pride." NVivo's "Nodes" function allowed for flexible coding, capturing both broad categories, such as "Positive Emotions" and "Negative Emotions," and more specific codes, like "Advisor Support" or "Access to Resources." Each node was tagged with its source document, ensuring traceability and allowing for cross-referencing as the analysis progressed.

Phase 3: Reassemble Data

After breaking down the data, it was reassembled to identify relationships and integrate insights across the various coded segments. NVivo's "Hierarchical Coding" structure facilitated this phase by allowing nodes to be grouped into parent categories. For example, specific nodes like "Advisor Feedback" and "Peer Support" were grouped under a broader parent node "Social Support." Similarly, emotional states related to academic challenges, such as "Anxiety" and "Frustration," were grouped under "Negative Emotions." This systematic organization allowed themes to emerge, offering a structured view of the relationships between emotions, support systems, and information-seeking behaviours.

The "Relationships" function in NVivo was also used here to visually map connections, such as linking "External Factors" to "Emotional Reactions" to see how specific external elements influenced participants' emotional responses.

Phase 4: Interpret Data

In the interpretation phase, deeper analysis was conducted on the reassembled data to understand underlying patterns and themes. Using **NVivo's Query and Matrix Coding** tools, the researcher was able to analyse patterns across different participant groups (e.g., comparing early-stage students to final-stage students) and assess how various

emotions were distributed across different phases of their research. For instance, it became apparent that "Work-Life Balance" stress was more prominent among early-stage students, while "Advisor Support" was frequently cited as an essential factor for those in the final stages of dissertation work.

The data interpretation also involved creating "Word Clouds" and "Word Frequency Queries" in NVivo, which visually highlighted the most common themes across all entries, helping identify dominant emotions and recurring topics. These visual aids were crucial in confirming thematic patterns and validating the coding structure established in earlier phases. The visual aids are presented in [Chapter 4.3 EXTERNAL INFLUENCES](#).

Phase 5: Conclude

The final phase involved concluding the data, linking back to the study's original aims of exploring how emotions influence information-seeking behaviours in doctoral research. In NVivo, **the Summary and Reports functions** were used to compile findings for each major theme, presenting an organized view of each emotional pattern, external influence, and information-seeking behaviour. This phase also allowed the researcher to reflect on the study's insights and consider implications for future research, particularly around potential interventions to support doctoral students emotionally.

The NVivo analysis provided a rich, unbiased representation of participants' experiences, with each phase building on the previous to yield a well-rounded understanding of the complex emotional landscape encountered in doctoral research. These insights will not only guide future research but also inform support mechanisms tailored to doctoral students' emotional and academic needs.

3.5.7 Stage 4 - Initial review of the conduct of the diary and interviews

Following the conference presentation of initial findings, the need for a deeper analysis became evident, leading to a more critical review of the initial diaries and interviews. This phase involved reading each transcript multiple times, marking key text elements, and noting potential themes. This process provided the researcher with a preliminary understanding of the data and allowed broad themes to emerge.

Realizing the importance of clarity, the researcher reached out to some participants for additional context, recognizing the value of targeted follow-up without overextending inquiries. Notably, a key insight emerged regarding interview length: longer interviews weren't always more valuable. For instance, while the first interview exceeded an hour, the third interview, which was 35 minutes, proved more insightful. The concise format of the third interview, partly due to time constraints, allowed the researcher to focus on core themes, underscoring the importance of structured, intentional questioning for meaningful data. This refined approach informed subsequent data collection and analysis, enhancing the quality of insights derived from each participant's contribution.

3.5.8 Stage 5 - Sensitising analysis of the diary and interviews

This stage acknowledges the absence of a single set of conventions for analysis in exploratory research, as pointed out by Martinho et al (2012). The researcher adopts an ideographic approach to delve into the participants' perceptions and experiences. The focus is on exploring how participants perceive emotions and information-seeking behaviour during their doctoral journey. The challenge here is to remain true to the data while constructing a coherent narrative from the research perspective.

However, there was an inevitable tension between being faithful to the data and, at the same time, from the researcher's point of view. This tidy construction is useful for further exploratory or educational purposes (Bowden and Walsh, 2000 p9). To address this, the diary data and interview recordings were meticulously revisited and analysed to ensure a thorough understanding. This process was challenging, aligning with (Gergen, M.M. and Gergen, K.J.) observations in 2000(p. 28).

A systematic yet open-minded approach was taken when re-examining the transcripts, aiming to fully grasp the complete meaning and perspective of each participant. This involved a deep dive into the nuances of their expressions, particularly focusing on how they conveyed emotions and their behaviour in seeking information. Key passages were highlighted, leading to the identification of several broad discussion areas.

These areas encompassed a range of topics:

- **Doctoral students' understanding of emotion**
- **Patterns and nature of their information-seeking behaviour**
- **Key attributes of emotions as perceived by these students**
- **Methods employed by doctoral students in seeking information**
- **The impact of emotional states on their motivation to seek information**
- **Potential causes of specific emotions**
- **External factors influencing their information-seeking behaviour**
- **Research strategies adopted by doctoral students**
- **Ways in which these students manage their emotions**
- **Other relevant factors like strategies and work experiences**

This careful examination allowed for some level of comparison across different transcripts. The text was reviewed multiple times, with individual narrative quotes being highlighted based on the identified themes. A detailed analysis revealed sub-themes within these broad categories, as participants often used varied language to describe similar concepts or the same terms with different emphases.

3.5.9 Stage 6 - Bracketing during the analysis

In self-reporting research, it's crucial to immerse oneself in the participants' perspectives, requiring researchers to practice 'bracketing.' This concept involves setting aside various elements, especially the researcher's personal experiences and beliefs, to focus on the participants' lived experiences more authentically.

Dörfler and Stierand (2021) acknowledge that complete bracketing is challenging, as some elements are more straightforward to set aside than others. For example, bracketing normative literature and policies about information-seeking behaviour is relatively easier due to their objective nature and conscious awareness, compared to personal beliefs and views, which are more subjective and less consciously acknowledged.

In this context, the researcher made a concerted effort to bracket her personal beliefs, experiences, and prior knowledge related to the research area. This involved several strategies:

- Setting aside personal views and beliefs.

- Ignoring previous research findings.

- Not relying on established normative literature.

- Avoiding predetermined interpretive categories.

Further measures were taken to ensure effective bracketing, enhancing the authenticity of the research:

- Creating a brief interview guide with only a few pre-highlighted questions, ensuring spontaneity.

- Utilizing open-ended questions to encourage unguided, genuine responses.

- Employing prompts specifically designed to delve deeper into participants' personal views and experiences.

- Transcribing interviews meticulously, with a keen focus on capturing nuances such as tone and emotional undertones.

- Repeatedly listening to and reading interview recordings and scripts, which aided in accurately identifying themes and contextualizing quotes.

These steps demonstrate a thorough and mindful approach to bracketing, aimed at minimizing researcher bias and ensuring that the study accurately reflects the participants' true experiences and perspectives.

3.5.10 NVivo Coding and Thematic Analysis Approach

The data analysis in this study employed NVivo software to systematically explore the emotional and self-regulatory experiences of doctoral students. NVivo facilitated both qualitative and quantitative analyses, enabling a detailed examination of themes, emotional variations, and specific self-regulatory processes as described by the participants. The following section provides an overview of the coding approach, explaining each phase from initial data preparation through to the final outcome space.

Step 1: Prepare Data for Analysis

- **Data Importation**: All diary entries and interview transcripts were imported into NVivo. Each participant's responses were organized as individual cases within NVivo, categorized by research stage (early, middle, and final years) to support cross-stage analysis.

- **Framework Preparation**: An analytical framework was developed, based on emotional activation types (Positive Activation, Negative Activation, Deactivation) and Zimmerman's Self-Regulated Learning (SRL) model. This framework was structured hierarchically in NVivo, mirroring the three Pools of Meaning identified in the study (Dissertation Process, Self-Regulatory Learning, and External Factors), with each pool further divided into sub-categories aligned with the study's emotional and cognitive themes.

Step 2: Open Coding and Thematic Extraction

- **Open Coding**: Using a line-by-line approach, each participant's narrative was examined, tagging excerpts with open codes that captured emotions (e.g., anxiety, frustration, hopefulness) and SRL phases (e.g., forethought, performance, self-reflection). Each coded excerpt was tagged by participant ID and research phase to support cross-case comparison.

- **Phenomenological Analysis**: To align with phenomenographic principles, codes were grouped according to how participants expressed their emotional and cognitive processes. For instance, emotional expressions such as "hope" and "anxiety" were categorized under Emotional Activation, with distinctions made by research stage (e.g., *Early Journey Hope, Mid-Stage Anxiety*). SRL phases, including task analysis and self-reflection, were coded according to Zimmerman's model, allowing for the systematic identification of emotional variations across research stages.

Step 3: Axial Coding and Theme Development

- **Cross-Case Analysis**: Utilising NVivo's *query functions*, codes were examined across cases to identify commonalities and differences. Axial coding enabled the organization of initial codes into higher-level themes such as *Emotional Journeys by Research Stage* and *External Support Influence on Self-Regulation*.

- **Creation of Thematic Categories**: Codes were grouped into thematic categories within each Pool of Meaning. For example, Pool 1 (Dissertation Process) included themes such as *Emotional Journey by Research Phase*, with sub-codes for each research phase (e.g., *Early, Mid, Final*), as outlined in the findings. These thematic categories provided insights into how emotions varied across participants and different stages of research.

Step 4: Selective Coding and Outcome Space Development

- **Outcome Space Design**: Based on the structured themes, NVivo's hierarchical coding enabled the creation of an Outcome Space, a conceptual model linking each thematic code to specific categories in .

- **Final Coding Scheme**: Themes were further refined into distinct outcome categories (e.g., *Regulatory Factors Linked to Dissertation Process*, *Self-Motivation Beliefs in Self-Regulated Learning*). NVivo's relationship nodes were used to connect emotional variations with participants' narratives, ensuring thematic coherence across Pools of Meaning.

3.5.11 Stage 8 - Compilation of participant's profiles

The compilation of individual profiles aims to identify central points of emphasis concerning the information-seeking behaviour of doctoral students. This in-depth examination of individual interviews and profiles focuses on participant experiences, contributing to an empathetic understanding of their perceptions. This stage helps to counter the tendency to interpret meanings out of context and ensures internal validity and consistency in the participants' accounts.

To examine these for each interviewee, the researcher drafted a summary of key themes on a separate page. Next, she re-examined these themes and detailed salient quotes for each. She then drafted another page for each interviewee describing the context of each of these quotes. Some key themes relating to the study findings thus emerged.

3.5.12 Stage 9 - Identifying interviewee themes and categories example case study

In this case study analysis of *Participant P6*, delve into how their narrative and responses were systematically coded within NVivo to illustrate the emotional and self-regulatory challenges encountered during their doctoral research journey. This example case provides a comprehensive look into how each coding phase contributes to the thematic categorization within the established framework, aligned with emotional activation, self-regulation, and external factors influencing the doctoral experience.

Coding for Emotional Activation (Early Stage)

Participant P6, an early-stage doctoral student, expressed **confusion and anxiety** surrounding the selection of their research topic. This emotional reaction is a common initial response among doctoral students when faced with the uncertainty and broad scope of choosing a research focus.

1. **Open Code**: **Negative Activation**: The emotional expressions of "confusion" and "anxiety" were coded as *Negative Activation* due to the distress and lack of confidence associated with these emotions during the initial research phase.

2. **Thematic Category**: This code was grouped under the thematic category *Emotional Journey as Early Year Researcher (EJ1.1)*, located within **Pool 1: Dissertation Process**. This pool focuses on how doctoral students emotionally respond to the core research processes, such as topic selection, data collection, and presentation.

3. **Framework Alignment**: Following the analytical framework, the open code "confusion and anxiety" aligns with *Negative Activation*, as detailed in Table 4.11. This alignment places P6's experience within a broader context of early-stage emotional challenges that influence information-seeking behaviours.

Coding for Self-Regulatory Phases

In addition to emotional responses, Participant P6 described a struggle with **goal setting and planning**, specifically within the task analysis component of the forethought phase. This challenge reflects a significant aspect of self-regulated learning, where early-stage doctoral students often face difficulties in establishing clear, manageable objectives.

1. **Forethought Phase (Task Analysis)**: P6 reported not having a "clear strategy" for tackling their research, which indicated a self-regulatory challenge in goal setting and task planning.

2. **Code**: This response was coded under *Self-Regulation in Forethought Phase (SRL EJ2.1)*, highlighting the *Task Analysis Difficulty* that early doctoral students may face when beginning their research projects.

3. **Thematic Category**: This code was assigned to the thematic category *Forethought Phase in Self-Regulated Learning*, located within **Pool 2: Self-Regulatory Learning Process**. This pool focuses on how doctoral students manage their own learning, motivation, and goals across various stages of their research journey.

4. **Framework Alignment**: In alignment with Zimmerman's SRL model, P6's difficulty was categorized as a *task analysis challenge*, representing a broader self-regulatory difficulty during the forethought phase. This highlights the need for effective planning and motivational strategies in early doctoral research stages.

Integration with External Factors (Pool 3)

Participant P6 also noted a **lack of guidance** from their supervisor, which contributed to feelings of uncertainty and exacerbated their anxiety regarding topic selection and

planning. The supervisory relationship is an essential external factor that can significantly impact a doctoral student's emotional and cognitive experiences, as it plays a crucial role in providing direction and support.

1. **Supervisory Relationship**: P6's mention of insufficient guidance was interpreted as a need for greater support and mentorship, particularly in the early stages of their research.

2. **Code**: This aspect of P6's experience was coded under *External Support (Supervisor Influence)*, reflecting how the supervisory relationship influences emotional and regulatory responses during the doctoral journey.

3. **Thematic Category**: The code was categorised within *Supervisor Relationship (EJ3.1)* under **Pool 3: External Factors**. This pool examines the role of external influences on the doctoral experience, including academic support networks, institutional culture, and personal challenges.

4. **Framework Alignment**: This finding aligned with other participant responses that underscored the importance of supervisory support. Alongside similar responses, P6's lack of guidance informed the thematic analysis in Chapter 4, illustrating how supervision affects emotional well-being and regulatory practices across different research stages.

This example demonstrates the rigorous application of NVivo's hierarchical coding, allowing the researcher to trace individual cases to broader themes, thereby contributing to the outcome space discussed in subsequent chapters. This method highlights the importance of early intervention strategies, targeted support, and tailored self-regulation techniques to support doctoral students effectively throughout their research journey.

3.6 ANALYSIS PROCEDURE

The research undertaken employs a mixed-methods methodology, integrating data from multiple phases to ensure a comprehensive understanding. The process of data analysis involved an iterative and meticulous coding procedure, wherein emerging categories were identified and later refined. Illustrated in Figure 3.7 of the thesis is the

phenomenographic analysis process. This process adheres to the principles established by Stenfors-Hayes, Hult, and Dahlgren (2013), and Ashworth and Lucas (2000), emphasizing an interviewing style that is both friendly and relaxed, yet remains neutral and non-judgmental. A key aspect of this process is the ability of the researcher to set aside personal biases, as highlighted by Jobin and Turale (2019). This entails a conscious effort to avoid influencing the conversation, even when possessing relevant information, to maintain the integrity of the interview process.
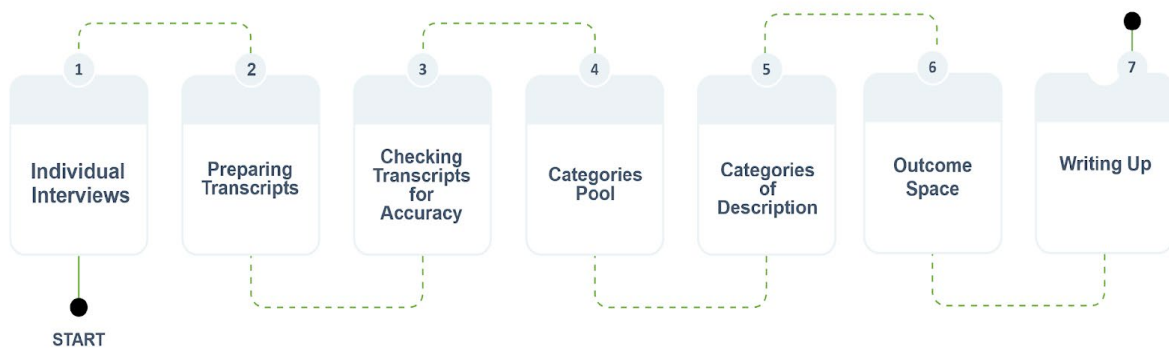
Figure 3.7 The phenomenographic analysis process

The creation of a pool of categories was instrumental in understanding how participants experienced emotional encounters during their information-seeking activities. The analysis of interview transcripts and categorizing of responses enabled the identification of patterns and similarities in participants' experiences. Once the system of categories was established, co-occurrences and connections were analysed through an iterative and interpretative process, as detailed in Chapter 3.4.2 of the thesis. Some categories emerged directly through the analysis, while others were more closely linked to specific interview questions.

Phenomenography, which posits that experiences of a phenomenon are qualitatively limited (as discussed in Chapter 3.4.1), led to the identification of only a finite number of descriptive variations within these categories. Some categories displayed an element of sophistication in their descriptions. Notably, responses from the same participant sometimes appeared in multiple variations within the same category, which aligns with

phenomenography's approach to understanding meaning as fragmented rather than individual-centric (Chapter 3.4.2).

In phenomenography, data is categorized descriptively, and some categories naturally had more supporting data in terms of quantity or quality (Chapter 3.4.6). These variations were incorporated into the study's categories of description, accompanied by relevant interview excerpts. An outcome space was developed as the final stage of the phenomenographic analysis, detailed in Chapter 5. This outcome space is crucial for the development of the gamified emotion regulation framework and the subsequent discussion of related literature.

During the data collection and analysis, the researcher maintained a reflective diary as a bracketing strategy, documenting the process in detail. A draft of this chapter was shared with the study participants, with 77% (28 participants) confirming that the findings resonated with their experiences, thereby validating the research findings.

The established categories also took into account the results from previous studies within the same wider project, such as those by Castelló et al. (2017) and Corcelles et al. (2019), which utilized similar frameworks. The subsequent section of the thesis aims to delve into the validity and reliability of the data collection process, affirming the academic rigor and integrity of the research.

3.6.1 Supervisory Team Role

In the analysis process, the supervisory team played a crucial role in ensuring the reliability and accuracy of the themes and categories, helping to minimize researcher bias. The attached image outlines the stages in the analysis, showing how each step involves rigor and validation, with supervisory input to enhance objectivity. Here's how the supervisory team contributed to each stage:

- **Individual Interviews**

After conducting the individual interviews, initial impressions and observations were shared with the supervisory team. At this stage, supervisors provided feedback on the interview approach and advised on areas that might need further exploration or

clarification. This collaborative reflection on interviews helped refine the focus and reduce the influence of preconceived notions that could affect interpretation.

- **Preparing Transcripts**

Once interviews were completed, transcripts were prepared for analysis. The supervisory team reviewed selected transcripts alongside the researcher to ensure that the data was accurately captured and represented. This step was essential for validating the raw data before analysis, as any transcription errors or misinterpretations could lead to inaccurate coding and theme development. Supervisors also checked for consistency in language and phrasing, which helped establish a solid foundation for the next stages.

- **Checking Transcripts for Accuracy**

Supervisors actively reviewed the transcripts to confirm their accuracy and ensure that they authentically reflected participants' words. This review process included cross-checking specific quotes and verifying that expressions were preserved. Supervisory feedback in this phase helped in identifying any potential misunderstandings or biases introduced during transcription, which reinforced the objective quality of the data.

- **Categories Pool**

In this stage, initial codes and themes were developed based on common patterns emerging from the data. The supervisory team was actively involved in reviewing the initial pool of categories and themes. They provided feedback on the scope and relevance of each category, challenging any assumptions or subjective interpretations by the researcher. By critically assessing the preliminary categories, the supervisors ensured that the themes were grounded in the data and not overly influenced by the researcher's perspective.

- **Categories of Description**

The process of defining and refining categories was done collaboratively with the supervisory team. Supervisors helped by challenging the naming and structure of each category, ensuring they captured the true essence of participants' experiences. They guided the researcher to maintain alignment with the study's objectives, helping refine

categories so they were descriptive, non-redundant, and free from researcher bias. This collaborative approach facilitated a more accurate representation of participants' responses.

- **Outcome Space**

In constructing the "Outcome Space," where themes and categories are organized to reflect the overall findings, the supervisory team provided critical insight. They helped ensure that the organization and relationship between categories accurately represented the data rather than any bias from the researcher's preconceived ideas. The supervisors' feedback focused on whether the outcome space logically represented the connections between categories, enhancing the coherence and rigor of the analysis.

- **Writing Up**

During the final writing-up stage, the supervisory team reviewed the descriptions of themes and categories to confirm that the findings were presented in a clear, unbiased manner. They helped the researcher avoid overemphasizing specific themes or drawing unsupported conclusions. By giving detailed feedback on each section, the supervisory team ensured that the write-up accurately represented the findings, remained grounded in the data, and communicated the analysis transparently.

3.6.2 Validity & Reliability

The validity of all research should be challenged, and measures put in place to improve the quality and acceptability of the work. This research through a phenomenographic approach, the emphasis on validity and reliability is paramount. Following the guidelines suggested by Cope (2014), a series of measures were implemented to ensure the rigor and trustworthiness of the findings, as outlined in Table 3.6 of the thesis.

Validity Measures	
Disclosure of Researcher's Background	Recognizing that a researcher's experiences inevitably influence their analysis, I have stated my background to provide context to the reader and to maintain transparency.
Sample Selection Explanation	The rationale behind the purposive sample selection was clearly articulated, ensuring it was free of bias.
Justification of Interview Schedule	The structure and reasoning behind the interview schedule were clearly detailed.

Bias-Free Data Collection Details	Steps taken to collect data without bias were thoroughly explained.
Open-Minded Data Analysis	detailed how data was analysed with an open mind, crucial in phenomenographic studies.
Checks and Measures for Analysis Accuracy	Steps were taken to ensure the analysis was appropriate and accurate.
Inclusion of Quotes in Categories	Appropriate quotes were included in each category of description, adding depth to the analysis.
Results Presented for External Scrutiny	The results were presented in a way that allows for external review and critique.

Table 3.6 Measures taken to improve rigour in phylogeographic analysis - adapted table from (Cope 2014)

Reliability Measures:

In qualitative research like this, reliability is concerned with the consistency of methods and methodology (Leung 2015). The researcher's approach, detailed in the respective chapter, was applied consistently throughout the research. The individual nature of the relationship with the data, while unique, is acknowledged as valid and reliable in this field (Cope 2014). This individualized interpretation is a hallmark of qualitative research and does not detract from the study's reliability.

Interjudge reliability was also considered by discussing the appropriateness and connections between categories with the research team (Cope, Horan, and Garner 1998). As noted by Akerlind, Bowden, and Green (2005), high-quality phenomenographic research can be achieved individually, and my solo work on this project does not undermine its reliability.

Furthermore, the study approach was both reflective and reflexive (Reid et al. 2018; Leung 2015). Reflectivity, particularly, is crucial in phenomenographic studies, as it involves recognizing and understanding biases and relationship with the subjects. This understanding enhances the insights presented in the findings, allowing readers to grasp the nuances of doctoral students' information-seeking behaviours.

In summary, the validity and reliability of this phenomenographic study on doctoral students' information-seeking behaviour were ensured through meticulous methodological design, transparency in execution, and introspective analysis, all of which contribute to a robust and credible exploration of this phenomenon.

3.6.3 Using Quotes during Analysis

In the context of this study, which investigates the lived experiences of doctoral students during their information-seeking processes, quotes are utilized strategically and thoughtfully to enhance the depth and authenticity of the research findings. The use of quotes aligns with Creswell's (2013;2014) and Sandelowski's (2010) perspectives on their significance in qualitative research. Here's an expanded view on how each type of quote, as classified by Richardson (1990) and cited in Creswell (2013), is employed:

- **Longer Quotations:** These are particularly valuable in elucidating complex understandings and nuanced experiences of doctoral students. When participants describe intricate aspects of their information-seeking behaviours or emotional experiences, longer quotes allow for a fuller, richer portrayal of these complexities. These extended excerpts offer a detailed glimpse into the students' thought processes, challenges, and strategies, providing depth to the phenomenographic analysis.

- **Embedded Quotes:** Used tactically throughout the analysis, embedded quotes serve as transitional tools or as means to introduce significant points. They are woven into the narrative to prepare readers for shifts in the discussion or to highlight key findings. For instance, an embedded quote might be used right before introducing a new theme in the data, or to underscore a shift from discussing emotional experiences to information-seeking strategies. These quotes act as narrative signposts, guiding the reader through the various facets of the doctoral students' experiences.

- **Short, Eye-catching Quotations:** These are selected for their impact and conciseness. Short quotes are powerful in conveying poignant, memorable insights or summarizing core experiences effectively. They are often used to represent the essence of a common experience among participants or to capture an impactful statement that resonates with the broader themes of the study. Due to their brevity and clarity, these quotes are easily digestible for readers, making the research more accessible and engaging.

By employing these different types of quotes, the study achieves several objectives: it provides a platform for the voices of doctoral students to be heard, enhances the credibility of the research findings by anchoring them in actual participant narratives, and helps in constructing a coherent and compelling narrative that accurately reflects the complexity and diversity of the doctoral students' experiences.

Furthermore, quotes are not just illustrative; they are integral in supporting the phenomenographic approach of the study. They help in identifying and describing the different ways doctoral students experience and perceive the information-seeking process, thus contributing to the development of a nuanced and comprehensive understanding of this phenomenon.

3.6.4 Ethical Considerations

Research ethics, as described by Gravetter and Forzano (2018, p.98), emphasize the researcher's duty to maintain honesty and respect for all subjects impacted by the research or the dissemination of its findings. Denscombe (2017) echoes Bell's and Bryman (2022) sentiment that research should adhere to ethical principles. In this study, participants were thoroughly informed, and their confidentiality and anonymity were ensured. They were not required to provide identifying information, aligning with Bryman and Bell's (2020) recommendations on informed consent and avoiding deception.

According to Gravetter and Forzano (2018), researchers must fully inform participants about the study. The research's purpose was communicated to the students, and the questionnaires included an introductory cover sheet (see **APPENDIX B**). Given the nature of the research involving potentially distressing topics, several ethical considerations

were made, starting with discussions with supervisors and review by the local ethical panel via ETHOS, MMU University's system. The data will be securely stored for ten years, following the England Research Code of Practice as per ERCOP standards, and protected with a password.

Finally, all participants received detailed documents about the study and provided their informed consent before participating, as detailed in **[APPENDIX C](#)**.

This process involved not only obtaining written consent before any formal research activities commenced but also a thorough briefing at the beginning of each diary entry or interview session. During these briefings, the researcher personally read out the entire informed consent form to each participant, ensuring they fully understood the terms and providing them with ample opportunity to ask any additional questions.

Funding No funding was received for conducting this study.

Conflict of interest the authors have no relationship, financial or otherwise, with individuals or organizations that could influence the work inappropriately. No conflict of interest exists.

To further safeguard the privacy and comfort of the participants, they were invited to choose their own pseudonyms. This practice allowed them to easily identify their own contributions in the quotes and transcripts. Following the transcription of their interviews or diary entries, the transcripts were sent back to the participants.

This step was crucial as it gave them the chance to review their contributions and opt to remove any part of their input they did not wish to be included in the final analysis of the study. This thorough and respectful process of consent and participant involvement underscores the study's commitment to ethical research practices, ensuring participants' autonomy and confidentiality are upheld throughout the research process.

3.7 OUTCOMES OF THE RESEARCH AND CONCLUDING THOUGHTS

The chapter under discussion embarks on a critical exploration of the philosophical underpinnings that are essential in selecting an appropriate research strategy. This initial stage is vital for grasping the essence of social science research and for making informed

decisions about the application of quantitative or qualitative methods. The choice between these methodologies is not arbitrary; it hinges on the specific objectives of the research, necessitating a thoughtful consideration of the study's underlying philosophical stance.

Moving forward, a significant revelation from this exploration is the study's alignment with the interpretivism paradigm. Interpretivism is particularly pertinent to research that seeks to delve into the subjective experiences and perceptions of individuals. In the context of this study, which focuses on doctoral students' emotions and information-seeking behaviours, interpretivism offers a lens through which these subjective realities can be more accurately understood. This alignment has, in turn, influenced the formulation of the research questions, driving them towards a more nuanced understanding of the individual experiences under scrutiny.

In terms of methodology, the chapter spotlights the strategic selection of a mixed-methods approach, amalgamating elements of both quantitative and qualitative research. This methodological pluralism is complemented using phenomenography for data analysis. Such a combination is particularly apt for the study at hand, allowing for an exhaustive exploration of the complex and layered research questions posed. Phenomenography, with its unique focus on understanding and categorizing variations in human experiences and perceptions, stands out as an ideal tool for dissecting and comprehending the varied experiences of the participants.

The research then pivots to the practical aspects of data collection and analysis, adopting diary and interview methodologies. These methods are chosen for their efficacy in capturing the intricate and personal 'lifeworld's' of the individual participants. The development of individual profiles from these data collection methods enables the research to zoom in on the distinct experiences and perspectives of each participant, thus enriching the study's depth and breadth.

However, the chapter also acknowledges the limitations inherent in the chosen methodologies. Despite these limitations, the individual participant profiles prove to be instrumental in uncovering and dissecting key perceptions and experiences among the

doctoral students. These profiles facilitate a rich, in-depth understanding of each participant's unique perspective, setting the stage for a detailed exploration in the subsequent chapter. This approach ensures that the study not only captures a wide range of experiences but also provides a profound insight into the nuanced ways in which doctoral students navigate their emotional and information-seeking journeys.

CHAPTER 4
DATA RESULTS
&
FINDINGS
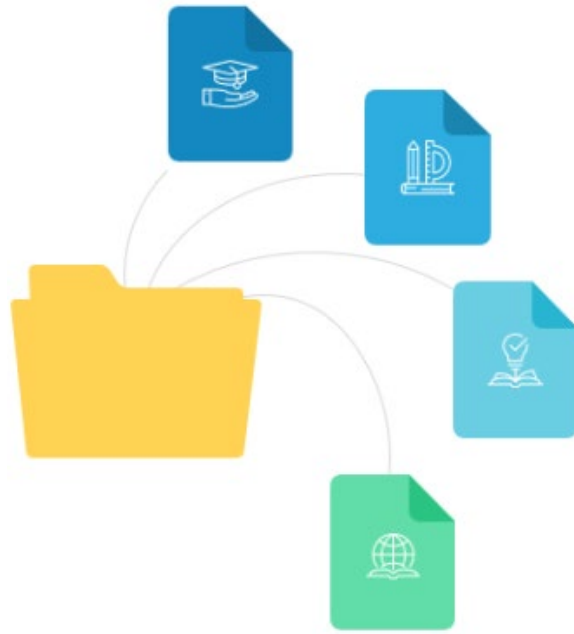
CHAPTER 4: DATA RESULTS & FINDINGS

This chapter presents a thorough analysis of the collected data, highlighting key findings regarding participants' demographics, research goals, emotional states, and their experiences throughout the various stages of their doctoral journey. The chapter begins with an in-depth overview of participant demographics (Section 4.1) to establish a context for interpreting subsequent data findings. This baseline demographic information is crucial as it allows for a nuanced understanding of how different factors—such as the academic phase, the field of study, and personal characteristics—intersect to shape participants' emotional experiences and information-seeking behaviours.

Following this demographic overview, the chapter delves into the quantitative and qualitative results from two main data collection phases. The first phase focuses on a week-long diary study in which participants reflected on their daily research goals, emotional responses, and challenges. This structured and objective data capture offers insight into the dynamic nature of emotions and information-seeking behaviours as students' progress through their studies. The second phase shifts to an interpretive approach, featuring in-depth interviews that provide rich, subjective insights into participants' unique experiences. By synthesizing the findings from both phases, the chapter culminates in an 'outcome space' that encapsulates the core themes, emotional patterns, and academic challenges experienced by doctoral students. All the results are available here.

4.1 PARTICIPANT DEMOGRAPHICS

This section describes the demographic information collected from the study participants. In general, scrutiny of respondents' demographic information helps a researcher assess their suitability to participate in the study. Further, the demographic distribution of the respondents helps establish the accuracy with which the study population is replicated in the sample. Prior studies, such as those by Onuoha and Obiako (2013), Faris (2016), and Morrison-Saunders et al. (2014), highlight the importance of considering gender, doctoral programme stage, and country of origin as

influential factors in emotional perspectives and information-seeking behaviours. These studies underline the relevance of including these demographic factors in the analysis.

4.1.1 Importance of Sampling in Research

Data sampling is fundamental in research as it directly affects the representativeness, reliability, and generalizability of study findings. Proper sampling allows researchers to collect manageable subsets of data from a larger population, making it feasible to conduct detailed analyses while preserving the validity of results. In the context of this study, the sampling of 36 doctoral students from diverse backgrounds, stages, and fields of study enables a robust exploration of the emotional and informational aspects of the doctoral journey. Key demographic variables such as **gender**, **age**, **PhD stage**, **country of origin**, **field of study**, and **family status** were chosen to capture a wide range of experiences, thereby enriching the study with varied perspectives.

Sampling from different **doctoral stages**—categorized as "Early," "Middle," and "Final"—is especially relevant for capturing the evolving nature of the doctoral journey. Additionally, sampling from different **fields of study** reflects the distinct academic cultures and expectations across disciplines.

4.1.2 Data Collection Process

The demographic information was gathered using a structured diary distributed to participants at the start of the diary study. Each participant completed demographic questions on the first page, covering gender, age, doctoral stage, country of origin, current PhD program, and family status. This demographic data serves as a foundation for understanding the results and is summarized in Table 4.1. The demographic profile aids in contextualizing participants' emotional responses and information-seeking behaviours. All the anonymised data are at **APPENDIX E.**

Categories	Groups	Number of Participants
Gender	Female	21
	Male	15
Age	19-28	8
	29-38	15
	39-48	10
	49-58	2
	58+	1
PhD level	>1st year	7
	1st year	5
	2nd year	11
	3rd year	10
	4th year	2
	4th year+	1
Country of Origin	UK	12
	China	5
	Saudi	6
	Qatar	3
	Pakistan	4
	India	2
	France	2
	Poland	2
Current PhD Programme	Arts and Humanities	8
	Computing	10
	Science & Technology	6
	Health & Social Care	3
	Business &Economics	5
	Other	4
Family Status	Married	15
	Married with kids	6
	Single	3
	Single with kids	2
	Separated	3
	Engaged	5
	Other	2

Table 4.1 Demographic variation in participant sample (n=36)

1.Gender Distribution

The sample includes a higher proportion of female participants (59%) compared to male participants (41%). This demonstrates a slight gender imbalance in the sample, which could reflect broader trends in higher education demographics or the specific appeal of the study to female doctoral students.

2.Age Range

Participants are spread across a wide age range, with the majority falling within the 29-38 (42%) and 39-48 (28%) age brackets. This indicates that a significant portion of doctoral students are in their late 20s to late 40s, suggesting that doctoral study is an endeavour undertaken by individuals at various stages of their professional and personal lives.

3.PhD Level

The distribution across different years of their PhD programme shows a concentration in the 2nd (31%) and 3rd (28%) years. Students in the early stages of their doctoral research (1st year) account for 19%, while those in the latter stages (4th year and beyond) comprise a smaller segment (9%). This could point to a midpoint in the doctoral journey where students are more likely to engage in external research activities, possibly due to having more defined research interests and being in the midst of active research work.

4.Country of Origin

The sample exhibits a diverse international composition, with the largest group being from the UK (33%). Chinese (14%) and Saudi (17%) students also form a significant portion, followed by students from Qatar, Pakistan, India, France, and Poland, each representing 6-11% of the total. This diversity may contribute to a broad range of cultural perspectives in the research findings.

5.Current PhD Programme

The fields of study among participants vary, with Computer Science (28%) and Arts and Humanities (22%) being the most represented. Science & Technology, Health & Social Care, and Business & Economics also have notable representation, suggesting the research's appeal across different academic disciplines.

6.Family Status

Regarding family status, the largest group is married without kids (42%), followed by single participants (17%). Married with kids (17%) and engaged (14%) categories are also

significant, indicating that the sample includes individuals with a variety of personal commitments and life situations.

The variations in the demographic profile of the doctoral students sampled here can have several **implications**:

- Gender: The higher number of female participants could influence the study's outcomes if the researched phenomena have gender-specific aspects.
- Age: The diversity in age suggests that findings could reflect a wide range of life experiences and motivations for pursuing doctoral studies.
- PhD Level: With many participants in the middle years of their PhD, the sample might provide insights specific to the challenges and experiences typical of this phase.
- Country of Origin: The international nature of the sample enriches the study with a variety of cultural viewpoints, potentially affecting the interpretation of the research topic.
- Field of Study: The spread across different academic disciplines means that the research could capture a broad spectrum of academic cultures and practices.
- Family Status: The varied family statuses present the opportunity to explore how external factors impact the doctoral journey.

Overall, the demographic data indicates a sample with considerable diversity, which enriches the research findings with a wide range of perspectives and experiences. However, this diversity may impact the generalizability of the results if not handled carefully. The next presents the quantitative analysis of the doctoral student diary responses focusing on their emotional perspective and impact on information-seeking behaviour. The results are obtained in different phases, and questions are based on different levels of doctoral student research skills. The data results of the collective stages of learners are mentioned in the next section.

4.2 FIRST STAGE: SRET FINDINGS

The Self-Reporting Emotion Tool (SRET), outlined in [Section 3.5.2.1](#), is a carefully designed data collection instrument developed to capture a broad range of emotional

experiences that doctoral students encounter throughout their research. The tool's primary objective is to obtain comprehensive insights into the emotional landscape associated with doctoral research, especially focusing on how these emotions influence students' information-seeking behavio**u**rs and overall progress towards their research goals.

The SRET tool is organized as a **week-long diary study** format, enabling participants to record their emotional states over several days. This approach allows the collection of data from **Day 1 to Day 7**, capturing multiple data points rather than a single momentary snapshot. The intention behind collecting entries over a full week is to avoid a narrow or potentially biased dataset that might only reflect transient emotions. Instead, the week-long diary entries help create a more nuanced and reliable emotional profile for each participant. By structuring the tool to gather data across several days, SRET captures the *dynamic and evolving nature of emotions*, which can vary significantly over time, especially in a high-stakes academic context such as dissertation work. The next section showcases data findings.

4.2.1 COMPARISON A: EMOTION INTENSITY AND GOAL ATTAINMENT ACROSS RESEARCH PHASES

This analysis examines the relationship between emotional experiences and goal attainment across different phases of research, based on SRET diary questions 1 and 3. The primary objective was to evaluate how the intensity of specific emotions correlates with success levels throughout the research journey, providing insights into the emotional dynamics of academic research progression. The table can be found here.

Analysis:

   a. **Data Segmentation:** Participants were categorised into three distinct research phases: Early, Middle and Final Phase.
   b. **Emotional Variables Examined:** Key emotions were selected based on their potential impact on research progress: **Anxiety:** Stress and worry related to research challenges. **Pride:** Sense of accomplishment following successful task completion. **Relief:** Emotional release after

overcoming obstacles. **Frustration:** Negative responses to setbacks and difficulties

c. **Success Level Classification:** The intensity of these emotions was compared with task outcomes which were categorized into seven distinct levels:

1. Very Unsuccessful: Extremely failing expected level
2. Unsuccessful: Failing of intended goals
3. Somewhat Unsuccessful: Falling short of intended goals
4. Neutral: Neither successful nor unsuccessful
5. Somewhat Successful: Meeting basic objectives
6. Successful-Expected goal outcomes
7. Very Successful: Exceeding expected outcomes

Findings:

1. **Early Phase:**
   o **Emotion Impact:** High levels of **anxiety** and **frustration** were frequently observed in unsuccessful tasks, with students reporting lower success levels. Conversely, **hope** and **pride** tended to be moderate when tasks were somewhat successful.
   o **Insights:** Students in the early phase struggle more with emotional regulation, as high anxiety often correlates with unsuccessful outcomes. This suggests that they may lack confidence or experience, making them more susceptible to stress and less likely to attain their goals.

2. **Middle Phase:**
   o **Emotion Impact:** Middle-stage students reported **moderate to high pride** for successful tasks, indicating a sense of accomplishment as they progressed. **Anxiety** and **frustration** remained elevated but were often paired with **relief** when tasks were completed.
   o **Insights:** Middle-stage students experience mixed emotions. Success in this phase is often accompanied by pride but is tempered by ongoing

stressors. High anxiety continues to impact goal attainment, but relief from progress gives emotional balance.

3. **Final Phase**:
    - ○ **Emotion Impact**: In the final phase, **pride** and **relief** were dominant in successful tasks, while unsuccessful tasks led to **frustration** and **anxiety**. High pride was a consistent indicator of success, while anxiety was less prevalent compared to the early phase.
    - ○ **Insights**: Final-stage students manage their emotions more effectively. Pride and relief are indicators of task success, showing they have likely adapted to high-stress environments. Anxiety decreases, suggesting emotional regulation improves as students gain confidence in their research abilities.

4.2.2 COMPARISON B: EMOTION INTENSITY FLUCTUATIONS THROUGHOUT THE WEEK

Tracking emotional trajectories throughout the week reveals consistent patterns that reflect how doctoral students' emotional states evolve with task progression and approaching deadlines. At the **start of the week**, emotions like **hope and pride** are moderately high, suggesting that students begin their week with a positive outlook and readiness to tackle new tasks. This optimism aligns with initial confidence in their goals and the motivation to make progress.

However, **mid-week** marks a shift, with **anxiety and frustration** reaching peak intensity for many participants. This increase is associated with cumulative workload pressure and looming deadlines. The emotional fluctuation mid-week highlights a critical point where students may benefit from additional support or structured management interventions. The increase in frustration often signals difficulties with task completion, leading to emotional strain that could disrupt information-seeking behavior and direct impact on outputs.

By the **end of the week** as tasks are completed, **relief and pride** become more prominent, indicating a sense of achievement and emotional stabilization. Anxiety

decreases as students wrap up their weekly tasks, reflecting satisfaction with their progress. This pattern in Figure 4.1 suggests that students find relief in task completion, which has positive implications for their motivation and preparedness for the upcoming week.
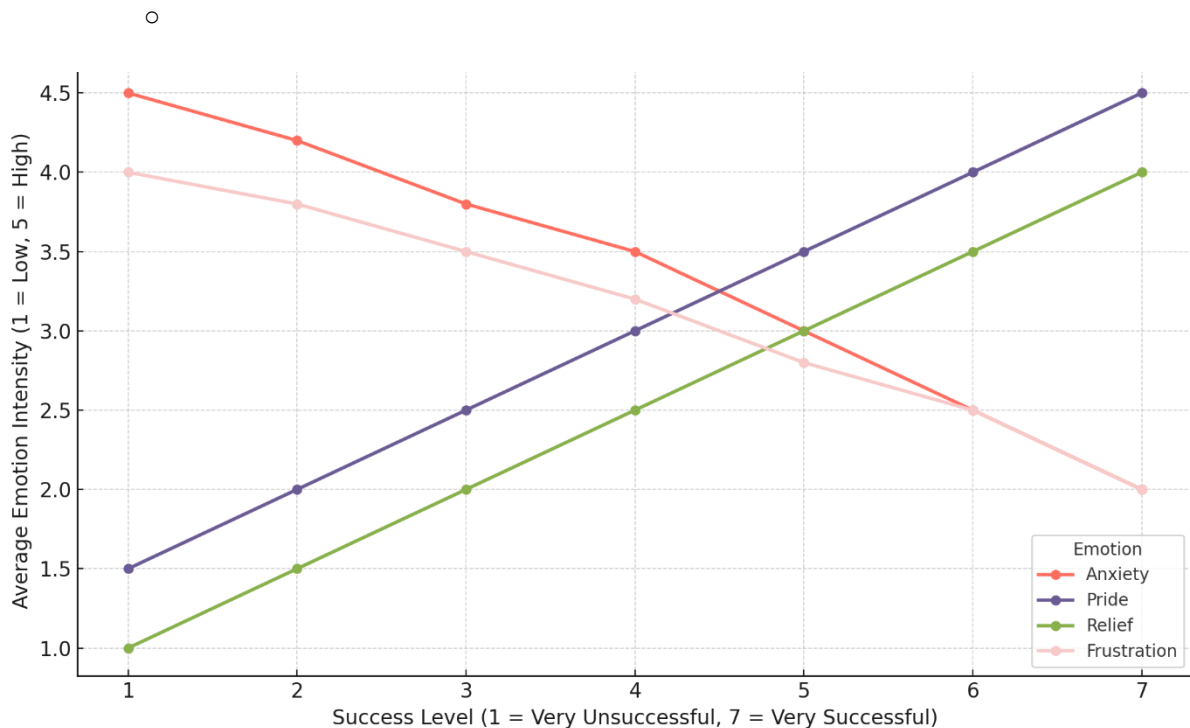
Figure 4.1 Average Emotion Intensity by Task Success Level

- **Anxiety** (red) shows a clear decline as success levels increase, indicating that higher anxiety is associated with less successful outcomes.

- **Pride** (purple) rises with success, peaking at the highest success levels, reflecting the positive reinforcement of accomplishing tasks.

- **Relief** (green) also increases with success, showing that task completion brings a sense of emotional release.

- **Frustration** (light pink) decreases as tasks become more successful, with unsuccessful tasks often linked to higher frustration.

These trends reinforce the idea that managing emotions like anxiety and frustration could improve task outcomes, while positive emotions such as pride and relief support higher success levels.

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The **Average Emotion Intensity by Task Success Level** graph aligns directly with the research objectives of examining the impact of emotion and emotion regulation on doctoral students' information-seeking behaviour, exploring self-regulation strategies, and identifying effective methods for enhancing emotional regulation. Here's how each component of the graph supports these objectives:

Objective 1: Analyse the Impact of Emotion and Emotion Regulation on Information-Seeking Behavior

The graph highlights how different emotional intensities correlate with task success levels, showcasing the direct influence of emotions on students' ability to complete tasks. Specifically:

- **High Anxiety and Frustration** at lower success levels (1-3) suggest that these negative emotions interfere with goal attainment, which likely disrupts information-seeking behaviour. When students feel anxious or frustrated, their cognitive focus may narrow, impacting their ability to search for information effectively, evaluate sources, or synthesize research insights.

- **Increasing Pride and Relief** as success levels rise indicate that positive emotions are associated with better outcomes. When students feel pride or relief, it can enhance motivation, confidence, and persistence, all of which are crucial for effective information-seeking.

The graph suggests that students with better emotion regulation, who can manage anxiety and frustration while cultivating pride and relief, are likely to engage more productively in information-seeking activities.

Objective 2: Explore Self-Regulation and Learning in Doctoral Students in Relation to Emotion Regulation Strategies

The trends in the graph reveal patterns that underscore the need for self-regulation strategies to manage specific emotions:

- The decrease in **anxiety** and **frustration** from low to high success levels indicates that students who can regulate these negative emotions may be better equipped

to achieve their goals. Strategies to manage anxiety and reduce frustration could involve time management, structured task breakdowns, or mindfulness practices to help students remain calm and focused.

- **Increasing pride and relief** in successful outcomes emphasize the value of setting achievable milestones and rewarding progress. By breaking down larger goals into smaller tasks, students can experience more frequent success, thereby fostering positive emotions that support learning and perseverance.

This insight suggests that emotion regulation strategies should include methods to mitigate anxiety and encourage positive reinforcement, helping students maintain a steady emotional state conducive to effective learning and research.

Objective 3: Identify Strategies for Improving Emotional Regulation in Doctoral Students Based on Research Findings

The graph provides actionable insights into which emotions to target for improvement:

- **Mitigating Anxiety and Frustration**: Since these emotions are highest at lower success levels, institutions can focus on interventions that help students manage stress during challenging tasks. Techniques like counselling, peer support, or stress-reduction workshops could assist students in handling the pressures of research.

- **Cultivating Pride and Relief**: The gradual increase in pride and relief with task success shows that reinforcing positive emotions can improve research outcomes. Supervisors and mentors could encourage students to celebrate small victories, fostering a positive emotional environment that supports resilience.

In addition to traditional strategies like mentorship and peer support, **futuristic, structured interventions** could play a significant role in enhancing doctoral students' emotional regulation and, consequently, their research productivity and information-seeking behaviour such as AI-powered workforce systems and gamified progress systems.

4.2.3 COMPARISON C: REASONS AFFECTING INFORMATION-SEEKING BEHAVIOR

The reasons provided by students for their emotional states offer critical insights into the external and internal stressors that influence information-seeking behaviour. **Deadlines** emerge as a major factor causing high **anxiety** and **frustration**, as students feel pressured to meet time-sensitive goals. This pressure often leads to rushed information-seeking behaviours, where students might compromise on quality or exhaust themselves trying to meet expectations. Effective planning and deadline management can mitigate this stress, allowing for a more efficient and emotionally balanced research process.

Using New Tools brings about mixed emotions. Initially, students experience **hope and excitement**, motivated by the potential benefits of these tools. However, challenges in mastering unfamiliar tools often lead to frustration and decreased productivity. This underscores the importance of providing training and peer support when introducing new research tools, as it can reduce frustration and encourage productive information-seeking behaviour.

Searching for Keywords and resource availability also significantly impacts students' emotional states. **Frustration and boredom** are frequently reported in relation to keyword searches, especially when students struggle to locate relevant information. Limited resources exacerbate this frustration, causing **anxiety** and negatively impacting information-seeking efficiency. Enhancing access to databases and resources or offering tutorials on effective search techniques can alleviate this issue and reduce emotional strain.

4.2 EMOTIONAL CAUSES

In Section 4.2, the various reasons that trigger emotional responses among doctoral students while seeking information in their research journey according to Q5 in SRET was explored. Based on the detailed diary data provided for 36 participants across different phases (Early, Middle, and Final), we can identify patterns in the reasons that spark specific emotions. Here's an analysis of the findings:

4.2.1 Common Emotional Triggers

The data reveals a set of recurring reasons that contribute to emotional challenges in information-seeking tasks. These triggers include **Deadlines, What to Search, When to Stop, Sources to Add, Searching Keywords, Selecting Information, Documenting Information**, and **Nothing in Particular**. Each of these reasons correlates with specific emotions such as frustration, anxiety, hope, pride, and relief, depending on the research stage.

Key Triggers by Research Phase:

- **Early Phase**:

  o Early-phase students frequently encounter emotional triggers related to narrowing down sources and deciding on keywords. This aligns with their efforts to establish a research foundation, often bringing about emotions of **uncertainty and frustration** due to unfamiliarity with resources.

  o A significant number of early-phase students report challenges in determining the direction of their search, as they are just beginning their research journey. This ambiguity can lead to **anxiety** as they struggle to define clear search parameters.

- **Middle Phase**:

  o Middle-phase students face heightened emotional responses due to **time constraints** and the need to refine their research focus. With deadlines looming, emotions like **stress and urgency** become more prominent, and students report feeling **overwhelmed** as they attempt to balance data collection and analysis.

  o As they deepen their research, knowing when to halt information-seeking becomes a common issue. This challenge is often accompanied by **frustration and indecision**, as students worry about missing critical data or including irrelevant information.

- **Final Phase**:

o In the final phase, students experience emotional triggers primarily from impending deadlines and the need to document their findings comprehensively. Emotions such as **pressure and relief** are reported, especially as they work to finalize their thesis.

o Final-phase students are also affected by the challenge of determining which additional sources to include for comprehensiveness. This brings about **anxiety and doubt** as they aim to ensure their work's credibility and thoroughness.

4.2.2. Interesting Insights and Observations

The emotional triggers reveal several notable patterns that highlight the complex and evolving nature of doctoral research:

- As participants progress from the early to final phases, the reasons for emotional triggers shift from broad, exploratory tasks (like identifying what to search) to more specific, refinement-focused tasks (like selecting and documenting information). This transition showcases the maturation of research focus over time.

- Deadlines consistently emerge as a powerful emotional trigger. In the middle and final phases, the looming pressure of due dates is associated with heightened anxiety, emphasizing the need for time management strategies and possibly more institutional support to help students manage workloads effectively.

- In both the middle and final phases, students face challenges in discerning **when to stop** and **which sources to add**. This reflects the difficulty in achieving a balance between thoroughness and efficiency, a challenge that is especially relevant in qualitative research where data saturation is a subjective judgment.

Phase	Common Emotional Triggers	Associated Emotions	Key Observations
Early	Selecting Information, What to Search, Searching Keywords	Frustration, Uncertainty	Difficulty in defining scope, lack of familiarity with resources
Middle	Deadlines, When to Stop, Selecting Information	Stress, Urgency, Indecision	Pressure to refine focus, manage time, balance data collection & analysis
Final	Deadlines, Documenting Information, Sources to Add	Anxiety, Pressure, Relief	Need to ensure thoroughness, finalizing documentation, managing submission pressure

The analysis of emotional triggers reveals a clear progression in the challenges faced by doctoral students as they advance through their research. Each phase brings a distinct set of stressors, influenced by the specific tasks and expectations at that stage. By understanding these emotional triggers, institutions and supervisors can develop targeted strategies to support students at each phase—whether by providing guidance on search strategies in the early phase, time management tools in the middle phase, or mental health support as deadlines approach in the final phase. These insights add depth to our understanding of the doctoral journey, showcasing the nuanced interplay between information-seeking behaviours and emotional responses.

4.3 EXTERNAL INFLUENCES

SRET examines **External Factors** that might influence the participants' information retrieval behaviour, which can include environmental, institutional, or personal variables.

These questions are related to external factors affecting the student's emotions in their research process, directly impacting information-seeking behaviour. These questions are relevant to investigating the supervisory relationship and external factors that directly impact the emotional journey of information-seeking of PhD students. In a study about the interaction between a doctoral student and advisors, Grover and Malhorta (2003;2004) noted that "the key to having a successful dissertation is to establish a good relationship with his/her advisor" (p.16). Table 4.8 illustrates various external factors influencing the information retrieval behaviour of doctoral research students during their research stage, along with some indicative data:

External Factors	Frequency	Impact on Emotions (Positive/Negative)
Academic Advisor Support	High (70%)	Mostly Positive (60%) / Negative (40%)
Availability of Research Resources	Moderate (50%)	Mostly Negative (65%) / Positive (35%)
Collaboration with Peers	Low (30%)	Positive (80%) / Negative (20%)
Technology and Software Tools	High (75%)	Positive (55%) / Negative (45%)
Institutional Infrastructure	Moderate (45%)	Negative (60%) / Positive (40%)
Funding and Financial Support	Low (25%)	Negative (70%) / Positive (30%)
Work-Life Balance	High (65%)	Negative (75%) / Positive (25%)
Access to Digital Libraries	High (80%)	Positive (70%) / Negative (30%)
Language and Cultural Barriers	Moderate (40%)	Negative (85%) / Positive (15%)
External Academic Events & Conferences	Low (20%)	Positive (90%) / Negative (10%)

Table 4.8 External Factors

Also, the word cloud of different reasons added by doctoral student into the e-diaries are visualised in Figure 4.1 External Factors Word Cloud.
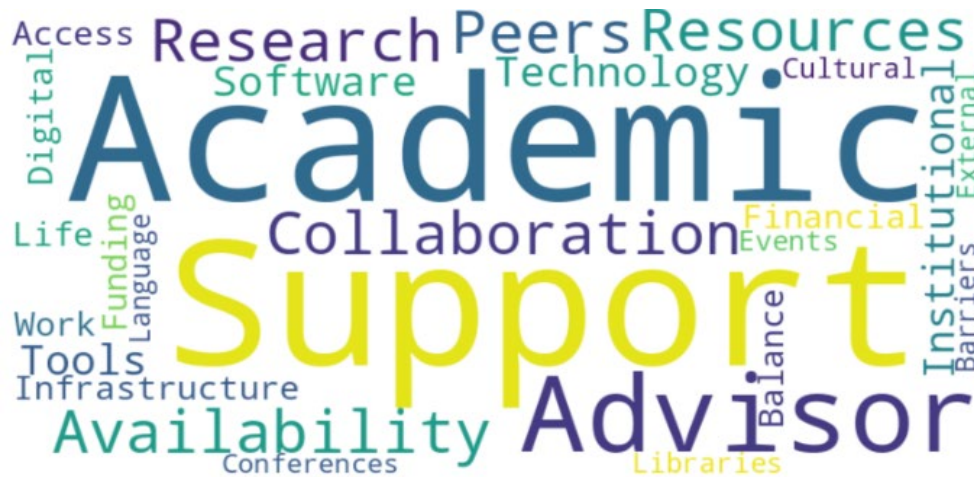
Figure 4.1 External Factors Word Cloud

Analysis of the Impact of External Factors

- **Academic Advisor Support:** High influence with mixed emotions. Positive experiences are linked to guidance and mentorship, while negative ones often stem from miscommunication or lack of support.

- **Availability of Research Resources:** A moderate level of influence with more negative emotions, suggesting challenges in accessing necessary materials or data.

- **Collaboration with Peers:** Less frequent but mostly positive, indicating that peer interactions can provide emotional support and valuable insights.

- **Technology and Software Tools:** Highly influential with a balanced emotional impact. Efficient tools can facilitate research, but technical issues or learning curves can be frustrating.

- **Institutional Infrastructure:** A moderate influence with a tilt towards negative emotions, possibly due to inadequate facilities or administrative support.

- **Funding and Financial Support:** Although less frequent, financial constraints negatively impact emotions, contributing to stress and uncertainty.

- **Work-Life Balance:** Highly influential with predominantly negative emotions, highlighting the challenge of managing research demands with personal life.
- **Access to Digital Libraries:** High influence with more positive than negative emotions, suggesting that digital libraries are crucial and generally effective resources.
- **Language and Cultural Barriers:** Moderate influence with mainly negative impact, especially for international students, affecting their ability to access and comprehend resources.
- **External Academic Events & Conferences:** Though infrequent, participation in these events generally leads to positive emotions, providing networking opportunities and exposure to new ideas.

The above shows doctoral research students encounter a variety of external factors that significantly impact their information retrieval behaviour and emotional well-being. While some factors, like academic advisor support and access to digital libraries, can have a predominantly positive influence, others such as financial constraints and work-life balance challenges often lead to negative emotional experiences. Addressing these external factors can significantly enhance the research journey and emotional health of doctoral students.

4.4. EMOTION REGULATION/MANAGEMENT

After rating the intensity level of the emotions, they may have experienced while working towards their goal, students selected one emotion that negatively affected their progress and described what they tried to do to change that emotion. Open-ended statements about emotion regulation strategies were coded as follows.

During the first iteration, predominant emergent themes were also noted and used to refine the coding categories. This resulted in 11 categories of emotion regulation strategies that were used to complete the second round of coding. Table 4.9 contains descriptions of each of the categories and the frequency with which students reported using each type of strategy at each time.

Phases of Doctoral Study	Emotion Regulation Strategy	Description	Frequency of Use	Effectiveness for Boredom	Effectiveness for Anxiety
Early Phase	Supervisory Support	Seeking guidance from supervisors to lessen anxiety and other negative emotions.	Often	Low	High
	Social Support	Engaging with peers or instructors for help or companionship.	Increasing over time (~20%)	Low	High
	Task Avoidance	Avoiding tasks that trigger negative emotions.	~20%	Low	Very Low
	Environment Management	Altering the study environment to reduce distractions.	Least frequent	High	Low
Middle Phase	Task/Goal Management	Organizing work, scheduling, and breaking tasks into smaller pieces.	Most frequent	High	High
	Task Focus	Concentrating on the task to overcome challenging emotions.	Frequent at Time 1, less at Time 2	Moderate	High
	Enhancing Competence	Improving understanding of material to reduce negative emotions.	Least frequent at Time 1, more at Phase 2	Low	High
Final	Task Enactment	Changing tactics to manage undesirable	Third most frequent	High	Moderate

Phase					
		emotions.			
	Self-Consecrating Thoughts	Reflecting on the consequences of task completion or non-completion.	Decreasing over time	High	Moderate
All Phases	Cognitive Change	Altering perceptions related to the task.	Similar to Task Avoidance	Low	High
	All Phases	Cognitive Change	Altering perceptions related to the task.	Similar to Task Avoidance	Low
	Do Nothing	Choosing not to alter emotions, sometimes considering them beneficial.	More for boredom	High	Low

Table 4.9 Emotion Regulation Strategies

The emotion regulation strategies which are from participant diary inputs are explained next.

Task/Goal Management: This is the predominant strategy among students. It encompasses a range of activities such as meticulously organizing work, creating detailed schedules, segmenting larger tasks into more manageable parts, and importantly, incorporating regular breaks. This approach is particularly adept at handling both boredom and anxiety, providing a structured way to tackle academic responsibilities.

Task Focus: Notably prevalent in the initial stages of doctoral research, this strategy involves a concentrated effort on the task at hand. By focusing intensely on the work instead of the emotions it evokes, students often find themselves completing tasks more rapidly, which in turn helps diminish the negative feelings associated with the task.

Task Enactment: This strategy, rooted in Winne and Hadwin's (1998) model, entails adapting one's approach to a task as a means of managing emotions, with a particular effectiveness in mitigating boredom. It's about altering the method of task execution to find a more emotionally manageable path.

Self-Consecrating Thoughts/Actions: This involves a reflective process where students ponder over the outcomes of completing or not completing their tasks and sometimes self-reward for accomplishing them. Over time, the reliance on this strategy seems to diminish.

Supervisory Support: Often underutilized in the early phases of research, this strategy becomes more prominent as students' progress. It involves engaging in detailed discussions with supervisors about research goals and progress, which can significantly alleviate feelings of anxiety and other related emotions.

Social Support: This approach includes seeking assistance and advice from peers or instructors, or simply engaging in study sessions with friends. Notably, its usage escalates over time and is more frequently employed to counteract anxiety than boredom.

Enhancing Competence: Primarily used in the middle phase of doctoral studies, this strategy focuses on deepening one's understanding and grasp of the material. It's more often employed to regulate anxiety and other challenging emotions rather than boredom.

Task Avoidance: Approximately a fifth of students admit to occasionally shunning tasks or aspects of tasks that stir negative emotions. Though it provides temporary emotional relief, this strategy often leads to increased vulnerability and mental health concerns, as it doesn't address the root problem.

Cognitive Change: This involves modifying one's thought patterns or adopting a more positive outlook towards the task at hand. It's used about as frequently as task avoidance strategies but is particularly effective in managing anxiety.

Response Modulation: Comprising tactics like deep breathing or relaxation exercises, this strategy directly targets the emotional state. It's more often utilized for anxiety management than for alleviating boredom.

Do Nothing: In some cases, students choose not to actively change their emotional state, finding that certain emotions can actually be beneficial, especially in the case of boredom.

Environment Management: The least frequently reported strategy, this involves making changes to one's study environment, such as choosing a different location or rearranging the current space to better suit study needs. It's primarily used to combat boredom.

Each of these strategies represents a unique facet of how doctoral students navigate the emotional complexities of their academic journey, offering insight into the varied approaches they employ to maintain psychological well-being during this demanding period. These categories and emotion regulation's strategies telly around with interview data and validate the results using a phenomenographic approach.

SECOND STAGE: PHENOMENOGRAPHIC FINDINGS

In the second stage, the researchers focused on comparing individual cases (within-case) and across different cases (cross-case) to identify common themes and variations in how doctoral students experience emotions and engage in information-seeking behaviour. This study employed phenomenography as its methodological approach, aiming to understand the diverse ways in which this phenomenon is experienced. The data was gathered through a series of individual semi-structured interviews, which were structured to explore the role of emotions on the information-seeking behaviour of doctoral students throughout their research journey. The study hypothesized that the emotions and emotion regulation strategies of doctoral students significantly influence their information-seeking behaviour.

To investigate this, the researchers crafted specific research questions to delve into the impacts of emotions and emotion regulation during information-seeking, the significant external factors influencing emotion regulation in this context, and how emotion regulation processes contribute to self-regulated learning during different phases of doctoral research.

The interview data was then meticulously analysed through a series of steps guided by established literature in the field. This process included defining the phenomena based on transcribed interview responses, organizing and referencing all interview data, reviewing transcripts individually, and making initial notes. Themes were predetermined based on a self-reporting emotion tool, and an open coding process was conducted using NVIVO software, allowing for the identification and comparison of various codes based on their differences and similarities.

These codes were grouped into sub-categories and categories, creating a framework that reflects both the manifest and latent content of the text. The researcher then arranged these codes and categories to develop a comprehensive coding scheme, which helped in grouping similar events and incidents under specific themes predetermined by the research objectives.

4.5 FINDINGS IN PARTICIPANTS' NARRATIVES/INTERVIEW

This section is designed to detail the variations and sub-categories in the participants' experiences and perceptions, without delving into an analysis of these variations. Such an analysis is reserved for a subsequent chapter, where a detailed discussion will take place. The participants' direct responses are also quoted and italicized to give a clear and authentic voice to their experiences and views. All the participants have number and pseudonym for anonymised identification. Due to distinct phases the numbers are given sequentially even the data is collected non sequential and based on learner's availability.

First, a general analysis of doctorate candidates' regulating elements and emotions when searching for dissertation information is given. After this, the three cases that illustrate, in more detail, the role of emotions in the participants' trajectories are portrayed. These cases were based on different phases of students. Finally, where relevant, selected, anonymised quotations from the participant interviews are included. The related findings are arranged in the Pool of Meanings, which includes the following three Pools and seven categories. Each category of description has a unique code so that it can be identified within the outcome space (Table 4.10).

Pool of Meanings	Categories of Description	Variations	Codes used in Outcome space
Pool 1: **Dissertation process** Regulatory factors linked to the research process: choice of topic, design, methodological aspects, data collection and analysis and presentation of results(writing).	Feelings, thoughts, and actions: viewing information narratives through the lens of the information search process (Initiate, Select, Explore, Formulate, Collect, Present & Access)	Emotional journey as early year researchers Emotional journey as middle year researchers Emotional journey as final year researchers	EJ1.1 EJ1.2 EJ1.3
Pool 2: **Self-Regulatory learning process** Regulatory factors linked to motivation, competencies and performance in the research, personal and/ or initiative.	Forethought Phase Performance Phase Self-Reflection Phase	Task analysis Self-motivation beliefs Psychological skills Self-judgement Self-reaction	EJ2.1 EJ2.2 EJ2.3 EJ2.4 EJ2.5
Pool 3: **External Factors** Regulatory factors linked to academic relationships: supervisor, the academic community, stays abroad, fellow PhD candidates and teaching experience during PhD study.	Supervisor-researcher relationship Academic culture Intra-personal challenges	Relationship building Academic culture Personal challenges	EJ3.1 EJ3.2 EJ3.3

Table 4.10 Pool of Meanings and categories of description

Pool 1, which follows, shows how specific phases of doctoral students experienced their information search process.

4.6 POOL 1: DISSERTATION PROCESS

Pool 1 consists of categories of description that relate to the different ways doctoral students experience the information search process as described and shared by participants during the interview.

This Pool of Meaning binds participants' reflections on feelings, thoughts, and actions through the lens of the information search process, such as initiate, select, explore, formulate, collect, present and access. This category formed a category of the description based on phenomenographic data pooled into three variations, such as

- Emotional Journey as early-year researchers
- Emotional Journey as middle-year researchers
- Emotional Journey as the end-year researchers

Next section comprised of one-by-one discussion of a pool of descriptions.

4.6.1 Feelings, thoughts, and actions: as doctoral researchers

In this category of description, the focus is on feelings, thoughts and actions during the information search process at different phases of doctoral students. This category emerged from the interview questions when asked how they perceived the process of finding information and what emotional state they encountered. Fragments of this category initially interlinked with other categories due to their subjective nature but then brought together to present emotional impact and information-seeking behaviour more holistically.

Their accounts highlight several different perceptions and events which resulted in emotion regulation and activation. For a better understanding of emotional accounts, these are also classified into three categories, as displayed in Table 4.11.

Classification of emotions	
Positive Activation (PA+)	These are emotions that channel energy towards various activities or challenges, often associated with a sense of well-being. They include feelings like joy, contentment, hope, delight, and a sense of peace.
Negative Activation (NA-)	This category encompasses emotions that also direct energy towards activities or challenges but are associated with discomfort or distress. Examples include anger, fear, frustration, feelings of being overwhelmed, anxiety, sorrow, a sense of helplessness, and confusion.
Deactivation Emotion (D- or D+)	These emotions tend to decrease energy levels and minimize actions. They can be connected to either feelings of discomfort or a sense of well-being and include emotions such as boredom, loneliness, sadness, disappointment, or despair.

Table 4.11 Classification of Emotions.

The most frequent significant events reported by doctoral students referred to the research process, particularly the methodological and design aspects of the doctoral thesis.

EJ1.1 The emotions most frequently mentioned throughout the narratives in the initial stages were referred to as Negative activation (NA-), such as anxiety or frustration. Overall, based on the total number of transcriptions, it can be inferred that the most prominent emotions for the students were hopefulness and anxiety, both of which are activation emotions – the former a positive one and the latter a negative one. Interestingly, in many of the cases analysed, hopefulness came up frequently as an emotion mainly associated with events when they find the information. Some narratives of early-year researchers:

> **P6(NE-):** *You know…. mmm, the biggest hurdle for me has been nailing down the topic. It's been a real struggle, honestly. I've been all over the place, feeling pretty lost and super confused. I mean, I've dug through online journals, scoured articles, and even went down internet rabbit holes, but nothing… nothing clicked. It's like I'm wandering without a map. (…Shrugs), I don't have a clear strategy to*

tackle this mess. .... But hey, I'm <u>not giving up</u>. I know I need to come up with a plan, and I'm holding onto hope that I'll figure this out.

The study found that <u>Anxiety</u> was a significant emotion experienced by participants, particularly in situations involving the pressure to achieve results or challenges faced in the early stages of their research.

> **P10(D-):** *I am just thinking about the beginning stages of my work... it really <u>freaks me</u> out. There's just so much to do, and it feels like a mountain that keeps growing. And then, when I look at other people's theses, I can't help but compare mine to theirs. It's during those times, especially when I'm reading, that I feel completely <u>overwhelmed</u>. I keep having these thoughts like, 'I need to finish this right now,' and 'How on earth am I going to get all of this done?' It's a lot, and honestly, all this <u>self-doubt</u> just makes it even harder.*

Furthermore, the study observed that for many participants, the greatest emotional impact, whether it was activation emotions (AE+-) or deactivation emotions (D+-), predominantly arose in scenarios specifically related to searching for information pertinent to their dissertation topics.

EJ1.2 For the Middle phase students, the events and emotions are most related to data collection and analysis. Also, notably, data collection is one of the most prominent factors in the regulation of emotions as well. From the data findings, the deactivation of emotions (D+-) is noteworthy such as boredom. Within this group, disappointment (NA-) was the most frequent. The following quotation is illustrative:

> **P13(NA-):** To be honest, the more I think about it, the more <u>disappointed</u> I feel. Every time I gather more data, I find myself having to rethink my topic all over again. It's gotten to the point where I'm seriously questioning whether I should even keep going with this. My motivation? (…Shakes head) It's pretty much hit rock bottom. This whole situation has really <u>shaken up my confidence</u> as a researcher. I keep asking myself, 'Should I push through or just call it quits?' And the worst part? I'm just stuck, like hitting a <u>mental block</u>, and I can't seem to make much progress. The fear of this unending <u>uncertainty</u> and the constant influx of new data… it's <u>overwhelming</u>. What am I supposed to do with all this?"

Year 2 to 3 students reported <u>frustration</u> was often linked to giving up research when faced with, for example, certain expectations and issues that they had wanted to tackle

but were not viable in the end. Here are some more perspectives from this category learner's:

> **P14 (AE+):** Honestly, the frustration I've felt in my second year... it's been a real eye-opener. I mean, yes, there were moments when I thought I couldn't do it, especially when my initial plans just wouldn't work out. But you know what? Leans forward It kind of lit a fire under me. It pushed me to explore new avenues I hadn't even considered before. It's like this unexpected journey of discovery, and I'm here for it!"

> **P15(D-):** It's been a rough ride, especially this year. Every time I hit a snag in my research, which happens more often than I'd like, it just drains me. (..Sighs) There are days I feel so stuck, so lost in the uncertainty of it all. It's like walking through a maze with no exit in sight. It's not just frustrating; it's downright disheartening.

> **P17(N+):** You know, facing these obstacles in my research... it's been a real test. There were times I wanted to give up, feeling like it's all just too much. But then, this anger, this frustration, it kind of became a driving force. Firmly It made me challenge the status quo, question things more deeply. It's tough, but it's also empowering in a strange way.

> **P22(AE-):** This journey, especially in the third year, has been more about introspection for me. Facing these challenges, realizing some paths are just not viable... it's been a quiet kind of frustration. (...)It's not about being angry or upset; it's more about finding peace in the midst of chaos, learning to navigate through the uncertainty. It's a slow process, but there's a certain calmness in accepting and adapting.

In his category, the doctoral students reported periods of uncertainty, confusion and temporary blocks, which sometimes made it possible to search for new alternatives and solutions that probably would not have appeared had they not faced these obstacles.

EJ1.3 For the Final phase students, at this stage, which is predominantly characterized by data analysis and writing, most doctoral candidates, depending on their individual projects, might already have advanced drafts of parts of their thesis. It is observed that during the writing-up phase, a sense of satisfaction and elation is commonly experienced when final drafts of thesis chapters, or the entire thesis, are completed, leading to positive activation (PA+). However, the journey to this achievement is not without its emotional challenges. Candidates often encounter strong negative emotions, particularly frustration, stemming from the constant requirement to think and write

about their project. A common fear among them is the possibility of failure, frequently driven by concerns about their research's novelty and contribution to their field.

As P29 candidate expressed in a passive manner,

> **P29(AE+):** Information can be formulated and found; the problem arises in writing up. Possession of the work exists, but articulation and constant explanation induce nervousness. An increase in writing attempts seems to reshape the project unexpectedly, prompting questions about the sufficiency of the research conducted. Persistent thoughts hinder the writing process, indicating a need for support."

More added,

> **P26 (AE+):** (Speaking with a mix of excitement and anxiety) , getting into the final stretch of writing my thesis, there's this weird mix of emotions. On one hand, I feel this rush, this positive vibe when I see my chapters coming together. It's like, 'Wow, I'm actually doing this!' But then, there are moments, especially after annual reviews or conferences, where I'm hit with this wave of self-doubt. It's like, 'Am I really good enough? Is my work even significant?' It's a rollercoaster, but somehow, these highs and lows keep me pushing forward.

> **P28 (AE-):** (Looking thoughtful),During the writing phase, it's been a journey of ups and downs. The annual reviews, they're helpful, sure. They give me a sense of direction, but they also bring out this imposter syndrome in me. I sit there, listening to feedback, and can't help but feel like I don't belong. (...Pauses) And then there's the writing itself. Some days it flows, and other days, it's like pulling teeth. It's frustrating, but I guess it's all part of the process.

> **P31 (AE+):** (With a sense of accomplishment) ,I won't lie, seeing my thesis take shape has been incredibly satisfying. There's this sense of achievement when you read through your drafts and realize, 'Hey, this is actually good!' But attending conferences can be a double-edged sword. On one side, they're inspiring, but on the other, they make me question my own work. Like, 'Am I really contributing anything new here?' Despite the doubts, these experiences have been crucial in shaping my thesis.

Lastly, another one added:

> **P35 (AE-):** (Sighing), Writing up my thesis has been one of the most challenging phases. It's not just the writing itself, but the constant questioning of my work's value. After every annual review or conference, I find myself grappling with this sense of not being good enough, wondering if my research really holds up. It's a

> tough spot to be in, but I'm learning to navigate through these feelings of inadequacy and keep my focus on the writing.

In the narratives, doctoral students often describe information seeking as a process fraught with frequent obstacles, numerous decision points open for debate, and unpredictable criteria for assessing research. These challenges, they report, impact their methodological choices, ultimately affecting the anticipated results' quality, validity, and reliability. Consequently, in the face of negative events, there is a prevalent report of negative emotions (NE-) such as helplessness and frustration, particularly due to the inability to control all aspects of their research process.

The above categories of description explain categorically different variations and the associated feelings, thoughts and processes involved during the dissertation process. The three categories of emotions helped to categorise them for further analysis process in Chapter 5.

This Pool 1 clearly explains and depicts the emotional turmoil's through the research processes and many different type of emotions a doctoral learner's gone through. The next section explains Pool 2 Self-regulatory learning process which helps to understand doctoral student emotions during their dissertation journey.

4.7 POOL 2: SELF-REGULATORY LEARNING PROCESS

Doctoral students' learning journeys are deeply personal and multifaceted, often dictated by the way they regulate their cognition, motivation, and behaviour throughout their research. This self-regulatory learning (SRL) process is a pivotal aspect of their academic progression. Through diaries and interviews, we've dissected the SRL experiences of these students, revealing the intricate relationship between their emotional regulation and their learning phases.

Pool 2 consists of categories of description relating to self-regulatory learning experiences as described by the participants. This category emerged directly through the narratives of learner's diary and interview study. In addition, there are relative questions involved in diary study and interview to explore how emotion regulation processes benefit self-regulated learning during research phases of doctoral students.

Three categories of description emerged from the transcripts that illustrate distinct ways participants experienced self-regulatory learning and categorised them according to (Zimmerman,2011) as shown in Figure (4.2). The SRL process is a dynamic, cyclical three-phase model consisting of the *forethought*, *performance,* and *self-reflection* phases. The narratives from doctoral candidates have shed light on how each phase contributes to their overall learning experience, with emotional regulation playing a critical role at every step.

This is viewed as an ongoing cycle alternating between the following three phases.

- Self-Regulatory in the forethought phase
- Self-Regulatory in the performance phase
- Self-Regulatory in the self-reflection phase

Figure 4.2 Zimmerman's 3-phase self-regulated cyclical learning model adopted to explain this
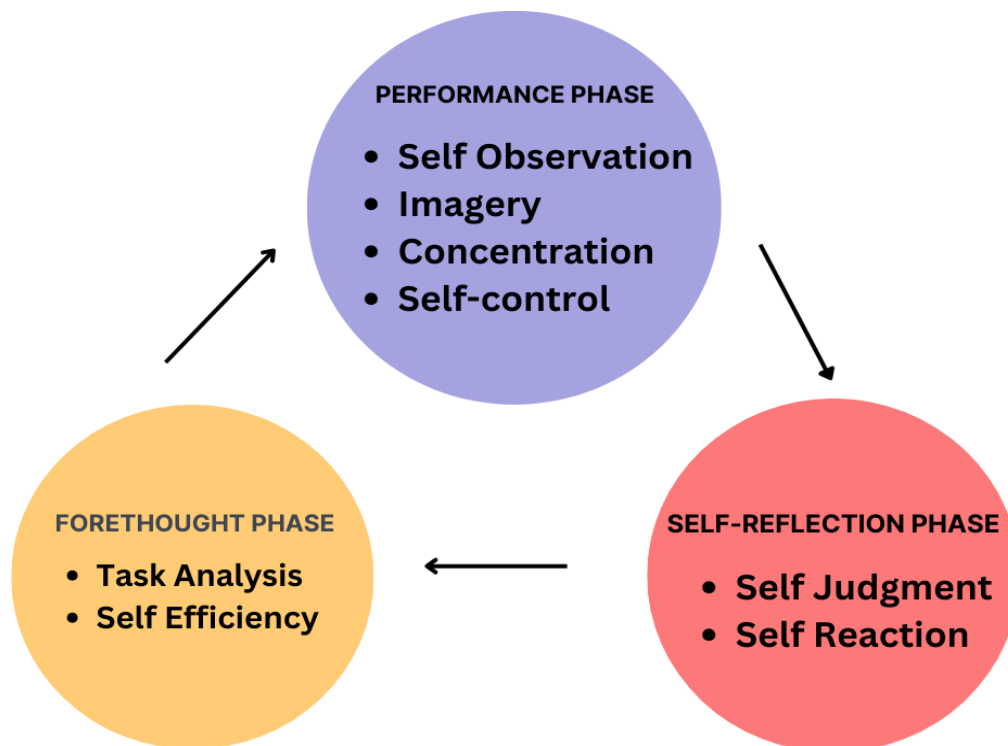
study.

Every process in line with our research exploration as narratives helped us understand how the SRL process influences the emotional regulation of doctoral students. Three

distinct will be explored further as categories of description included in pool two are reported below. The first category of description in this pool, 'self-regulatory learning in the forethought phase,' is presented in the next section.

4.7.1 Category of description: Forethought Phase of SRL (EJ 2.1)

The first phase, the forethought phase, sets the stage for learning. It's a preparatory phase where doctoral students engage in task analysis and cultivate self-motivation beliefs. Within this phase, two distinct sub-processes emerge: task analysis and the development of self-motivation.

● <u>The forethought phase involves task analysis and self-motivation</u>

Participants engaged with reflective exercises through diaries and interviews, articulating their methods of self-regulation with respect to planning, goal setting, and time management. These personal narratives provided a window into the lived experiences of doctoral candidates as they navigated the initial phase of Zimmerman's cyclical model of self-regulated learning (SRL). Delving into these firsthand accounts reveals the various approaches to task analysis, an essential component of the forethought phase in SRL.

In this context, three representative responses were selected to highlight the diverse strategies of task analysis employed by learners at this stage:

> **P2(NA-& D-+)-**When I dive into my research… I'm not really the type to lay out strict goals. It's kind of like… letting a bird out of its cage, just letting it go where it wants. I mean, sure, I'll draft up a plan, lay out some bullet points… but more often than not, they just kind of float away from me. And yeah, I get that sticking to a plan is supposed to help, but sometimes… when I don't, it just winds me up with anxiety. Also, you know, things often… they just end up taking more time than I thought they would.

The verbatim account provided by the student reflects a blend of emotions that can be categorized according to Table 4.3 as Negative Activation (NA-).The student's expression of feeling <u>anxious</u> when not adhering to a plan indicates a presence of Negative

Activation. The admission of tasks taking longer than expected may also lead to feelings of being <u>overwhelmed,</u> which is another emotion typical of Negative Activation .Also the sense that bullet points or plans "float away" indicative of a Deactivation emotion, potentially pointing towards a feeling of disengagement or disappointment when plans are not followed.

P13 expressed their approach with a sense of structured enthusiasm:

> **(PA+):** You know, I'm pretty diligent about keeping track of my time. Like, at the beginning of each week, I always take a moment to jot down my goals and plans in my journal. It's kind of my ritual, you know? So, for example, I'll set out a specific plan, like searching for articles on a particular topic or using a certain keyword. And then, once I've found those articles and gone through them, I tick them off my list and move on to the next thing. It's this process, this checking off things from my list, that really gives me a <u>boost</u>. It's like I can feel this sense of <u>achievement</u>, you know? It's pretty <u>rewarding</u>. And when I can actually incorporate what I've found into my work, it's even better. Honestly, I think this method, this way of organizing things, could be a game changer for anyone. It's definitely worth giving a shot, at least that's what I believe.

P13's narrative exhibits a clear embodiment of Positive Activation (PA+) emotions in their approach to the doctoral research process. Their methodical and enthusiastic strategy is evident in the way they describe their weekly ritual of setting goals and plans, a practice that not only structures their work but also imbues a sense of achievement and satisfaction. This structured approach, marked by diligent time management and an organized method of task completion, is indicative of a positive emotional state that energizes and motivates.

The joy and sense of accomplishment P13 experiences upon completing tasks and incorporating findings into their work is quintessential of Positive Activation emotions. Moreover, their recommendation of this approach to others reflects not just a belief in its effectiveness but also a desire to share what clearly is a source of personal contentment and success. In essence, P13's approach to their research, characterized by a combination of methodical planning, achievement, and advocacy of their methods, aligns perfectly with the energizing and fulfilling aspects of Positive Activation emotions.

The writing phase learners pointed mostly this phase when starting off writing. This is what they narrate:

> **P25 (NA+)** Dealing with writing can be quite challenging. There are moments where it really gets to me, you know? Sometimes I find myself questioning why it's not possible to just get all my thoughts down on paper right from the start. It's a bit <u>frustrating</u> because it doesn't quite work that way. The thing is, writing is a different beast compared to researching or reading. In my case, writing is more about setting specific targets, like a certain number of words I aim to write each day or week. This strategy is really about helping me inch closer to my broader goals. I do make an effort to stick to this plan, but let's be real, there are days when keeping up just feels <u>overwhelming</u>. But, I guess, that's just a part of this whole learning journey."

This narrative predominantly falls into the category of Negative Activation (NA-). This category encompasses emotions that are directed towards activities or challenges but are often accompanied by discomfort or distress.

The participant expresses frustration, especially when grappling with the initial phases of writing. Frustration is a key emotion in the Negative Activation category, as it indicates a sense of discomfort. There's also an undercurrent of feeling overwhelmed, particularly on days when the participant cannot keep up with their planned word count. Being overwhelmed is another emotion typical of Negative Activation, as it involves a response to challenging situations with discomfort.

Despite these challenges, the participant's commitment to setting and striving towards daily or weekly goals indicates a proactive approach to managing these negative emotions, suggesting an awareness and acceptance of these as part of the learning process.

The role of self-regulatory learning during the forethought phase presents a critical and enriching experience in the doctoral journey. This phase highlights the significant advantages of effective goal setting and time management strategies, underscoring how these practices contribute positively to the doctoral students' learning experiences. Engaging in thoughtful planning and setting clear objectives at this early stage empowers

students, enabling them to navigate their academic journey with a greater sense of control and purpose.

As we transition to the subsequent category, we delve deeper into the nuances of self-regulatory learning. This next segment offers a detailed exploration of how variations in self-regulatory practices manifest in different phases of the doctoral process. By examining these variations, we gain insights into the diverse strategies doctoral learners employ and how these approaches influence their overall academic journey. This exploration not only enhances our understanding of self-regulatory learning but also illuminates the myriad ways in which doctoral students adapt and thrive within the demanding landscape of higher education. The next category of description, explained with its variance, is presented in the next phase.

4.7.2 Category of description: Performance Phase in SRL (EJ 2.2)

In this specific category, the study explores into the self-regulatory behaviours of doctoral students during the active performance of tasks. This aspect of SRL was illuminated not through direct questioning in interviews, but rather through a thoughtful re-organization of other categories during the data analysis phase. While the interview questions were more general and not specifically aimed at this topic, they nonetheless prompted reflections that revealed the significant role of psychological skills in managing emotions during task performance. These findings are particularly intriguing as they shed light on how psychological strategies influence emotional regulation in the midst of task execution. The doctoral students' experiences in this phase can be further divided into several modes:

- **Self-Observation in the Performance Phase:** Here, students engage in self-monitoring, critically assessing their own actions and progress. This introspective process helps them to stay aligned with their goals and make necessary adjustments.
- **Imagery in the Performance Phase:** The use of mental imagery by students serves as a powerful tool. They envision the successful completion of tasks or the

mastery of complex concepts, which aids in motivation and cognitive organization.

● **Concentration in the Performance Phase:** A key element in this phase is the ability to maintain focus and direct attention effectively. This concentration is crucial for managing the demands of intensive research and academic writing.

● **Self-Control in the Performance Phase:** This involves managing impulses, emotions, and behaviours to stay on course with their research objectives. It's a balancing act between internal desires and the rigors of academic work.

Despite the evident importance of these self-regulatory modes, it was observed that many participants were not consciously aware of these variances. This lack of awareness often led to a negative impact on their doctoral journey, highlighting a potential area for development in doctoral training programmes. By fostering a deeper understanding of these self-regulatory techniques, doctoral students can be better equipped to navigate the complexities of their academic endeavour's.

Each of these variances plays a crucial role in how doctoral students manage their tasks and emotions during the performance phase. Understanding and harnessing these aspects of self-regulation can significantly enhance the doctoral research experience, providing students with the tools to navigate their journey more effectively. The next section illustrates all the results from students' narratives.

4.7.2.1 Performance phase involves self-observation.

Participants explored during the interview how they regulate themselves to achieve their goals regarding information searching during doctoral research. Many of them indicated that mostly their inner voices resulted in negative or positive activating of emotions. As narrated by P16,P19,P30:

> **P16**-.... when I'm really in the thick of it, doing my research tasks, it's like there's a lot going on in my mind. It's not just about the work itself, but also about how I'm managing all of it. Like, I find myself watching my own steps, kind of keeping an eye on how I'm progressing. That's the self-observation

bit, right? And then there's this thing I do, where I picture in my head how it'll all turn out – that's the imagery part. Helps me stay motivated, honestly.

P19 added:

> …. Concentration, though, that's a big one. Staying focused with all the distractions and the workload, it's tough but super necessary. And, of course, self-control, that's about not letting myself get sidetracked, keeping my emotions in check, and not giving in to procrastination or frustration. It's a bit like juggling, trying to keep all these balls in the air.

P35 being a final year learner explains this when answering the questions regarding their performance and did they have any self-observation pattern:

> But here's the thing, I didn't really realize I was doing all this until recently. It's like, you're doing it, but you're not fully aware, you know? And not knowing this stuff, I think it made things harder than they needed to be. If only I had a better grip on these strategies from the start…

The above participant's reflection on their experience indicates a mix of these emotional responses, underscoring the complexity of emotional experiences in the doctoral journey. While there are aspects of self-regulation that help manage these emotions, the lack of initial awareness about these strategies seems to have contributed to the negative emotional impact. Another variance which emerged from the narratives are elaborating their answers to the interview and asked what could be possible best-case scenario for them to help them focus and helped them in goal attainment.

4.7.2.2 Performance phase involves imagery.

In this category, the focus is on how the strategy of imagery enhances focus and emotional control, assisting in the effective execution of assigned tasks. One participant **P5** described how the process of brainstorming, drawing from personal experiences, thoughts, and emotions, became instrumental in responding creatively to their research challenges. They articulated,

> Whenever I tackled a new topic, I'd dive into a brainstorming session. I'd pull from my own life, my feelings, my past experiences. It was like piecing

together a puzzle, using bits of my own story to craft something meaningful in my writing.

A second-phase learner **P10** shared a different, yet equally effective strategy:

For me, the game-changer was using cue cards alongside my reading. Each card was like a mini summary, a snapshot of key ideas that I could visually organize and refer back to. It made the information more tangible and helped me stay on track.

P12 speaking on visual mapping:

Okay, so when it comes to tackling complex theories or huge data sets, I've found that drawing them out really helps. I mean, I make these visual maps, diagrams... sort of like translating all that complicated stuff into a picture that I can actually understand. It's like taking something super abstract and making it real, tangible. This way, I don't just get it; I remember it way better. It's like the information sticks in my brain in picture form.

P15 discussing role-playing scenarios:

I've got this little trick I do in my head. I play out these scenarios, you know, like I'm at a conference presenting my research or defending my thesis in front of a panel. It's all in my mind, but it feels pretty real. Doing this, it's like practice, but without the actual crowd. It builds up my confidence, eases those nerves. Honestly, it's been a game-changer in dealing with the whole anxiety thing.

P18 on future success imagery:

Sometimes, when things get tough, I just close my eyes and picture the finish line – that moment when my dissertation's all done and dusted, or even seeing my name on a published paper. It's like giving myself a glimpse of the future, a successful one. This kind of positive thinking, it's more than just daydreaming. It keeps me driven, helps me push through the doubts and the tough times.

P36 talking about relaxation imagery:

When the stress starts to creep up, I've found this cool way to dial it down. I just sit back, take a deep breath, and picture myself somewhere peaceful

– could be a quiet beach, a mountain top, anywhere calm. It's like a <u>mental escape hatch</u>. It helps me chill out, regain my focus. It's like hitting a reset button in my brain, you know? Suddenly, everything's <u>more manageable</u>.

These examples demonstrate how doctoral students creatively employ imagery to navigate the challenges of their academic journey. By mentally simulating various aspects of their research and academic goals, they can maintain focus, regulate emotions, and align themselves more closely with their objectives. This imaginative approach not only aids in the practical aspects of their work but also plays a crucial role in emotional well-being, highlighting the power of the mind in both academic and personal development. Another very interesting modes come up is explained in next section.

4.7.2.3 Performance phase involves concentration.

This category involves attempts to read and concentrate the material better to reduce a challenging emotion. These strategies were reported least frequently in Phase 3 and most frequently in Phases 1 & 2. The participant appeared to use these strategies more often to regulate anxiety and other emotional challenges. Following are representative statements in this category:

P3's experience:

> ...when I felt really angry about a research question or something not working out, I didn't just stew in it. I took it as <u>a learning moment</u>. Like, I'd dive deep into understanding why I got it wrong, which helped me not only to avoid similar mistakes in the future but also to keep that anger at bay. It's like turning <u>frustration into a learning tool</u>, you know?

P4's approach:

> Whenever I felt anxious about my research, my go-to strategy was to just <u>immerse myself in the material</u>. I figured the more I knew, the less reason I'd have to feel nervous. It was all about getting so familiar with my work that anxiety just didn't have room to pop up.

P9's method:

> Continuing experiments was my way of dealing with uncertainty. Each time I got a result, especially a significant one, it was like a <u>small victory</u>. It kept building my excitement and confidence. That feeling when things finally start clicking into place is just amazing.

P19's tactic:

> I remember feeling overwhelmed at times. But instead of <u>letting it get to me</u>, I'd focus harder on understanding my research. It was like channelling all that energy into productive learning, which gradually reduced the overwhelming feelings and helped me stay on track.

P28's strategy:

> There were moments when I was just swamped with doubt, you know? My response was to double down on my work. I'd spend more time in the lab, more time with my data. And each successful experiment, each piece of the puzzle fitting, it chipped away at that doubt. Before I knew it, I was more excited about my research than worried.

Each of these statements from the participants, P3, P4, P9, P19, and P28, illustrates a common theme: <u>using dedication to learning and experimenting as a means to regulate challenging emotions such as anger, anxiety, and doubt.</u> This approach reflects a proactive stance in doctoral students' emotional regulation, where the focus shifts from the emotional challenge to engaging more deeply with their academic work, thus transforming potential setbacks into opportunities for growth and excitement.

4.7.2.4 Performance phase involves self-control.

Response modulation, a self-regulatory strategy involving direct efforts to alter emotional states, was identified as a less frequently reported but significant method in managing emotions, particularly in controlling anxiety. This approach, constituting about 5% of the strategies mentioned, focuses on actions that directly impact emotional states, differing from cognitive strategies that modify the thought process. Unlike cognitive change, response modulation was more commonly used to regulate anxiety

rather than boredom. Participants shared various examples of how they employed this technique:

deep breathing during writing by **P33**:

> When I was working on my results section, I could feel the tension building up. So, I'd just pause, take a deep, slow breath, and gently remind myself to relax. It was a simple act, but it helped me find my calm and refocus on my writing without the stress.

Also elaborated:

> I realized that being well-rested was key to staying alert and attentive. So, I made a conscious effort to get more sleep, to rest when needed. It wasn't just about avoiding tiredness; it was about being in the best mental state to tackle my work.

P9 gave a very relatable example such as :

> I noticed a pattern where I'd get irritable when I was hungry. So, a simple solution for me was to make sure I ate regularly. It sounds basic but keeping hunger at bay really helped in managing my mood swings, especially during long research sessions.

The next section, 'Self-Regulatory in the Self-Reflection Phase,' expands on another crucial aspect of the self-regulatory learning process, delving into how doctoral students engage in reflective practices post-task completion to evaluate and learn from their experiences. This phase encompasses understanding the outcomes of their strategies, internalizing lessons learned, and planning future actions based on these reflections. This reflective practice not only solidifies learning but also plays a pivotal role in emotional regulation, helping students to develop a more nuanced understanding of their emotional responses and how these impact their academic progress.

4.7.3 Category of description: Self-Regulatory in self-reflection phase (EJ 2.3)

This category focuses on how doctoral students engage in self-reflection, particularly in evaluating their work and understanding the reasons behind their outcomes. The process of self-judgment, a critical aspect of this phase, involves students scrutinizing

their own performance, which invariably evokes a spectrum of emotions. These emotional responses are heavily influenced by the students' attributional style, directly impacting their future motivation and self-regulation strategies.

Two variances involve in this category which subcategories as stated:

- Self-reflection phase involves self-judgement.
- Self-reaction phase involves self-reaction.

4.7.3.1 Self-reflection phase involves self-judgement.

Emerging predominantly in adult learning contexts, self-judgment has been identified as a significant internal critique among students, especially during research phases. Most participants admitted to experiencing self-judgment and self-doubt, which they recognized as major negative emotions impacting their learning process. This phenomenon is defined as the affective and cognitive reactions experienced while evaluating oneself.

P4's Experience:

> Every time I reviewed my work, I couldn't help but critique every detail. It was constant self-judgment. Like, 'Is this really good enough? Could I have done this part better?' It often left me feeling doubtful about my abilities, even though I knew I was putting in my best effort.

P9's Reflection:

> Looking back at what I've written, there were moments I felt really proud, but then there were times I just felt disappointed. It was a rollercoaster of emotions, swinging between satisfaction and self-doubt.

P21's Insight:

> Self-judgment was a big part of my daily routine. I'd end each day going over my progress, often being my own worst critic. It's tough because you want to do well, but you also need to be realistic about where you stand.

4.7.1.2 Self-reaction phase involves self-reaction.

Strategies like focusing on the task and trying to accelerate completion to mitigate challenging emotions were commonly reported, especially in the initial phases of research. Participants described tactics such as ignoring distractions and pushing through emotional barriers to achieve their objectives. For example, students **P6 & 20** wrote statements such as the following:

> There were days when I just didn't feel like working on my thesis. Doubts about my topic, the usual stuff. But I had this deadline looming over me, and I just told myself, 'No excuses, let's get this done.' Setting those daily targets, it kind of kept me grounded and moving forward.

> Sometimes, I'd get bogged down by worries about my research quality. But instead of dwelling on those thoughts, I'd focus on small, achievable parts of my work. It was all about conquering one small hill at a time.

Student in writing phase how he strategies to work and for goal attainment:

> When I was working on my thesis, I had to really make sure I didn't let my feelings get in the way. You know how it is, sometimes you just don't feel like doing the work or you start doubting if your topic is even good. But I had this goal to wrap it up before the weekend, and I just told myself, "Okay, let's do this."

> It wasn't easy, especially with all these negative thoughts popping up. One day I'd be worried about whether my research was good enough, and the next day I'd be frustrated because it felt like I wasn't making any progress. But I knew that if I let these feelings take over, I'd never get anything done.

> So, I started setting small goals for myself every day. It was like, "Today, I'm just going to finish this one section," or, "Let's just get through these few pages." Doing that really helped. It kind of built up my confidence bit by bit, and slowly, I started feeling more in control.

Analysing the snippets above from a researcher's perspective reveals several key themes and lines of reasoning, particularly in the context of self-regulation and emotion regulation during the thesis phase of doctoral research. A prominent theme is the impact of internal dialogue on emotional states. Participants note how their 'inner voices' trigger

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both negative and positive emotions, significantly affecting their motivation and productivity. This internal dialogue is a critical factor in their emotional regulation.

Another notable theme is the cycle of negative emotions leading to productivity stagnation. Participants describe a pattern where feelings like self-doubt and frustration result in a halt in progress, illustrating the importance of emotional states in academic performance. To combat this, a strategy of setting small, daily goals is employed, which proves effective in gradually building confidence and regaining control over work progress. This approach suggests that breaking down larger tasks into manageable parts can be a practical method of self-regulation.

Furthermore, the participants' ability to recognize and reflect on their emotional state and its impact on their work indicates a high level of self-awareness, a critical aspect of self-regulation. This self-observation allows for adjustments in coping strategies to handle emotional challenges. There's also an ongoing search for strategies to overcome these challenges, indicating a proactive approach towards problem-solving and a desire to improve self-regulation techniques.

Lastly, the narratives ties the regulation of emotions directly to the achievement of goals, particularly in academic settings. The ability to effectively manage emotions is seen as key to reaching desired outcomes, such as completing a thesis. From these phenomenography observations, it's evident that emotional self-regulation is a vital component of academic success, especially in research-intensive tasks like thesis writing. Skills such as managing one's internal dialogue, setting achievable goals, and maintaining self-awareness significantly impact a student's ability to navigate the challenges of doctoral research. The next section involves how self-regulation by mental information affects emotion regulation.

4.7.4 Summary of POOL 2

In the realm of Self-Regulatory Learning (SRL) among doctoral students, a comprehensive study from Pool 2 unveils several crucial insights, particularly emphasizing the interplay between cognitive, motivational, and behavioural regulation and its profound impact on the emotional aspects of learning. This synthesis of findings

provides a nuanced understanding of how doctoral students navigate their academic journey.

From a broader perspective, several key themes emerge from this study. The internal dialogue of students acts as a critical component in their emotional regulation, directly impacting their motivation and productivity. Negative emotions, such as self-doubt and frustration, are shown to be significant in leading to stagnation in productivity, underscoring the importance of emotional states in academic performance. Furthermore, the ability to recognize and reflect on one's emotional state and its subsequent impact on work is indicative of a high level of self-awareness, a vital element for effective self-regulation. Lastly, the effective management of emotions is crucial for achieving academic goals, particularly in research-intensive tasks like thesis writing.

From a researcher's vantage point, these findings elucidate the intricate relationship between emotional regulation and different phases in the doctoral students' SRL process. The study underscores the imperative need to integrate emotional regulation strategies within doctoral training programmes. Fostering a deeper understanding of self-regulatory techniques is suggested to significantly enhance the academic journey of doctoral students. This comprehensive grasp of the SRL process, with its incorporation of the emotional dimension, is crucial in shaping effective learning environments and support systems for doctoral students, enabling them to successfully navigate and thrive in the demanding landscape of higher education. The next section Pool 3 lastly shows how external factors experienced by the research students affect their doctoral journey in light of emotional regulations and self-regulatory learning.

4.8 POOL 3: EXTERNAL FACTORS

Pool 3, a key component of this study, identifies different categories that emerged from the data, specifically highlighting how these external factors are perceived within the doctoral participants. Three distinct categories were identified in Pool 3, each representing a unique aspect of how external factors impact students' emotional regulation and information-seeking behaviours:

- **External Factors as Supervisor Relationship:** This category explores how the relationship with academic supervisors affects doctoral students' experiences.
- **External Factor as Academic Culture:** This focuses on the influence of the broader academic environment and culture on students.
- **External Factor as Intra-personal Challenges:** This category delves into the internal challenges and personal struggles faced by doctoral students.

This can be visualised into a generative model from the student's narrative shown in Figure 4.3:
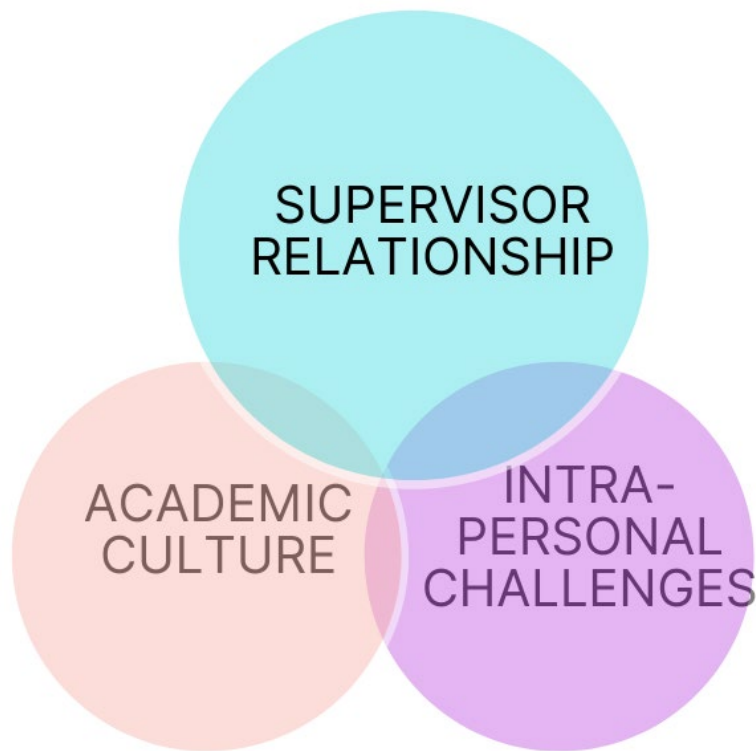
Figure 4.3 External Factor's Generative Model

The first category, "External Factor as Relationship Building," is set to be discussed in the following section of the study.

These insights are derived from diary entries and interview data collected from doctoral students. This approach allows for a detailed understanding of the personal and interpersonal dynamics that doctoral students navigate during their studies. The analysis

of these personal accounts helps in understanding the nuanced ways in which these external factors play a role in shaping the doctoral experience.

4.8.1 Category of description: Supervisor Relationship (EJ 3.1)

The participants' experiences with so many emotions involved, were their interactions with their supervisors. Most of the participants' comments about their supervisors were positive, with individuals acknowledging their efficiency, support, feedback and friendly manners. For example, **P34** explained that his supervisors' trust in his ability had given him the confidence to begin writing:

> **(P34)** When. . . you are a person from an environment that does not value publication as it is here, and then you come to this place ...Yes . . . I was thrilled that my supervisors yeah they trusted me and tried to motivate me – 'Yes you can, you had experienced and . . . when we discussed content-based knowledge...

Conversely, **P18** considered the role his supervisor assigned him unsuitable and face-threatening. However, conscious of the power dynamics at work, he chose not to counterattack. Instead, he lowered his sights and chose to focus on 'just finishing' the PhD:

> I guess there was a lot of drive, but . . . you just reach a point where you don't care anymore what occurs. All you want to do is just . . . try to see if you can have the results and try to finish.

When asked to explain, the interesting way P18 paraphrased his supervisor's appraisal of his work revealed his suppressed anger:

> In the beginning, well, I could write stuff and . . . he doesn't understand it so 'it's —--t . . .it's rubbish', he would say it doesn't make sense to him.

However, as evidenced by the references to positive emotions when meeting with a supervisor, the feedback received, or its content, it was important that students received support and personal validation. The doctoral supervisor was the doctoral student's main point of reference. There are also interesting results found out in this category:

P10 on infrequent reference to peers:

> In my research, there's hardly any time to interact with others. Everyone is absorbed in their own projects. It sometimes feels like we're in parallel universes, even when we're in the same place.

P18 on impact of peer absence on anxiety:

> I often feel isolated in my work. Without regular interactions with peers, I'm left to deal with my research challenges alone. It's anxiety-inducing to not have someone to bounce ideas off or share concerns with.

P31 on increased perception of loneliness:

> The loneliness in this doctoral journey is palpable. Days and weeks go by without meaningful conversations with fellow students. It's like being on an island, separated from potential academic camaraderie.

4.8.2 Category of description: Academic Culture (EJ 3.2)

Almost three-quarters of international candidates referred to feelings concerning interactions with members of their communities, which caused the information searching. Their experiences within their departments were consistently negative, while their interactions in their respective communities were (in all but one case) extremely positive.

P7 complained about her department's unfriendly culture and felt 'very, very troubled at what she perceived as a lack of welcome and orientation when she first arrived. P18, P24, and P30 also regretted the absence of peers with whom to discuss ideas. This lack of departmental community sent a powerful (unintended?) message that scholarly research is a solitary affair. In contrast, participants' interactions with their disciplinary communities at conferences and in the publication, process were highly positive. P18's account of attending a 'very prestigious' international conference in Europe conveys his pleasure and pride:

> That was interesting because . . . it gave me really good feedback . . . during the break, people were coming to me . . . and they were telling me they are impressed about what I am doing . . . (P18).

By participating in this conference, P18 experienced the satisfaction of being recognised as a researcher by others in his disciplinary community. P24 contacted two international experts in his field about a paper he was writing and was delighted to receive positive feedback on his work. In both cases, this emotional boost was converted into enhanced confidence and motivation. One of the learners' positive activation of this category such as :

> Community, or the lack of community, during the first years. I felt lonely and in the dark for a long time. I had no cohort, no peers to turn to. I was doing this study on my own and felt it. It was hard, super hard. I missed the conversation with my peers and other PhD students. The lifeline came when I joined the graduate network for PhD students in open education worldwide. The network saved me and helped me grow and believe in what I was capable of doing. The network has a face-to-face and online dimension; both are equally important.

Many of the events experienced by doctoral students could be described as ambivalent. This is because they aroused more than one type of emotion simultaneously: generally, positive activation, negative activation, and positive and negative deactivation. This ambivalent assessment was most frequently expressed in the regulatory factor referring to work-life balance, where a feeling of loneliness or isolation predominated. On the other hand, this situation was considered necessary to progress with the doctoral thesis, so students reported experiencing delight and satisfaction. The following quotations reflect the above:

> On the positive side, because it was a research stay, I did not mingle, so I spent three months without practically talking to anyone, but I did work . . . so I noticed that I was progressing, and that, on the other hand, encouraged me; it was positive for the thesis, not for me. That was negative in terms of the doctorate because . . . well, it could also be positive because it has given me experience and knowledge, right? However, it is also negative because I have been cut off. At this time, I have not done anything at all, but it has been good for me.

The participant explained how academic culture helped him continue his doctoral research and ultimately had a positive activation impact on the research process.

> I think last year they were quite prescriptive, and they were quite strict, and they structured my year quite heavily in terms of giving me certain things to read and then reporting back, writing essays, making me do all these posters and conferences and so on, which is quite hands-on, but since I've finished my first year they've taken a step back, and I think they trust me a bit more now and I have sort of proven that I can do things on my own.
> So they seem to take a step back and just let me get on with my research, and now they're kind of...they're more...I guess they still guide me and put me in touch with useful people that they know... so that's been useful. So I think at the moment they act more as sort of facilitators or networkers almost for me, which is good.

4.8.2 Category of description: Intra-personal Challenges (EJ 3.2)

Due to the subjective nature of the study and humans comprise complex behaviour. This category of description is interlinked with all the other categories, and more or less every interview transcript, someone points towards self-understanding and challenges. These can further narrow down into more variations, such as

Personal Challenges: Several participants mentioned significant personal challenges they faced while pursuing their doctorates. Some were dealing with personal losses, such as the release of their son from prison and the dissolution of their marriage. In addition, some of the research participants assisted her mother in dealing with a serious health condition.

Many of them have financial issues that significantly impact their journey and emotions. However, neither of these students mentioned these issues as sources of stress, let alone as justifications for poor performance. Rather, they portrayed these stressors as just another obstacle to overcome in their daily lives. Participant 16 is represented by:

> I want to regulate myself, but it's not working when I struggle financially. I work part-time, but then my research suffers. Balancing work and research is difficult. I could not focus on one...you know, I want to finish and concentrate, but how... it's my fault, and I could not motivate myself.

Language Barrier: Almost all the doctoral students indicated one common variation, writing and given the salience of review in writing activities; this is hardly surprising. The trials associated with writing in English generated mainly strong emotions:

> Sometimes. . I know what I'm doing, but it's hard for me to express in a different language . . . and sometimes I get irritated with myself ah yeah, you know .you know what you want to say, but it's not there.

All international students stated that finding the right keyword to research for information is difficult for them and causes them great anxiety and frustration.

> I feel reluctant to use new keywords.....during research, I found new keywords...., which I had never used before, so it worries me and feels...Uhm.... I am incapable of using library services...... Sometimes I do feel I did not know how to research umm..... So I cannot continue my PhD **(P4).**

Time pressure: Participants complained that writing was time-consuming and took time away from other activities, in addition to eliciting anger, anxiety, and frustration. The final phase, the student, narrated when telling about personal challenges they encountered that directly affected their emotional learning journey in terms of time pressure, she narrated:

> There were time pressures from work and my studies, and often, I felt that I neglected my family. I felt guilty. Guilty of coming home, switching on the laptop and working. Guilty for working during many, many weekends and holidays. I needed to be disciplined, determined and stubborn, I guess, to keep going and bring this study to fruition.

> But, I did find the time where there was none. In the end, everything came together. It was an exhilarating process, and I wanted to share my findings with others. I started sharing my work in progress with others through conferences and articles but also used my learning to develop open initiatives. Some might think/say that these were distractions, but in reality, they helped me test some of my ideas and were invaluable for my development as a researcher and practitioner. I could do all this as my study was linked to my work. Some might not have this opportunity.

4.8.3 Summary of POOL 3:

The three categories of description included in Pool 3 are: 'external factors as relationship building', 'external factory as a lack of academic community and 'external factor as personal challenges. These categories and their qualitatively different variations indicate that self-regulatory learning and emotional regulation impact these categories.

Language barriers, personal problems, self-motivation/passion, professional communities and supervisor relationships all play a part in doctoral narratives.

Writing English for those whose first language is not English experienced strong negative emotions. Personal problems also generated concern, especially concerning future job prospects. Self-motivation/passion was a core driver, and talking about professional communities was emotive and appeared to influence action. Perceived lack of time affected the students emotionally, as did supervisor relationships, especially concerning the influence the supervisor can have.

Hence, it can be seen that emotions underlie all of these categories. It is anticipated that the approach taken will allow us to further explore how the emotions within these incidents have influenced thinking and motivated action in the doctoral student acknowledges how emotion may be influenced (especially by information resources and services encountered) and managed to inspire, guide and enhance the doctoral student and their research trajectory. In doing so, the doctoral journey will not only become more effective but also more enjoyable for both supervisors and students alike.To visualise the doctoral students emotional journeys through the lens of information seeking for their research year.The following section depicts emotional trajectories.

4.9 EMOTIONAL TRAJECTORIES

The narratives during the interview and probing question helped to create the emotional journey trajectories of candidates - in the early, middle, and final stages of their PhD journeys - gain insights into the emotional and regulatory elements that shape their academic trajectories. The next section will discuss three cases which are depicting the phases of PhD and what are emotional trajectories the learner's gone through.

Case 1: The Early Stage - Elsa's Journey of Initial Challenges and Adaptation

Elsa, in the first year of her PhD in Environmental Science, is experiencing the initial challenges of defining her research topic and understanding the breadth of existing literature. Elsa's journey begins with excitement and motivation, common in early-stage PhD candidates (Wellington, 2010). However, she soon encounters feelings of overwhelm and self-doubt as she navigates the vastness of her field (Bandura, 1997).

Elsa's primary regulating elements are her supervisory meetings and peer support groups. These structures provide her with guidance and a sense of belonging, crucial for early-stage doctoral students (Lee et al, 2011). Elsa struggles with narrowing down her research topic, a common issue for early-stage candidates (Pyhältö, Vekkaila, and Keskinen,2015). To address this, she utilizes regular feedback sessions with her supervisor and engages in peer brainstorming sessions, aligning with strategies suggested by Kumar and Stracke (2008).On the basis of these input ,the mapping trajectory is shown in Figure 4.4.
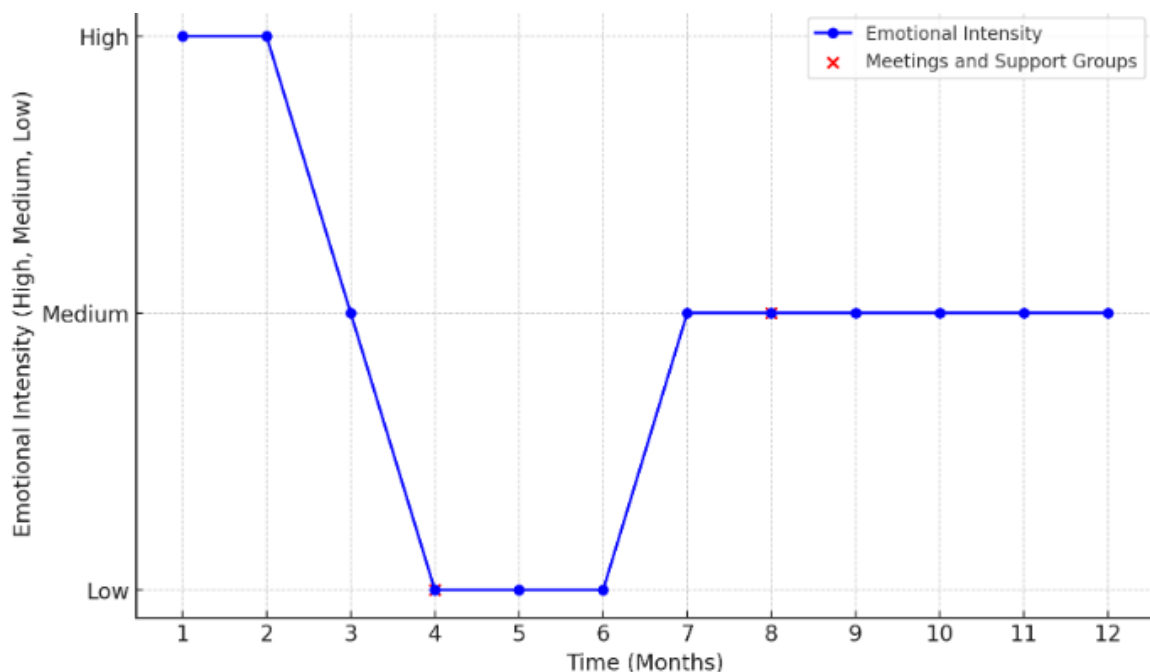
Figure 4.4 Elsa Emotional Trajectory

Here is the line graph depicting Elsa's journey over 12 months. The blue line represents her emotional intensity, ranging from high to low. The red dots indicate the points where

she attends supervisory meetings and peer support groups, which are herself regulatory attempt to get external help to manage her emotions.

Case 2: The Middle Stage - Alex's Journey of Depth and Self-Reflection

Quinn, in his third year of a PhD in Sociology, is deeply immersed in data collection and analysis. His journey represents the middle stage, where the initial excitement has plateaued, and the reality of extensive research sets in. Quinn experiences periods of isolation and stress, common in the middle stages of a PhD (Devine & Hunter, 2017). He also faces moments of self-doubt as he delves deeper into his data analysis. When asked Quinn how he regulate his emotions, he informed that he relies on structured routines and self-imposed deadlines to maintain momentum. He also finds solace in informal discussions with fellow researchers, which helps in alleviating feelings of isolation (Peluso et al., 2012). His mapping of his journey depicts in Figure 4.5.
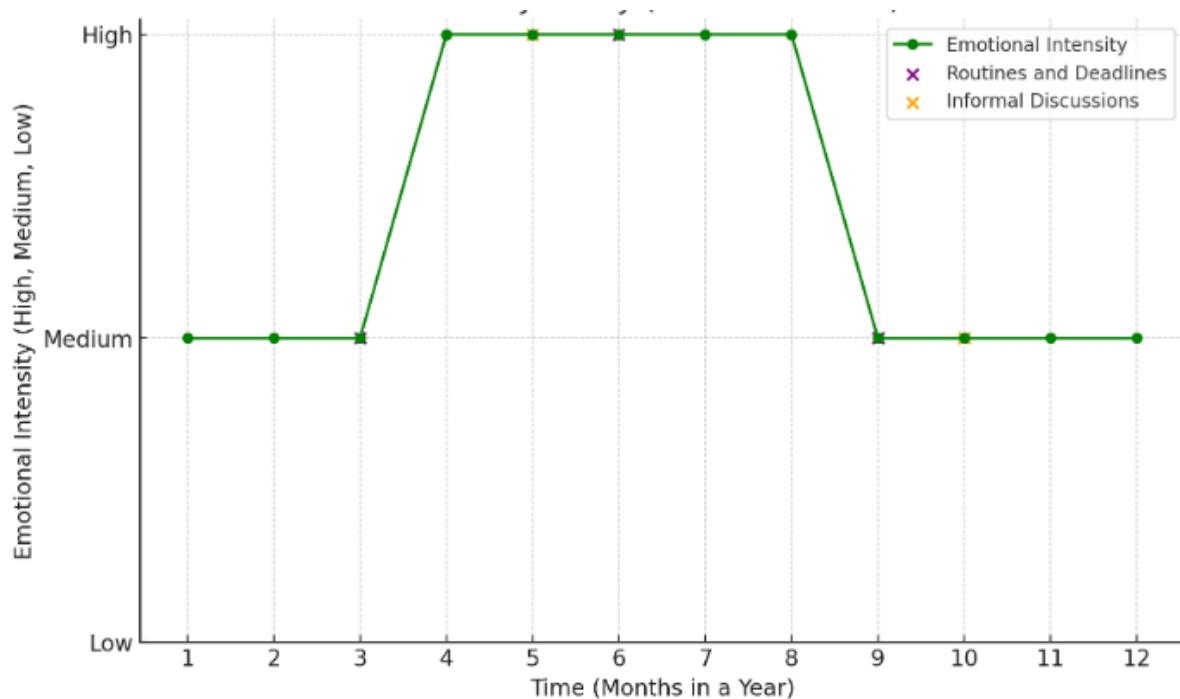
Figure 4.5 Quinn Emotional Trajectory

The line graph for Quinn's journey from Year 2 to Year 3. The green line indicates Quinn's emotional intensity over this period, showing moderate motivation initially, followed by peaks of stress, and a slight increase in confidence towards the end. The purple dots

represent periods of structured routines and self-imposed deadlines, and the orange dots highlight moments of informal discussions.

Case 3: The Final Stage - Liam's Journey of Synthesis and Completion

Liam, in the final year of his PhD in Computer Science, is synthesizing his research findings and writing his dissertation. This stage is characterized by a push to integrate years of work into a coherent thesis. Liam oscillates between anxiety about meeting deadlines and excitement about completing his journey (Lovitts, 2008). The pressure to produce a high-quality thesis is intense, often leading to stress and apprehension (Wellington, 2010). Liam's primary support comes from his dissertation committee and writing groups. These provide him with critical feedback and keep him anchored to his goals (Aitchison & Lee, 2006). The graph showing his emotion journey are Figure 4.6.
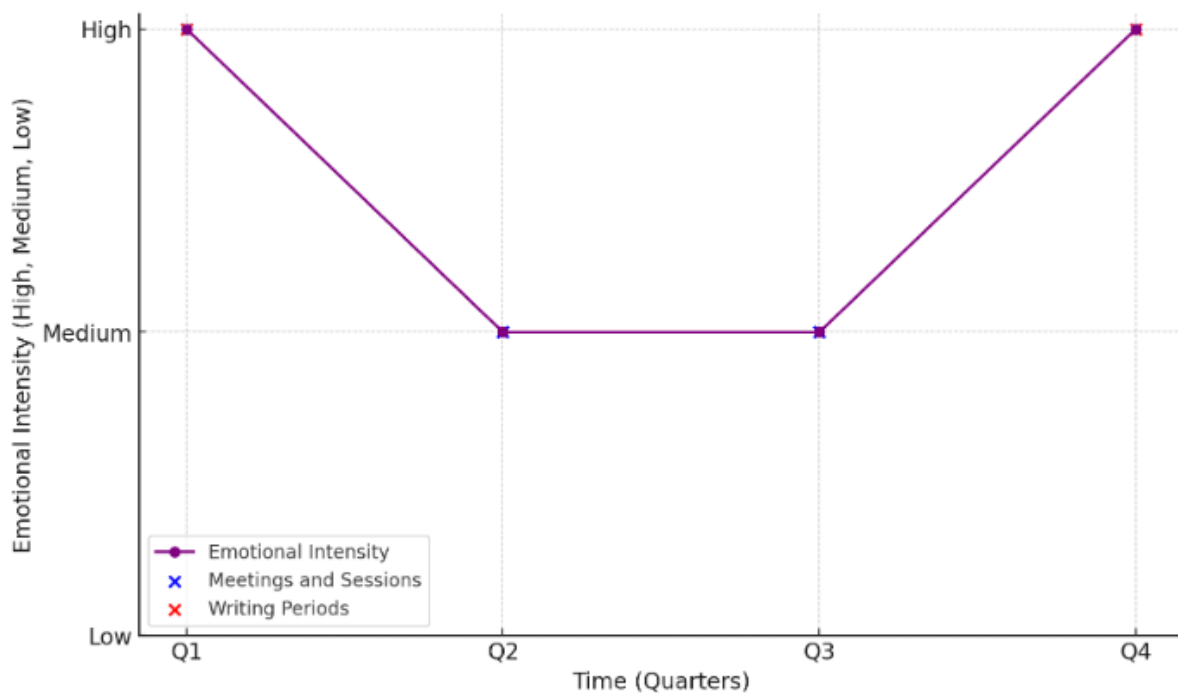
Figure 4.6 Liam's Emotional Trajectory

The above graph for Liam's journey during his final year, divided into quarters. The purple line represents his emotional intensity, which starts and ends high, with fluctuations in between. Blue dots mark the periods of dissertation committee meetings and writing group sessions, while red dots indicate periods of intense writing and synthesis.

The outcome space presented in the following section shows possible relationships and links among the above categories of description.

4.10 PHENOMENOGRAPHIC OUTCOME SPACE

The outcome space Figure 4.7 is the final output of the phenomenographic analysis of this study. It is an empirical construct that has been developed following an iterative process described in Chapter 3.6. In constructing the outcome space, the researcher inferred from the categories of description, within the pools of meanings, the logical relationship and links between them. The iterative process involved in doing this is illustrated and reflected upon in a reflective diary.

The outcome space synthesises the seven categories of descriptions identified in this study. It shows the potential links and logical relationships between these that provide further insight into aspects that influence and shape the gamified emotional learning experience related to self-regulatory learning. The outcome space also provides insights that aid in formulating a response to RQ2 based on answers to RQ1. These contribute towards the design of a gamified emotion management framework, which will be discussed in Chapter 6 after responses to RQ1 have been addressed and discussed in Chapter 5.

The outcome space as represented in the diagram, reflect the various dimensions and components that emerged from the study. Here is the explanation on different Areas and links.

4.10.1 Area A: Emotion Regulations and Self-regulatory Learning Processes

This area consists of categories of description situated in Pool 1(Dissertation process) and Pool 2(SRL Learning) . The specific categories of description, which emerged through the phenomenographic analysis process, show on how doctoral students' emotion regulation and self-regulatory learning processes affect their information-seeking behaviour. Let's dive into each pool to explore their intricacies and interconnectedness.

- **Pool 1: Dissertation Process Feelings, Thoughts, and Actions -** This suggests a timeline of the emotional journey of doctoral students, from early to final year researchers, and the different feelings, thoughts, and actions that characterize these stages.

These factors encompass the strategic decisions and actions a researcher undertakes, from the selection of the topic to the presentation of results. Kelley & Salisbury-Glennon (2016) emphasize the need for high motivation and self-regulation throughout the dissertation process, highlighting the complexity and self-driven nature of doctoral research.

This refers to the affective and cognitive engagement of researchers as they navigate the information search process. The stages of Initiate, Select, Explore, Formulate, Collect, Present, and Access require self-regulatory strategies for motivation and action, as discussed in the context of students' thesis writing.

The different timelines of doctoral students' journey outcomes as category of variations which significantly impact their ISB and SRL. Three variations are encountered: **Early Year Researchers (EJ1.1), Middle Year Researchers (EJ1.2) and Final Year Researchers (EJ1.3):** Another Category of description also emerged which is explained in Chapter 4.9.

- **Pool 2: Self-Regulatory Learning Process** This pool outlines the phases of the self-regulatory learning process, which includes forethought, performance, and self-reflection. Each phase has specific tasks or skills associated with it, such as task analysis and self-motivation beliefs in the forethought phase.
- **Pool 3: External Factors Contributing and Shaping the Lived Experience** This pool acknowledges the influence of external factors like relationship building, academic culture, and personal challenges on the lived experiences of doctoral students.

4.10.2 Area B: External Factors

This area underscores the external factors mentioned in Pool 3, emphasising their impact on doctoral students' experiences in three distinct categories This pool outlines three major categories:

Relationship Building (EJ.3.1)

The quality of relationships with supervisors and peers can greatly influence a doctoral student's emotional state. Positive relationships often lead to feelings of support and confidence, whereas negative relationships can contribute to stress and isolation.

Academic Culture (EJ.3.2)

The broader academic environment, including departmental culture, institutional support, and the availability of academic networks, shapes the doctoral experience. An inclusive and supportive academic culture can bolster a student's resilience and motivation.

Personal Challenges (EJ.3.3)

Personal circumstances such as financial pressures, family responsibilities, or health issues directly impact a student's ability to focus and progress, thereby affecting their emotional well-being.

INTERPLAY BETWEEN AREAS A AND B

The external factors from Pool 3 exert a considerable influence on the emotional and intellectual experiences of doctoral students represented in Pool 1. For example:

Relationship Building impacts researchers by setting the stage for their entire doctoral journey. Positive supervision and peer relationships can mitigate feelings of anxiety and bolster motivation, essential for the initial stages of the PhD. Academic Culture influences researchers by either providing a nurturing environment that can foster sustained motivation through challenges or a competitive, isolating environment that may exacerbate the PhD slump. Personal Challenges affect researchers significantly.

The pressures of completing the dissertation are compounded by personal circumstances, making the need for resilience and support even greater.

In summary, the emotional journey of doctoral students is not linear but cyclical and responsive to a multitude of external factors.The outcome space Figure 4.5 emerged through an iterative and explorative process from the data through organising and reorganising the categories of description until a picture emerged that was stable and showed possible links between categories of description and how they might influence each other.

The seven categories of description from the three pools of meanings shown in the outcome space are referenced with their code to be easily identified .The synthesis and discussion of this outcome were discussed in 5.1, 5.2 & 5.3.

Pool 2: Self-Regulatory Learning Process

Forethought Phase
Task analysis EJ2.1
Self-motivation beliefs EJ2.2

Performance Phase
Psychological skills EJ2.3

Self-Reflection Phase
Self-judgement EJ2.4
Self-reaction EJ2.5

Pool 1: Dissertation Process Feelings, thoughts and actions

Emotional Journey as early year researchers

EJ1.1

Emotional Journey as middle year researchers

EJ1.2

Emotional Journey as final year researchers

EJ1.3

Area A: Emotion Regulations and Self-regulatory learning processes impact the information seeking behaviour of doctoral students

Pool 3: External Factors contributing and shaping the lived experience

Relationship building

EJ3.1

Academic Culture

EJ3.2

Personal Challenges

EJ3.3

Area B : External Factors

Figure 4.7 The outcome space

4.11 CONCLUDING THOUGHTS

Within this chapter, the phenomenographic findings were presented in the pool of meanings and categories of description. In addition, the outcome space, the outcome of this phenomenographic analysis, was constructed. Insight was gained into the mix methods different variations of the emotional journey of doctoral researchers.

The research finding gave a direct answers RQ1 which are.

- **What are the significant impacts of emotion and emotion regulations during the information-seeking behaviour of doctoral students during the research journey?**

The phenomenographic study of doctoral students' experiences, as presented in this research, offers a rich tapestry of insights into the multifaceted nature of the doctoral journey. This journey is not merely an academic endeavor but a profound personal and professional transformation. The research intricately weaves together the emotional, cognitive, and contextual strands that shape this unique voyage, providing a nuanced understanding of the doctoral process.

At the heart of the doctoral experience are the intertwined processes of emotional regulation and self-regulatory learning. Doctoral candidates navigate a complex emotional landscape, experiencing a spectrum of feelings ranging from excitement and hope to anxiety and frustration. These emotions are not peripheral but central to their academic engagement, influencing their motivation, resilience, and ultimately, their success.

The self-regulatory learning process, with its phases of forethought, performance, and self-reflection, serves as a navigational tool. It helps students to not only manage their emotions but also to channel them towards productive academic work. Through task analysis, goal setting, and strategic planning, students shape their doctoral journey, adapting to challenges and seizing opportunities for growth.

- **What are the significant external factors related to emotion regulation during the information-searching process?**

The doctoral journey is not undertaken in isolation. External factors, including the supervisor-student relationship, academic culture, and personal challenges, significantly impact this journey. The quality of supervision can either elevate a student's confidence or exacerbate their insecurities. Academic culture, too, plays a dual role - as a source of support and inspiration or as a contributor to feelings of isolation and self-doubt. Personal challenges, such as financial constraints and language barriers, add another layer of complexity, affecting students' ability to focus and progress in their research.

- **How do emotion regulation processes benefit self-regulated learning during the research phases of doctoral students?**

The study highlights the bidirectional influence between internal processes (emotion regulation and self-regulation) and external factors. This dynamic interplay suggests that doctoral experiences are not linear but cyclical and iterative. Emotional and self-regulatory strategies are constantly refined in response to external feedback and challenges. The study serves as a call for empathy and understanding towards doctoral students. Their journey is more than just an academic pursuit; it is a passage marked by intense emotional and intellectual growth. Recognizing this can lead to more supportive and effective doctoral training, ultimately enriching the academic community and society at large.

The study opens avenues for future research, particularly in exploring the efficacy of different support mechanisms in enhancing doctoral students' well-being and academic performance. Longitudinal studies could provide deeper insights into how emotional and self-regulatory strategies evolve over the course of the doctoral journey.

In conclusion, the doctoral journey, as illuminated by this phenomenographic study, is a complex interplay of emotions, self-regulatory learning processes, and external influences. Understanding this interplay is crucial in shaping effective learning environments and support systems for doctoral students. By acknowledging and addressing the emotional and contextual dimensions of doctoral research, academic

institutions can not only enhance students' academic success but also contribute to their overall well-being and personal development. This study, therefore, contributes significantly to the discourse on doctoral education, offering a comprehensive framework that captures the essence of the doctoral journey in all its complexity and diversity.

The Chapter 5, which follows, contains a discussion based on the findings presented in this chapter. It synthesises the phenomenographic analysis, categories of descriptions and the outcome space, underpinned by relevant literature.

CHAPTER 5
DISCUSSION
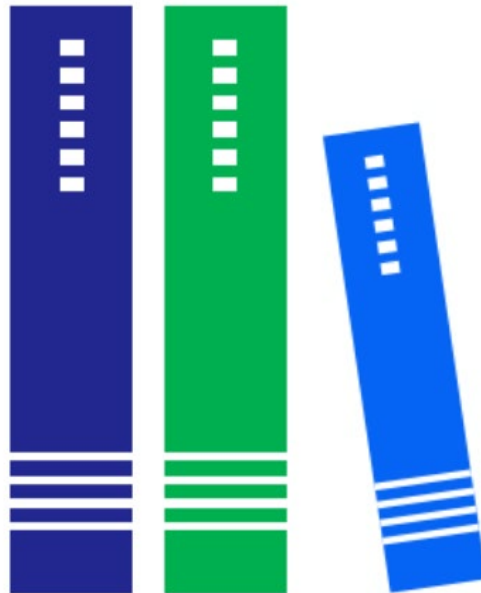
CHAPTER 5: DISCUSSION

In Chapter Five, the findings of this study were presented in the form of seven categories of description arranged in three pools of meaning: 'dissertation process', 'self-regulatory learning process' and 'external factors (Table 4.3), which emerged through the analysis of the SRET tool and phenomenographic data. The outcome space constructed illustrates the relationships between these (Figure 4.5).

This study aimed to understand the emotional regulations of students pursuing a doctoral degree in a full-time university programme. The findings of this study were determined through the statistical data and the use of phenomenological data analysis, which looks at data thematically to extract the essences and essentials of participant meanings (Miles, Huberman, & Saldana, 2014).

The next sections explore the answers that are shaped by an intensive literature review on information-seeking behaviour and emotion regulations. First section 5.1 discussed *The role of emotion and emotion regulation on information-seeking behaviour in doctoral students and identified strategies to enhance emotional regulation based on findings*.

5 DISCUSSION OF RESEARCH QUESTION

This study provided valuable insights into how participants experienced and managed emotions throughout their research journey, highlighting the relationship between emotional regulation and self-regulatory learning. Findings suggest that doctoral students encountered varied emotional challenges, both qualitatively and quantitatively, and developed distinct strategies for managing these experiences.

The primary research question explores *the role of emotion and emotion regulation on information-seeking behaviour in doctoral students and identifies strategies to enhance emotional regulation based on findings*. Additionally, it seeks to identify key external factors—such as supervisory relationships, peer support, and resource availability—and modern, supportive strategies, including gamification techniques, that enhance emotional regulation and improve research engagement and resilience in doctoral students.

The results from Chapter 4 are structured using three dimensions that synthesise the SRET tool and phenomenographic findings as relevant to the emotion regulation and self-regulatory experience and result into outcome space.

The outcome space is explored further into three dimensions.

- **DIMENSION 1: EMOTIONS AND DOCTORAL RESEARCH PROCESS**
- **DIMENSION 2: DO EMOTION REGULATION PROCESSES RELATE TO SELF-REGULATED LEARNING IN DOCTORAL STUDENTS?**
- **DIMENSION 3: INFLUENCING FACTORS ON THE DOCTORAL JOURNEY**

These are discussed in the following sections, with the first, DIMENSION 1, addressed below.

5.1 DIMENSION 1: Emotions and Doctoral Research Process

The central research idea is to explore student dissertation journeys throughout the years and determine the impact of emotions. The findings that emerged from phenomenography analysis output many perspectives inside this dimension.

5.1.1 How do doctoral students conceptualise or perceive emotions during the research journey?

Participants were asked this question in *SRET Q3* about what they feel when completing their research tasks, and also in the interview discussed to elaborate their answers, they were free to describe their emotions. Rather than being able to define it concisely, it has been found that many instated listed the causes of emotions, including the many internal feelings associated with it. They also discussed emotions in the context of subjective and ubiquitous nature. The lack of explanation or consistent way of defining emotions would continue to suggest that there is no single unifying defamation for the phenomenon, which has already been described in the literature (Bhise et al. 2018). Many words have been used by participants to describe their feelings when narrated during the interview and written in the diary study, as shown in Figure 5.1.
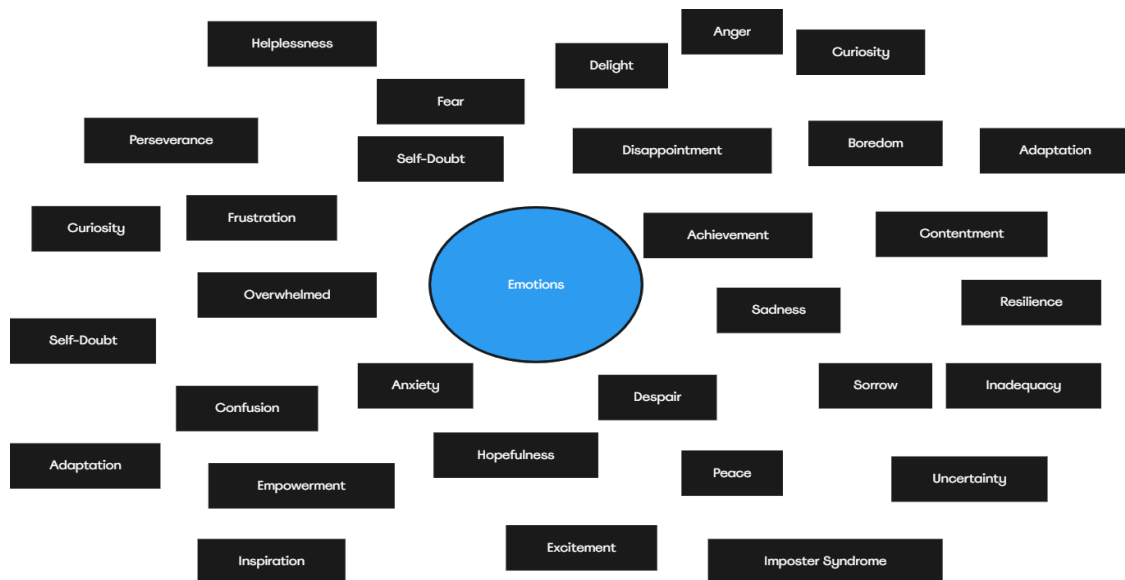
Figure 5.1 Named Emotions

It has been observed in 4.6.1 and found that doctoral students' emotional experiences are closely tied to their academic progression from the early to final stages. This aligns with the stage-based models of emotional development, suggesting that individuals encounter specific emotional challenges at different stages of a complex task, like a doctoral thesis. For example, in the work of (Maher et al.,2013), the emotional trajectory of PhD students is explored, revealing how emotions like excitement, anxiety, and satisfaction flow with academic milestones. For instance, the initial excitement in the early stages often gives way to anxiety during the proposal development phase. This aligns with (Vekkaila et al.,2013), who found that doctoral students' emotional experiences are not static but evolve as they progress, often mirroring the challenges and successes of each phase.

Furthermore, the categorisation into Positive Activation (PA+), Negative Activation (NA-), and Deactivation (D- or D+) reflects appraisal theories of emotion (e.g., Lazarus, 1991) in Chapter 2.7.2, where they argued emotions arise from personal interpretations of events. Some observational analyses of one-by-one category are in the following section:

Early-Year Researchers: Emotional Turbulence and Hope

Predominant Emotions: Negative Activation (NA-) like anxiety and frustration. Early-year researchers experience a significant emotional turmoil, primarily characterised by

confusion and a sense of direction lessness, as described in 4.6.1. This period is marked by a struggle to define research topics and a feeling overwhelmed by the vastness of their task. This aligns with the concept of "threshold crossing" in doctoral studies, where students transition from confusion to clarity (Meyer and Land, 2003). The presence of hope amidst this confusion suggests resilience and a forward-looking attitude, essential for academic perseverance.

Middle-Year Researchers: Data Challenges and Emotional Regulation

Predominant Emotions: Deactivation (D+-) like boredom and disappointment (NA-).In the middle phase, the emotional landscape shifts towards dealing with data-related challenges. Disappointment and boredom emerge as students grapple with data collection and analysis, leading to moments of self-doubt and reconsideration of their research path. As learner's are somehow clear with their direction, but it's hard to comprehend the data collection and make sense of it while dealing with it. It also aligns with human nature, so this phase reflects the concept of "liminality" in doctoral research, where students are in a transitional phase, navigating between data collection and analysis (Kiley & Wisker, 2009). The emotional deactivation observed can be linked to the cognitive load theory, suggesting that the intense cognitive demands of this phase may lead to emotional exhaustion (Sweller, 2020).

End-Year Researchers: From Frustration to Elation

Predominant Emotions: Positive Activation (PA+) such as satisfaction and clarity.The final phase is a blend of doubts but more towards satisfaction. Frustration arises from the challenges of writing and articulating research findings, while satisfaction is experienced upon completing drafts or the entire thesis. This phase resonates with the concept of "autonomy" in self-regulated learning, where students take greater control over their learning process, leading to feelings of accomplishment (Zimmerman, 2002). The emotional journey from frustration to satisfaction mirrors the journey from dependence to independence in doctoral research.

5.1.2 How do Emotions and Research Method relate?

All the data results at 4.6.1 also helped in organising the Emotions into a stages model as displayed at Figure 5.2.

```
└───────────────────────Stages of Emotions───────────────────────┐
│
├─────┐ Stage 1: Confusion
│     └── 🤭 Independent Reading, Identifying Literature Gaps, Initial Frustration
│
├─────┐ Stage 2: Uncertainty
│     └── 🙁 Proposal Adaptation, Diverse Search Strategies, Mixed Feelings of Anxiety and
Optimism
│
├─────┐ Stage 3: Certainty
│     └── 🙃 Focused Literature Update, Empirical Data Alignment, Growing Confidence
│
├─────┐ Stage 4: Success
│     └── 🏆 Satisfaction with Research Outcome, Improved Search Skills, Enhanced
Capability and Knowledge
│
└────────────────────────────────────────────────────────────────┘
```

Figure 5.2 Stages of Emotions

Stage 1 - Confusion Early in their research, doctoral candidates often experience confusion. A minority start by independently reading to clarify their topics, with some focusing on identifying gaps in literature as a key motivator. This stage is marked by an initial frustration, but a willingness to explore and innovate. At the proposal phase, most

students cease research after finding sufficient information to demonstrate a literature gap. They also use a variety of sources, including YouTube videos, for hypothesis validation. Despite this, there's an overarching sense of uncertainty due to limited knowledge, leading to a dominant information-seeking behaviour over emotions.

Stage 2 - Uncertainty As doctoral students begin their dissertation research, they commonly face the need to adapt their proposals to meet supervisor expectations. Their search strategies vary, often involving broad internet searches and discussions with supervisors for guidance and resource recommendations. This stage is characterized by a mix of anxiety and optimism, with the latter growing after supervisor consultations. The research process here is described as unique to each student, often involving extensive citation chasing and a reliance on both digital and physical library resources. Despite an initial general approach to sources, the students gradually refine their search, navigating through confusion and frustration.

Stage 3 - Certainty Approaching the end of their research, students conduct a limited search for additional information, mainly focusing on updating their literature in line with their empirical findings. This stage is marked by increased confidence and a clear sense of direction, stemming from the alignment of literature review and empirical data. Students report a heightened interest and clarity in their topics, attributing their confidence to the focused updating of their literature.

Stage 4 - Success Reflecting on the entire research process, most students feel a sense of satisfaction, confidence, and certainty. They appreciate the clarity and focus achieved in their research. Although a few remain dissatisfied and continue seeking information, the majority feel enhanced confidence in their field of study. Despite not considering themselves expert searchers, they acknowledge significant improvement in their research skills, feeling more informed and capable in their information-seeking abilities.

These stages reflect a transformation in students' information-seeking behaviour and emotional responses, demonstrating a journey from initial uncertainty to confident and focused research expertise.

There are also interesting observations that - from confusion to optimism stages - play a crucial role in shaping their information-seeking behaviour. Initially, emotions may act as

barriers, causing delays and inefficiencies in gathering information. However, as students' progress, their emotional growth facilitates a more focused and efficient search strategy. The transition from a broad, uncertain approach to a more targeted and confident methodology highlights the significant impact of emotions on the research process.

These results are also closely examined with the baseline Kuhlthau's model explained in 2.6.1.1, as Kuhlthau's Information Seeking Process (ISP) model is a six-stage model that describes the thoughts, feelings, and actions of individuals engaging in information-seeking behaviour, particularly in the context of conducting research. The stages are initiation, selection, exploration, formulation, collection, and presentation. This model is particularly relevant when examining the emotional journey of doctoral students through their research process.

5.1.3 Stages of ISP model with emotional occurrences in doctoral research

Kuhlthau's Information Seeking Process (ISP) model is a six-stage model that describes the thoughts, feelings, and actions of individuals engaging in information-seeking behaviour, particularly in the context of conducting research. The stages are initiation, selection, exploration, formulation, collection, and presentation. The results also helped to compare how the ISP model, doctoral learners' phases, and emotional occurrences are interlinked. Table 5.1 gives a tabular exploration of all these dimensions.

ISP Model Stage	Doctoral Research Phase	Emotional Experience
Initiation	Early-Year Research	Confusion, Apprehension
Selection	Early-Year Research	Uncertainty, Doubt
Exploration	Early to Middle-Year Research	Certainty, Frustration
Formulation	Middle-Year Research	Clarity, Anxiety
Collection	Middle to End-Year Research	Confidence, Stress
Presentation	End-Year Research	Relief, Satisfaction

Table 5.1 ISP process & emotional experience

- **Initiation | Emotions: Confusion, apprehension**

This stage corresponds to the beginning of the doctoral journey, where students recognize a lack of knowledge. The emotional landscape here is dominated by feelings of uncertainty and apprehension, much like the early-year doctoral students who are trying to define their research topics as described in *Pool 1 4.6.1(Ej1.1)* The uncertainty principle of Kuhlthau's model reflects the anxiety and confusion experienced by students at this stage.

- **Selection | Emotions: Uncertainty, doubt**

At this point, doctoral students choose a general topic or direction, which brings a mix of optimism and doubt. This stage mirrors the early phase of the doctoral journey where students oscillate between hope and frustration as they attempt to narrow down their research focus results in *Pool 1 4.6.1(Ej.1.1)*

- **Exploration | Emotions: Confusion, frustration**

Exploration involves investigating information to learn more about the topic. Here, doctoral students often face the same confusion and frustration depicted in the emotional turbulence of mid-level researchers. The exploration phase is characterized by an increased recognition of the information gap, leading to feelings of being overwhelmed described in *Pool 1 4.6.1(Ej1.2)*.

- **Formulation | Emotions: Clarity, anxiety**

In the formulation stage, doctoral students develop a focused perspective on their topic. This is akin to the transition from the middle to final years, where students begin to see a clearer path but may still experience anxiety as they work on defining their thesis statement or research question. *Pool 1 4.6.1(Ej1.2)*

- **Collection | Emotions: Confidence and stress**

Collection is the gathering of information pertinent to the focused perspective. Doctoral students in the middle years of their research experience these emotions as they collect and analyse data, feeling a sense of confidence in their direction but also stress from the immense workload as commutated at *Pool 1 4.6.1(Ej1.3)*

- **Presentation | Emotions: Relief, satisfaction**

The final stage involves completing the research and presenting the findings. This aligns with the end-year researchers' transition from frustration to elation. The relief and satisfaction experienced by doctoral students at this stage reflect the culmination of their hard work and the achievement of a significant milestone in their academic career described in *Pool 1 4.6.1(Ej1.3)*

When the ISP model is overlaid on the doctoral research process, it's evident that doctoral students' emotions evolve in a manner that closely mirrors the stages defined by Kuhlthau. The emotional states from early-stage anxiety and confusion to mid-stage emotional regulation, and finally to end-stage satisfaction and accomplishment, correspond to the progression through initiation, selection, exploration, formulation, collection, and presentation.

5.1.3 Synthesizing the ISP Model with Doctoral Research Emotions

This comparison highlights the emotional component of information-seeking behaviour, suggesting that the process of doctoral research is not just cognitive but also deeply affective and emotional. This comparison also supports this research hypothesis which demonstrates that emotions do affect the information-seeking behaviour of doctoral students and by recognizing the emotional states associated with each stage of the ISP model, doctoral supervisors and academic support services can better assist doctoral students in navigating the complex emotional landscape of their research journey. Also, doctoral students by themselves can self-understand their emotions and using self-regulatory learning aspects can have a better experience through the tedious years of work.

The research findings validate Kuhlthau's model, emphasizing that students often begin their research with a vague focus. In the planning phase, they engage in broad browsing and gather general ideas or background information about their research field.

An emotional response marked by apprehension and uncertainty is common during these early stages, stemming from unclear research topics and thoughts. The recognition of a research gap and the search for background information are key to

confirming the need for information. Students primarily rely on secondary sources at the proposal stage, comparing old and new resources to spot differences and updates. Despite initial anxieties, there's a noted optimism among students about their research.

As the research progresses to the second stage, there's a shift in approach. Students restructure their initial, underdeveloped concepts, often revising proposals based on feedback from supervisors. Although still not fully focused, the information search becomes more structured, involving extensive use of the internet and library catalogues. Students engage in varied search methods, including citation chaining, to refine their focus.

Despite the use of diverse resources like videotapes, DVDs, and interlibrary loans, the rising prevalence of the internet has decreased reliance on physical libraries. During this phase, students often experience confusion and frustration, reflecting the challenges in bridging the gaps in their knowledge.

The direction of the research becomes clearer as students develop a focused approach, reducing initial uncertainties. This stage sees increased reliance on external factors such as supervisors' guidance for building confidence and directing the research. Satisfaction with the search process is generally high, but the review of collected information remains vital. Some students may repeat parts of the process to ensure comprehensive coverage. Overall, developing a flexible yet organized search strategy is key to successful information seeking.

Moreover, the ISP model's relevance Chapter 2.5.1 to doctoral research suggests that information seeking is not a purely mechanical task but a complex interaction between the researcher and the information environment, influenced by cognitive, affective, and contextual factors. This holistic view supports a more nuanced understanding of doctoral students' experiences and underscores the need for emotional support mechanisms throughout the doctoral journey.

5.2 DIMENSION 2: DO EMOTION REGULATION PROCESSES RELATE TO SELF-REGULATED LEARNING IN DOCTORAL STUDENTS?

As a researcher exploring the nexus between emotion regulation processes and self-regulated learning in doctoral students, it's evident that this terrain is remarkably complex and nuanced. The relationship between emotional experiences and learning outcomes is not merely correlational but deeply intertwined, influencing various facets of a student's academic journey. To answer this dimension the categories are explained using adapted model of (Zimmerman, 2000) based on the SRL process which is a dynamic, cyclical three-phase model consisting of the forethought, performance, and self-reflection phases section 4.7.In synthesizing the findings from Pool 2 of this study on Self-Regulatory Learning (SRL) Processes in doctoral students, several key insights emerge. These insights revolve around how doctoral students navigate their learning journey by regulating cognition, motivation, and behaviour, with a particular focus on the emotional aspects of this regulation.

5.2.1 Forethought Phase of Self-Regulatory Learning

The initial stage, known as the Forethought Phase, is pivotal in shaping students' learning trajectories. Here, doctoral students engage in task analysis and cultivate self-motivation beliefs, showcasing a spectrum of strategies ranging from structured planning to more flexible approaches. This diversity in task analysis approaches reflects the individual differences in learning styles and preferences. However, it's in the realm of emotional regulation where this phase becomes particularly significant. Students' emotional responses to their planning strategies—ranging from anxiety and overwhelm when deviating from plans to a sense of achievement and satisfaction upon adhering to them—highlight the crucial role of emotional responses in shaping the learning process (Zimmerman, 2000; Bandura, 1986).

5.2.2. Performance Phase in Self-Regulatory Learning

During the Performance Phase, four key processes emerge self-observation, imagery, concentration and self-awareness. Students' active engagement in self-monitoring and the use of mental imagery as a tool for envisioning successful task completion play a vital role in fostering motivation and cognitive organization. These

strategies are instrumental in maintaining focus and managing various psychological facets, including impulses, emotions, and behaviours. Notably, many students are not fully conscious of employing these strategies, suggesting an area ripe for enhancement in doctoral training programmes (Baumeister et al., 1994; Schunk & Zimmerman, 2007).

5.2.3 Self-Reflection Phase of Self-Regulatory Learning

The Self-Reflection Phase involves critical self-scrutiny, often accompanied by a wide range of emotions, from pride to self-doubt. The emotional responses in this phase are significant as they substantially influence future motivation and strategies for self-regulation. Strategies to mitigate challenging emotions in this phase often involve focusing on the task at hand and setting daily goals, demonstrating a proactive stance in transforming emotional challenges into opportunities for growth (Weiner, 2014; Locke & Latham, 2002).

5.3.4 Key Themes and Implications of dimension 2

The study on Self-Regulatory Learning (SRL) Processes in doctoral students offers rich insights into the complex interplay of emotions and goal attainment. Integrating the quantitative data from chapter 4.6 with the qualitative findings 4.7 and the outcome space from 4.10, the study gains a comprehensive understanding of how different emotions, including boredom, positive and negative emotions, influence doctoral students' self-evaluations of goal attainment. This discussion will be synthesized into a table format to provide a visually engaging and clear presentation of the key themes and their implications.The detailed explanation of all the background studies can be found at *Chapter 2.10*.

Theme	Key Findings	Implications	Background Studies
Positive Emotions and Goal Attainment	Positive emotions are positively correlated with self-evaluations of goal attainment.	Enhancing positive emotional experiences can be instrumental in improving academic outcomes.	Fredrickson et al. (2008, 2013); Pekrun et al. (2012)
Negative Emotions and Goal Attainment	Negative emotions have a detrimental effect on self-evaluations of goal attainment.	Addressing and mitigating negative emotions can help in improving goal	Carver & Scheier (1990, 2000,2012); Ben & Bernacki (2015))

Theme	Key Findings	Implications	Background Studies
		achievement.	
Boredom's Unique Role	Boredom positively influences goal attainment at the between-person level but not at the within-person level.*(Table 4.6)*	Indicates a complex relationship between boredom and goal attainment, suggesting a nuanced approach to engagement and motivation.	Goetz (2016)
Emotional Regulation Strategies	Various strategies are used by students to manage emotions, impacting their learning process.	Tailoring emotional regulation strategies to individual needs can enhance learning efficacy.	Gross (1998); Zimmerman (2000)
Internal Dialogue and Emotional States	The nature of internal dialogue (self-talk) significantly impacts emotional regulation, motivation, and productivity.	Promoting positive self-talk can enhance motivation and productivity, while negative self-talk should be addressed.	Bandura (1986); Zimmerman (2000)
Productivity and Emotion	Negative emotions like self-doubt and frustration impede productivity and academic performance.	Strategies to manage negative emotions can improve concentration and academic success.	Pekrun et al. (2012)
Self-Awareness and Coping Strategies	High self-awareness allows for effective emotional regulation and the employment of appropriate coping strategies.	Fostering self-awareness can lead to better academic outcomes through tailored emotional management.	Schunk & Zimmerman (2020)
Goal Achievement and Emotion Management	Effective emotion management is crucial for achieving academic goals, especially in research-intensive tasks.	Teaching emotion management skills can aid in setting realistic goals and maintaining motivation.	Locke & Latham (2002)

Table 5.2 Key themes discussion

This table 5.2 illustrates the multifaceted nature of emotions in the academic context, particularly for doctoral students engaged in SRL.The table outlines the key themes related to self-regulation, emotions, and goal attainment in academic contexts,

specifically for doctoral students. Each theme is supported by key findings, implications, and relevant background studies. Here is a detailed explanation:

1. Positive Emotions and Goal Attainment

Key Findings: Positive emotions are closely linked with higher self-evaluations of goal attainment.

Implications: Enhancing positive emotions can significantly improve academic outcomes. For example, a doctoral student who feels excited and curious about their research is more likely to engage deeply with their work and experience a sense of accomplishment, thus enhancing their overall academic performance.

Background Studies: Studies by Fredrickson (2008, 2011); Pekrun et al. (2012) support the role of positive emotions in broadening thought-action repertoires and enhancing learning and achievement.

2. Negative Emotions and Goal Attainment

Key Findings: Negative emotions negatively impact self-evaluations of goal attainment.

Implications: Addressing and reducing negative emotions like anxiety or frustration is vital for academic success. For instance, a student who frequently feels overwhelmed by their thesis work may benefit from stress-reduction strategies, which could improve their focus and productivity.

Background Studies: Research by Carver & Scheier (1990, 2000); Winne & Hadwin (1998, 2008) indicates that managing negative emotions is crucial for effective self-regulation in academic settings.

3. Boredom's Unique Role

Key Findings: Boredom has a positive impact on goal attainment at a general level but not in specific instances.

Implications: This suggests that boredom play a complex role in motivation and engagement. For instance, a student might find certain aspects of research monotonous, but this boredom could also provide them with the opportunity to seek new, more engaging methods or areas of study.

Background Studies: This specific study (Table 4.6) highlights this unique relationship between boredom and goal attainment.

4. Emotional Regulation Strategies

Key Findings: Students use various strategies to regulate their emotions, which influences their learning such as imaginary situations,self calming strategies,self observations and self control.

Implications: Customizing emotional regulation strategies to fit individual needs can enhance learning effectiveness. For example, one student might find relaxation techniques like meditation helpful, while another might prefer physical activities to manage stress.

Background Studies: Gross (1998); Zimmerman (2000) provide frameworks for understanding and applying emotional regulation in educational contexts.

5. Internal Dialogue and Emotional States

Key Findings: The nature of a student's internal dialogue significantly affects their emotional regulation, motivation, and productivity.

Implications: Encouraging positive self-talk can boost motivation and productivity. For example, a doctoral student who reassures themselves of their capability and progress can maintain a more positive outlook and motivation.

Background Studies: Theories by Schunk & Zimmerman (2020) highlight the importance of self-efficacy and self-regulation in academic achievement.

6. Productivity and Emotion

Key Findings: Emotions like self-doubt and frustration can hinder productivity.

Implications: Developing strategies to manage these negative emotions can lead to improved focus and academic success. For instance, cognitive-behavioural techniques help students reframe negative thoughts that impede productivity.

Background Studies: Pekrun et al. (2012) explore the impact of emotions on academic performance.

7. Self-Awareness and Coping Strategies

Key Findings: High self-awareness is linked to effective emotional regulation and appropriate coping strategy use.

Implications: Enhancing self-awareness can lead to better academic results. For example, a student aware of their stress triggers can proactively engage in stress-relief activities.

Background Studies: Schunk & Zimmerman (2020) emphasize the role of self-awareness in self-regulation.

8. Goal Achievement and Emotion Management

Key Findings: Effective management of emotions is vital for achieving academic goals.

Implications: Teaching emotional management skills is essential, especially in tasks requiring intense focus, such as research. For instance, teaching doctoral students' techniques for managing anxiety or disappointment can help them maintain steady progress towards their goals.

Background Studies: Locke & Latham (2002) work on goal-setting theory emphasizes the importance of emotion in achieving challenging goals.

Each theme in this table plays a crucial role in understanding and enhancing the academic experience of doctoral students. The combination of positive emotion enhancement, negative emotion management, understanding the nuanced role of boredom, and the development of personalized emotional regulation strategies forms a comprehensive approach to improving academic outcomes. Also the results helped in understand the phenomenon in detail and point towards a need to comprehensive new frameworks for management the emotions regulation by advance technology and new methods.

5.3 DIMENSION 3: INFLUENCING FACTORS ON THE DOCTORAL JOURNEY

Chapter 4,section 4.8 describes a detailed analysis of the study under observation. The synthesizing of the findings on the various external factors impacting doctoral students' emotional journeys through information-seeking behaviour offers a comprehensive view of the doctoral experience such as:

5.3.1 Supervisory Relationships

The quality of supervisory relationships exerts a significant influence on doctoral students, with a high impact on their emotional journey. Positive supervisory interactions, characterized by effective guidance and support, bolster students' confidence and motivation, which are essential for successful information seeking and research progress. Conversely, negative experiences such as miscommunication or lack of support can lead to frustration and demotivation, which may impede students' ability to seek and utilize information effectively.

5.3.2 Resource Availability and Infrastructure

The moderate to high impact of resource availability and infrastructure on students' emotional states underscores the importance of having accessible and adequate research facilities. Challenges in this area, including inadequate facilities and lack of administrative support, can hamper information-seeking activities and negatively affect students' research efficiency, leading to heightened stress and a diminished capacity to cope with academic demands.

5.3.3 Peer Collaboration and Academic Culture

Variability in the influence of peer collaboration and academic culture suggests that these factors play a critical yet diverse role in shaping the emotional experiences of doctoral students. The presence of a supportive academic community contributes positively to students' emotional journeys, providing a sense of belonging and boosting confidence. In contrast, isolation can erode self-esteem and impede the exchange of information and ideas, essential components of academic progress.

5.3.4 Work-Life Balance and Personal Challenges

The high influence and predominantly negative impact of work-life balance and personal challenges on doctoral students' emotional well-being cannot be overstated. The stress and guilt arising from difficulties in managing research alongside personal life can be substantial, leading to decreased mental health and academic productivity. Ensuring that students can achieve a harmonious balance is crucial for maintaining both their well-being and their effectiveness in information-seeking behaviour.

5.3.5 Financial Support

Financial support, though less frequently mentioned, holds a significantly negative impact on students when it is inadequate. Financial pressures lead to stress and uncertainty, which can distract from academic pursuits and complicate the information-seeking process by introducing additional worries and potentially limiting access to paid resources.

5.3.6 Language and Cultural Barriers

For international students, moderate influence from language and cultural barriers introduces additional emotional challenges. These barriers can lead to feelings of incompetence and frustration, particularly when language proficiency impedes the ability to search for, access, and comprehend necessary information. Overcoming these barriers is vital for creating equitable and supportive environments that facilitate the information-seeking process.

5.4 TRAJECTORY DISCUSSION

The cases of Elsa, Quinn, and Liam customise section 4.9 illustrates the intricate relationship between emotions and self-regulation in the PhD journey. This relationship is pivotal because emotions significantly influence cognitive processes, motivation, and learning strategies, all of which are crucial in a PhD programme. By understanding and managing these emotions through a guided framework of self-regulated learning (SRL), doctoral candidates can be helped to navigate the PhD process more effectively.

Self-Regulation Learning (SRL) and Emotions in PhD Journey

1. Early Stage (Elsa's Case): Elsa's initial excitement followed by overwhelm and self-doubt is a classic example of the emotional rollercoaster experienced by early-stage PhD candidates. SRL in this context involves setting realistic goals, time management, and seeking feedback (Zimmerman, 2000).

2. Middle Stage (Quinn's Case): Quinn's experience of isolation and stress is indicative of the challenges faced in the middle stages of a PhD. SRL strategies like self-motivation and resilience are key here. A structured SRL approach could assist Quinn.

3. Final Stage (Liam's Case): Liam's fluctuating anxiety and excitement towards the end of his PhD journey are common in the final stages. Here, SRL focuses on effective time management, synthesis of information, and preparation for the final defence. A guided framework could support Liam.

Investigating the emotional journey of doctoral students, particularly through the lenses of information-seeking behaviour, requires a nuanced understanding of the strategies that can be employed to manage the diverse emotional experiences encountered during the doctoral process. The following recommendations align with this research findings:

The exploration of the emotional journey of doctoral students, as revealed in Pool 1, offers profound insights into the doctoral experience but also for the broader academic community, including educators, mentors, and policymakers. The implications of this study extend into several key areas:

- **Emotional Intelligence in Doctoral Education:** The study underscores the critical role of emotional intelligence and emotional regulation in the doctoral journey. It suggests that these competencies should be integral components of doctoral training programmes. By equipping doctoral students with skills in emotional intelligence, they can better navigate the complex emotional landscape of their research journey, leading to more effective coping strategies and enhanced well-being.
- **Curriculum Design** Incorporating elements that address emotional regulation and resilience into the doctoral curriculum could significantly enhance students'

ability to navigate the emotional highs and lows of their research journey. This could involve workshops, seminars, or modules focused on emotional intelligence, stress management, and coping strategies, integrated into the existing curriculum.

- **Narrative Study and Emotion Nature** The narrative study approach used in Pool 1 has been instrumental in understanding the nature of emotions in doctoral students. By capturing the rich, personal experiences of students at different stages of their doctoral journey, this approach provides a nuanced understanding of how emotions evolve and influence the research process. This understanding is vital for developing targeted interventions and support mechanisms.

- **Gamification Framework** The application of a gamification framework in eliciting emotions and supporting doctoral students through their research phases is a novel and promising approach. Gamification can make the process of managing and understanding emotions more engaging and interactive. By incorporating game elements such as challenges, rewards, and progress tracking, a gamification framework can motivate students to engage more deeply with their emotional experiences. This can lead to better emotion regulation, increased resilience, and a more enjoyable and fulfilling doctoral journey.

The insights gained from this study have broader implications beyond academia. They can inform the design of emotion-based systems in various sectors, such as corporate training, mental health interventions, and personal development programmes. Understanding the emotional dynamics of individuals engaged in complex, long-term tasks can lead to more effective support systems and interventions across these fields.

In conclusion, the emotional journey of doctoral students is a critical aspect of their overall experience and success. By integrating emotional intelligence training, robust support systems, and innovative approaches like gamification into doctoral education, we can enhance the well-being and effectiveness of doctoral students. This not only benefits the students themselves but also contributes to the advancement of research and the development of emotion-based systems across various sectors.

5.5 CONCLUDING THOUGHTS

The insights gained from this study extend well beyond the immediate academic context, offering a foundation for designing emotion-based systems across various fields, including corporate training, mental health interventions, and personal development programs. By understanding the emotional dynamics experienced by individuals engaged in complex, long-term tasks, we can inform the development of support systems and interventions that promote emotional resilience and sustained engagement.

The emotional journey of doctoral students, as highlighted in this research, is a crucial component of their overall experience and success. Addressing this emotional dimension through integrated frameworks like the G.E.M (Gamified Emotion Management) Framework holds the potential to transform doctoral education by providing structured emotional support. This approach not only benefits individual students but also contributes to the broader advancement of research and the development of emotion-based systems applicable across sectors.

CHAPTER 6
GEM FRAMEWORK

CHAPTER 6: G.E.M FRAMEWORK AS A SOLUTION

Chapter 5 has systematically unpacked the emotional and cognitive experiences that shape the doctoral journey, offering a unique understanding that merges academic demands with personal resilience. By examining the interplay between the dissertation process, self-regulatory learning, and external influences, this chapter has underscored the complexity of the doctoral experience, where emotions significantly impact information-seeking behaviour, motivation, and research engagement. This understanding led directly to the conceptualization of the GEM Framework as a strategic response to the unified research question. Derived from findings on the emotional challenges faced by students, this framework integrates gamification techniques, such as those outlined in the Octalysis Framework, to support emotional resilience, enhance intrinsic motivation, and create an emotionally supportive research environment.

In response to the unified research question—*How do emotions and their regulation influence doctoral students' information-seeking behaviour throughout their research journey?*—the G.E.M Framework emerged **as a structured approach** to enhancing emotional regulation. Through a combination of supportive elements like goal setting, positive reinforcement, and community engagement, the G.E.M Framework is designed to help students manage emotional fluctuations effectively, thereby fostering resilience and maintaining academic momentum.

Section 6.1 starts with the proposed conceptual G.E.M framework and then follows by explaining and augmenting how emotions work as a pivotal trigger and lays the foundation for creating systems based on these frameworks. Therefore, the proposed framework was applied and compared in different scenarios to check its validity. The chapter concluded by assessing the research's validity and responding to the second research question. This sets the stage for the final chapter, Chapter 7: Conclusions.

6.1 Key Components and Strategic Function of the G.E.M Framework

The G.E.M Framework, grounded in the Octalysis-based model, integrates gamification elements that address both internal and external factors influencing doctoral students'

emotional well-being. Based on the findings of this study, it present a structured, future-oriented approach to emotional regulation in doctoral education, providing the following strategic components:

1. **Progress Tracking and Goal Setting**: Leveraging Octalysis principles, G.E.M introduces a system of goal tracking and milestone acknowledgement, enabling students to visualize their progress. This feature is particularly effective in managing emotions such as anxiety and frustration by fostering a sense of accomplishment and control over the dissertation process. By consistently monitoring their academic journey, students can maintain focus on their goals, which supports their intrinsic motivation and resilience during challenging phases.

2. **Positive Reinforcement and Rewards**: The G.E.M Framework incorporates reward-based elements, providing positive reinforcement for achieving milestones. Recognizing the significant emotional influence of feeling "stuck" or isolated in the research process, this gamified reward system counteracts negative emotions by celebrating small wins and reinforcing motivation. These rewards are tailored to academic contexts, creating an encouraging environment that promotes emotional balance and sustained effort.

3. **Social Influence and Peer Recognition**: Findings from this study emphasize the impact of external factors such as supervisory support, peer collaboration, and resource availability on students' emotional regulation. G.E.M leverages these insights by integrating community-building activities and collaborative tasks within the framework. By incorporating social elements like peer recognition and collaborative achievements, G.E.M addresses the external influences that often shape the doctoral experience, fostering a support network that alleviates emotional challenges.

4. **Empowerment and Personalization**: G.E.M.'s design allows students to personalize their goals and select strategies that align with their strengths and preferences. This autonomy empowers students, giving them control over their research trajectory, which can mitigate feelings of helplessness or frustration.

The personalized aspect of G.E.M ensures that it is adaptable to diverse academic needs, creating an emotionally supportive research environment tailored to each student.

6.2 How G.E.M model driven?

The G.E.M Framework stands for **Gamified Emotion Management Framework** and is based on the Octalysis Framework (Chou, Y.K.,2016) and extended in developing a gamified environment to shape doctoral students' emotional information-seeking journey.

At its core, the G.E.M Framework uses emotions to drive certain behaviours and actions, especially in the context of gamification. Let's break down the elements of the G.E.M framework as displayed in Figure 6.1:

-Positive Emotion: Pride, Interest
-Negative Emotion: Anxiety

-Positive Emotion: Pride, Joy, Amusement, Gratitude
-Negative Emotion: Anxiety

-Positive Emotion: Pride, Interest, Joy, Gratitude. Amusement
-Negative Emotion: Anxiety

-Positive Emotion: Pride. Interest
-Negative Emotion: Anxiety

-Positive Emotion: Interest. Amusement
-Negative Emotion: Jealousy, Sadness, Hate

-Positive Emotion: Interest, Amusement, Joy
-Negative Emotion: Anxiety, Sadness

-Positive Emotion: Interest
-Negative Emotion: Anxiety, Sadness, Anger

-Positive Emotion: Pride, Interest
-Negative Emotion: Anxiety, Anger, Sadness, hate

Meaning
Accomplishment
Empowerment
Ownership
GEM Framework
Social Influence
Scarcity
Unpredictability
Avoidance

Figure 6.1 Gamified Emotion Management Framework

The core gamification drivers are:

● **Meaning:** Represents the significance or purpose behind an action or behaviour.

● **Accomplishment:** The satisfaction derived from achieving a goal.

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- **Empowerment:** Allowing users or learners to have control and make decisions.
- **Social Influence:** The power of group dynamics and social interactions.
- **Unpredictability:** Introducing elements of surprise or uncertainty.
- **Avoidance:** Motivating users through the prevention of negative outcomes.
- **Scarcity:** Creating value through limiting access or availability.
- **Ownership:** Giving users a sense of possession or attachment.

These elements are associated with positive and negative emotions, which are harnessed to promote the study context such as doctoral students and how emotion regulation and management help with the gamified framework. Each driver is intricately linked to the emotional states of doctoral students. For instance, the sense of accomplishment might alleviate feelings of imposter syndrome, while empowerment can help in combating isolation often experienced in doctoral studies.

The G.E.M Framework is more than just a theoretical response to the emotional challenges identified in this study; it is a forward-looking solution aimed at reshaping doctoral education through emotional support and resilience-building strategies. By providing a structured, gamified approach to managing emotions, G.E.M addresses the unified research question from a proactive stance. It acknowledges the critical role of emotional regulation in information-seeking behaviour and offers a framework that not only supports students' immediate emotional needs but also cultivates long-term resilience and well-being.

The framework's potential applications extend into various fields, suggesting that G.E.M's principles could inform the design of emotion-based support systems in multiple domains. For instance, corporate training programs could adopt G.E.M's gamification strategies to support employees in managing stress and achieving professional goals. Similarly, mental health interventions could use G.E.M-like frameworks to provide structure and positive reinforcement, promoting emotional resilience in long-term therapeutic settings.

The next section is about the comparison of the framework mentioned above to the creation of an e-learning system and a comparison of both.

6.2 E-Learning for Doctoral Student Engagement & Emotion Management

The GEM framework applicability is applied to an E-Learning Environment and compared to the gamification element.

1. Meaning

Application: Connect learning objectives to the student's personal goals.

Gamification Element: Narrative or storyline that aligns with research objectives.

Example: Use storytelling where a student must solve professional skills using the knowledge they gain or apply/publish research milestones.

2. Accomplishment

Application: Celebrate milestones and achievements.

Gamification Element: Badges or certificates for completing research milestones or mastering skills.

Example: Award a "Critical Thinker" badge after a student successfully completes a challenging milestone.

3. Empowerment

Application: Allow doctoral students to choose their learning paths or customize their learning environment.

Gamification Element: Avatars that students can customize as they progress.

Example: As students advance, they can unlock customization options for their avatars.

4. Social Influence

Application: Meetups, peer reviews, Conference discussions or supervisory discussion boards.

Gamification Element: Leaderboards showcasing top-performing students for motivation factors.

Example: Host a monthly discussion where top leaderboard students share their research techniques. Also, senior learning helps to motivate and share resources and strategies.

5. **Unpredictability**

Application: Introduce surprise research articles or serendipity information, or bonus content.

Gamification Element: Mystery boxes containing bonus materials or challenges.

Example: After some achievement, students can get a "mystery box" which might contain a fun video lesson on new challenging concepts.

6. **Avoidance**

Application: Remind students of deadlines or the consequences of not completing meetings or research milestones.

Gamification Element: Time-based challenges.

Example: A research article that needs to be completed within one week, emphasizing time management.

7. **Scarcity**

Application: Offer limited-time access to special content or guest-guided lessons.

Gamification Element: Exclusive badges or content available for a short time.

Example: A guest lecture/training available only for the weekend, followed by a certificate.

8. **Ownership**

Application: Allow students to create their own content or share their notes.

Gamification Element: Personalized learning dashboards.

Example: A dashboard where students can pin their favourite/important research article or add personal notes.

The G.E.M framework, aims when adapted to e-learning, can significantly increase student engagement by tapping into their emotions management through game elements. By blending these elements with traditional gamification tactics, educators/universities can create a rich, immersive, and motivating learning environment. The next section helps to understand when we compare the framework to the core ISP Model.

6.3 Comparison of G.E.M (Gamified Emotion Management) Framework with Kuhlthau's Information Search Process (ISP) Model.

The G.E.M. Framework builds upon concepts from Kuhlthau's ISP Model by adding gamification to the emotional and cognitive aspects of information-seeking. This comparison underscores how the G.E.M. Framework supports doctoral students in managing the emotional complexities outlined in the unified research question, providing structure through game-based incentives and social features to enhance motivation and reduce stress

E-learning environments are enriched by understanding both the cognitive and emotional journeys of learners. Kuhlthau's Information Search Process (ISP) Model and the Gamified Emotion Management (G.E.M) Framework were compared in these respective journeys. This dives into a comparative analysis of these models and suggests their intertwined application in the e-learning space.

Carol Kuhlthau's Information Search Process (ISP) is a model that describes the feelings, thoughts, and actions of users during an information-seeking process, which typically occurs in six stages:

- **Initiation:** Recognizing a need for information.
- **Selection:** Choosing a general topic or specific source of information.
- **Exploration:** Becoming familiar with the topic and possibly feeling uncertainty or confusion.
- **Formulation:** Gaining clarity and focusing on a particular aspect of the topic.
- **Collection:** Gathering relevant information.
- **Presentation:** Completing the search and using the information. Show an image of it
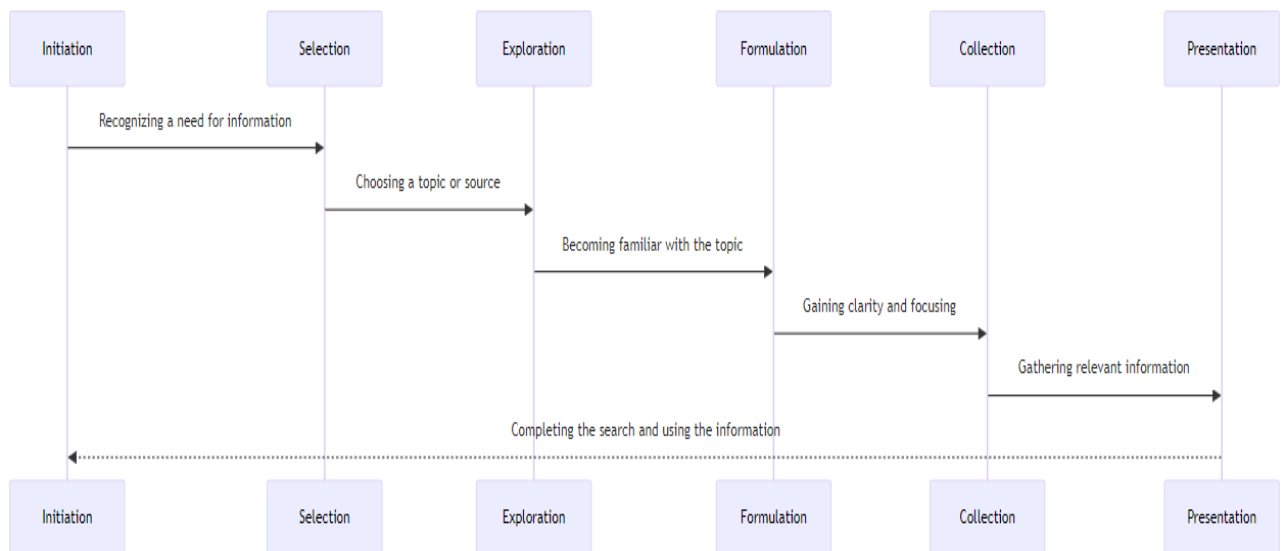
Figure 6.2 ISP Model

The ISP model is compared on different stages and aspects and explains the phenomena that using the intermingled strengths helped create the next futuristic systems. The next section explains the detailed comparative analysis in a tabular format of how the collaboration of GEM and ISP Model strengthens the creation of the E-Learning system for information gathering and how it could help students' information-seeking behaviour.

6.3.1 Comparative Analysis in E-Learning

Table 6.1 explains the E-learning Applicability of ISP and GEM framework.

ISP Model Stage	GEM Aspect	E-learning Application
Initiation	Meaning	Begin with a real-world scenario to highlight knowledge gaps. Follow with the importance of the knowledge to provide meaning.
Selection	Accomplishment	Once a topic or module is chosen, provide a badge upon completion to offer a sense of achievement.

ISP Model Stage	GEM Aspect	E-learning Application
Exploration	Empowerment	Allows students to explore various resources and simultaneously gives them control to customize their learning path.
Formulation	Social Influence	As focus narrows, use discussion boards to allow peer insights that influence or reaffirm direction.
Collection	Unpredictability	Introduce unexpected quizzes or challenges as students gather information to maintain engagement.
Presentation	Ownership	Allow students to create portfolios or reflections, emphasising their ownership of the learning journey.

Table 6.1 E-learning comparison of ISP and GEM Framework

This table encapsulates the relationship between Kuhlthau's ISP Model stages and the GEM Framework aspects, showing how each can be applied in an e-learning context for optimal student engagement and emotion management.

Each stage of this model corresponds to a specific aspect of the learning process, designed to enhance the overall educational experience. This approach combines psychological and educational principles to create a more engaging and effective learning environment. Let's break down each stage in the next section. Also, the E-learning applicability is discussed.

6.3.1.1 Initiation - Meaning

Real-World Scenario: The initiation stage begins with presenting a real-world scenario or problem. This approach immediately engages learners by highlighting the relevance and applicability of the subject matter to their lives or professional fields. Starting with a practical example makes it easier for learners to understand why the knowledge is valuable and worth pursuing.

Importance of knowledge: Following the scenario, the e-learning system emphasises the significance of the knowledge or skills that will be acquired. This step is crucial in providing meaning and context to the learning material, helping learners to understand the broader implications and applications of what they will learn.

6.3.1.2 Selection - Accomplishment

Topic choice: In this stage, learners select a research topic to focus on. This selection process empowers learners by giving them a say in their educational journey, catering to their interests and career goals.

Badge upon completion: Upon completing a module, learners receive a badge or similar form of recognition. This element introduces a tangible sense of accomplishment and motivates learners to continue their doctoral pursuits.

6.3.1.3 Exploration - Empowerment

Resource exploration: Students are encouraged to explore various resources. This could include texts, videos, interactive modules, and more. Such exploration fosters a deeper understanding of the subject matter and caters to different learning styles.

Customisation of learning path: Simultaneously, learners are given control over their learning path. This empowerment is crucial in adult learning theories and helps maintain engagement and enthusiasm throughout the learning process.

6.3.1.4 Formulation - Social Influence

Focus and direction: At this stage, learners begin to narrow their focus and formulate a clearer direction for their research. This process often involves more in-depth and specialised learning.

Discussion boards for peer insights: They allow learners to engage with their peers, gaining new perspectives and insights. This social interaction not only aids in learning but also helps build a community and network. Especially for doctoral students, it also goes along with their career progression.

6.3.1.5 Collection - Unpredictability

Information gathering: Learners are in the thick of acquiring and gathering information. This is a crucial stage where deep learning occurs.

Unexpected challenges: To maintain engagement and reinforce learning, this stage introduces elements of unpredictability, like surprise challenges. These activities help assess understanding and retain interest, especially to avoid boredom and help in motivation.

6.3.1.6 Presentation - Ownership

Creation of portfolios or reflections: In the final stage, learners are encouraged to create portfolios or reflections of their learning journey. This activity consolidates their learning and allows them to evaluate their progress critically.

Emphasis on ownership: Learners take ownership of their education by creating these outputs. This sense of ownership is vital for long-term learning and application of knowledge.

The ISP Model and GEM Framework integrate key psychological elements with educational strategies to create a dynamic, engaging, and effective e-learning environment. Each stage is thoughtfully designed to address different aspects of the learning process, ensuring that learners acquire knowledge and feel empowered, accomplished, and connected throughout their educational journey.

The next section is about GEM framework applicability in various use cases and scenarios and how it helped build the next futuristic systems and create a comprehensive, sophisticated system.

6.4 G.E.M Framework Use Cases

In response to the unified research question, the G.E.M. Framework's use cases address key emotional regulation needs, such as reducing feelings of isolation, managing research-related stress, and fostering intrinsic motivation. Through customizable features like a progress tracker and peer support networks, the framework provides doctoral students with practical tools that align with their unique research challenges

and emotional needs. The next section explains how the GEM Framework can be applied and tested through various use cases.

6.4.1 USE CASE 1: GARS – Gamified Academic Research System for Doctoral Students

Creating a gamified system for doctoral students in their research years offers a unique opportunity to blend academic rigour with engaging, motivational elements. The Gamified Academic Research System (GARS) can be designed to assist doctoral students like Alex, who is in the midst of his dissertation research. The system can use the GEM (Gamification, Emotion, Management) Framework, focusing on three core components: *Gathering Information, Engagement with Research, and Milestone Achievement.*

The next section explains the scenario and persona of a PhD student, Quinn is explained.

6.4.1.1 ALEX PERSONA

Figure 6.3 Alex Persona

Figure 6.3 displays a persona template for an individual named Alex Potter. Here's a summary of Alex's persona:

Name: Alex Potter

Age: 29

Gender: Male

Occupation: Doctoral Student (Year 3)

Location: Manchester

Alex has previously worked as a research assistant for two years, focusing on 20th-century political history.

Goals:

Short-term: Complete his dissertation within the next two years.

Long-term: Become a university professor and a published author in his field.

Personal Aspiration: To contribute significantly to the understanding of political history and its contemporary implications.

Technology Usage:

Proficient with digital tools, comfortable using research databases, academic software, and productivity apps.

Open to gamification, showing interest in innovative ways to stay motivated and organized.

Personality:

Highly analytical, enjoying deep dives into data and historical texts.

Self-motivated but sometimes struggles with maintaining focus over long periods.

Perfectionist, with a strong attention to detail which can sometimes slow down his progress.

Challenges:

Balancing research with teaching responsibilities and personal life.

Feeling isolated due to the solitary nature of his research.

Overwhelmed with organizing and synthesizing vast amounts of information and data.

Dislikes:

Tardiness

Poor time management

Wasteful practices

Products He Enjoys:

Breakfast Alley's macchiato

Free Perks

The Pretty Path lip balm

Use Case: GARS – Gamified Academic Research System for Doctoral Students

The above persona is now compared with GEM Framework steps and in next section explains which scenario and how the framework helps in the creation of

1. Gathering Information: Research Quests and Challenges

Scenario: Alex, a doctoral student in history, uses GARS to embark on 'Research Quests.' Each quest is a challenge to find and review a set number of sources, with different levels of difficulty based on the obscurity or complexity of the material.

Illustration: A quest dashboard showing various quests Alex can undertake, each tagged with topics relevant to his research. Completing these quests earns him points and unlocks advanced research materials.

2. Engagement with Research: Interactive Learning Paths

Scenario: To deepen his understanding, Alex engages with interactive learning paths in GARS. These paths include multimedia materials, quizzes, and peer discussion forums. Active participation and contributions yield points and badges.

Illustration: A 'Learning Tree' where each branch represents a different aspect of his research topic. As Alex progresses through the materials, the branches grow leaves and bear fruit, symbolizing his deepening understanding.

3. Milestone Achievement: Progress Tracking and Rewards

Scenario: Alex sets major milestones in GARS, like completing a chapter draft or presenting at a conference. Achieving these milestones results in significant rewards within the system, like unlocking exclusive content or a virtual conference where he can share his work.

Illustration: A 'Milestone Mountain' that visualizes his progress towards major goals. Each milestone is a checkpoint on the mountain, and reaching the summit represents the completion of his dissertation.

Additional Gamification Elements:

Collaborative Challenges: Group challenges where doctoral students collaborate to solve complex research problems, fostering teamwork and interdisciplinary learning.

Feedback Loop: Regular feedback from peers and mentors within the app, including constructive comments and ratings, encouraging continuous improvement.

Resource Scarcity and Unlocking: Certain high-quality resources or expert consultations are locked behind point thresholds, motivating continuous engagement.

Customization: Allowing users to tailor their research environment within the app, including the organization of resources, themes, and notification settings.

Conclusion

In this scenario, GARS uses the GEM Framework to transform the solitary and daunting task of doctoral research into an engaging, interactive journey. By gamifying the process of gathering information, engaging with research materials, and achieving milestones, the system not only motivates doctoral students like Alex but also provides a structured, supportive environment for their scholarly endeavours. This approach can lead to enhanced learning experiences, better research outcomes, and potentially reduce feelings of isolation and stress commonly associated with doctoral research. It also helps in self-motivation and self-learning with a sense of accountability and visual sensation for long-term projects.

6.4.2 USE CASE 2: Self-Regulation and Emotion Management for Doctoral Students

This use case is about developing the Self-Regulation and Emotion Management System for Doctoral Students to fit the specific needs and personality of Emily, our introverted doctoral student in Environmental Science. The use case scenario provides a detailed narrative of how the system can effectively assist Emily in managing her emotions and stress throughout her doctoral journey. Additionally, the existing tools and comparative studies that underline the effectiveness of such systems are also discussed. Let's dive into Emily's Persona.

6.4.2.1 EMILY PERSONA

USE CASE 2 EMILY NGUYEN

Self-Regulation and Emotion Management System for Doctoral Students

NAME:EMILY NGUYEN

Age: 26
Gender: Female
Occupation: Doctoral Student(Year 1)
Location: Birmingham

GOALS

- Academic Goal: To contribute meaningful research in the field of climate change and its impact on biodiversity.
- Personal Challenge: As an introvert, Emily often feels overwhelmed in large groups and during presentations. She also experiences stress and anxiety due to the high demands of her doctoral program.

CHALLENGES

- Time Management: Balancing research with teaching responsibilities and personal life.
- Isolation: Sometimes feels isolated due to the solitary nature of his research.
- Information Overload: Struggles with organizing and synthesizing vast amounts of information and data.

PERSONALITY

- Introverted, detail-oriented, highly organized, struggles with anxiety, especially in new social situations and under pressure.

DISLIKES

- Tardiness
- Poor time management
- Wasteful practices

Figure 6.4 Emily Persona

Figure 6.4 showing basic information regarding Emily profile to understand her personality traits.

Persona Profile: Emily – Aspiring Doctoral Student

Basic Information

Name: Emily Nguyen

Age: 26

Nationality: American

Field of Study: Environmental Science

Year in Programme: 1st year Ph.D. student

Background and Personality

Undergraduate Degree: B.Sc. in Biology, University of Washington

Master's Degree: M.Sc. in Environmental Science, University of Oregon

Personality Trait

Introverted, detail-oriented, highly organized, struggles with anxiety, especially in new social situations and under pressure.

Hobbies

Nature photography, journaling, and hiking.

Goals and Challenges

Academic Goal: To contribute meaningful research in the field of climate change and its impact on biodiversity.

Personal Challenge: As an introvert, Emily often feels overwhelmed in large groups and during presentations. She also experiences stress and anxiety due to the high demands of her doctoral programme.

Use Case: Self-Regulation and Emotion Management for Emily

Here we discuss how the Self-Regulation and Emotion Management system can be developed.

1)Setting and Character Introduction

Setting: Emily is navigating her first year in a demanding Ph.D. programme at the University of California, Berkeley.

Character: As an introverted individual, she faces unique challenges such as anxiety in social settings, stress from academic pressures, and occasional feelings of isolation. Emily can create her Avatar in-game settings to show her virtual character.

2)System Features Tailored to Emily

Personalized Goal Setting: The system allows Emily to set small, personalized goals, helping her tackle her studies and research in manageable segments. Emily uses the system to set small, achievable research and personal development goals, helping her manage feelings of being overwhelmed. Visualization of goals (like the 'Goal Galaxy') keeps her motivated and focused. This approach is grounded in research showing that breaking down tasks can significantly reduce academic stress (Boekaerts, M., 1996).

3)Mood Tracking and Emotional Awareness

Emily uses a mood tracker to log her emotional states. The system helps her identify patterns, such as increased anxiety before group meetings or presentations. The mood tracker ('Mood Meter') helps Emily recognize patterns in her emotional state, particularly her anxiety triggers. The system suggests strategies and activities to manage stress when high levels of anxiety or stress are detected. A study by Gratz, K. L., & Roemer, L. (2004) emphasizes the importance of emotional awareness in emotion regulation, particularly in high-stress environments like academia.

4) Mindfulness and Stress Management Practices

Regular mindfulness exercises help Emily manage her anxiety, particularly before presentations or meetings. The visual progress in the 'Mindfulness Meadow' reinforces her commitment to daily mindfulness practices. Kabat-Zinn's (2003) work on mindfulness meditation underscores its effectiveness in reducing anxiety and improving mental health.

5)Community Engagement

Engaging with other doctoral students on the forum, especially those who share similar challenges, makes her feel less isolated. Sharing and reading experiences on the forum helps Emily learn new coping strategies. According to Maher, M. A., et al. (2013), peer support is crucial in enhancing doctoral students' emotional well-being.

6)Expert Advice:

Access to resources on managing introversion in academia and coping with imposter syndrome provides Emily with valuable strategies and reassurance.

Comparative Tools and Studies

Apps like *Headspace* and *Calm* offer mindfulness exercises which have been shown to aid in stress reduction, though they are not tailored specifically to doctoral students. A study by Cohen, S., & Janicki-Deverts, D. (2009) highlights the effectiveness of stress management tools in academic settings, suggesting that tailored apps like the one Emily uses could be significantly beneficial.

Unlike general wellness apps, the above mentioned system offers features specifically designed for the academic context - goal setting for research tasks, forums for academic discussion, and stress management techniques relevant to academic pressures.

Conclusion

For Emily, starting her doctoral journey is both exciting and challenging. Her introverted nature and need for constant emotion regulation make her an ideal user for the Self-Regulation and Emotion Management System. This system provides her with a structured approach to manage her emotions and stress, while also offering a supportive community and resources tailored to her needs. Through goal setting, emotional tracking, and mindfulness practices, Emily finds herself better equipped to navigate the ups and downs of her doctoral journey, leading to a more fulfilling and less stressful experience.

6.5 EmoQuest Immserive App Concept

Creating an immersive app using the Octalysis Gamification Framework for Emotion Management is a compelling idea. The Octalysis GEM Framework, inspired by Yu-kai Chou, is based on the understanding that human motivation is driven by eight core drives. Each of these drives can be integrated into an app designed to help users manage and regulate their emotions effectively.All the positive and negative emotions could be regulated by regulating emotions as center for user narratives of Immseive App.

6.5.1 Conceptualizing the App: "EmoQuest"

"EmoQuest" is an immersive app designed to help users understand, regulate, and manage their emotions using gamified experiences based on the GEM Octalysis Framework. The app targets individuals seeking to improve their emotional intelligence, reduce stress, and foster well-being.

1. Epic Meaning & Calling (Core Drive 1)

Application: Users are embarked on a personal journey to become "Masters of Emotion," contributing to a community that values emotional intelligence and support.

Feature: Narratives that frame the user's journey as a quest to help themselves and others.

2. Development & Accomplishment (Core Drive 2)

Application: Structured progress system with challenges and tasks related to emotional management.

Feature: Badges, certificates, and levels to reward progress in emotional awareness and regulation.

3. Empowerment of Creativity & Feedback (Core Drive 3)

Application: Users can create personal emotional management strategies and receive feedback on their effectiveness.

Feature: Tools to craft personalized meditation or mindfulness sessions, with AI feedback on improvements.

4. Ownership & Possession (Core Drive 4)

Application: Users build a virtual "Emotion Garden" that grows and evolves based on their emotional management practices.

Feature: A customizable space that reflects the user's journey and achievements.

5. Social Influence & Relatedness (Core Drive 5)

Application: Community challenges, sharing of experiences, and peer support groups.

Feature: Options to join groups or forums, share achievements, and partake in communal challenges.

6. Scarcity & Impatience (Core Drive 6)

Application: Limited-time events and challenges that offer unique insights and rewards.

Feature: Special events or learning modules available only at certain times, encouraging regular engagement.

7. Unpredictability & Curiosity (Core Drive 7)

Application: Random events or insights about emotional health, creating an element of surprise.

Feature: "Emotion of the Day" or unexpected challenges to maintain user interest.

8. Loss & Avoidance (Core Drive 8)

Application: Reminders of the potential negative consequences of poor emotional management.

Feature: Notifications about the risks of neglecting emotional health, presented in a non-threatening manner.

Implementation and Challenges

User Testing: Essential to ensure the app's features resonate with users' emotional and motivational needs.

Balancing Octalysis Drives: Careful balance to ensure one drive doesn't overpower the others, maintaining a holistic and engaging experience of player.

Privacy and Sensitivity: Handling user data with utmost sensitivity, especially considering the personal nature of emotional information.

"EmoQuest" leverages the Octalysis Framework to create an engaging, supportive, and educational environment for users to explore and improve their emotional health. By addressing all eight core drives, the app ensures a diverse and motivating experience, catering to different user preferences and needs.

6.6 Other Domains

The Octalysis Group's GEM (Gamified Emotion Model) framework, a derivative of Yu-kai Chou's Octalysis framework, offers a comprehensive approach for creating immersive apps as explained above. Its applicability in this domain can be explored through various innovative ideas:

Enhanced User Engagement: Utilizing the GEM framework can help in designing app features that enhance user engagement. This involves incorporating game elements that are known to boost user interest and participation, such as challenges, rewards, and levels.

Personalized User Experience: The framework can be used to create a more personalized user experience. By analysing user behaviour and preferences, the app can adjust its content and challenges, accordingly, making the experience more relevant and engaging for each individual.

Social Connectivity: Integrating social elements based on the GEM framework can foster community building and peer interaction within the app. Features like leaderboards, team challenges, or social sharing can encourage users to connect and engage with others.

Progress Tracking and Feedback: Incorporating progress tracking mechanisms and instant feedback, as suggested by the GEM framework, can motivate users to continue using the app. This can be achieved through visual progress bars, achievement badges, or regular performance summaries.

Narrative and Storytelling: The use of narrative and storytelling, aligned with the GEM framework's emphasis on creating engaging experiences, can make the app more captivating. A storyline that progresses with user interaction can keep users interested and invested in the app.

Adaptive Difficulty Levels: Implementing adaptive difficulty levels can cater to a wide range of users with varying skill sets. This ensures that the app remains challenging yet achievable, keeping users engaged over time.

Real-world Integration: Linking app activities with real-world outcomes or rewards can enhance the immersive experience. For example, completing certain tasks in the app could translate to discounts, physical rewards, or real-life achievements.

Multisensory Experience: Leveraging technology to create a multisensory experience, such as integrating AR/VR elements, can significantly enhance immersion. This aligns with the GEM framework's goal of creating captivating and engaging environments.

Feedback Loops and Iteration: Consistent user feedback loops can be established to continually improve the app. This iterative process, supported by the GEM framework, ensures the app stays relevant and engaging based on user input and changing trends.

Ethical Considerations and Balance: While implementing the GEM framework, it's important to consider ethical aspects and maintain a balance to avoid over-addiction or negative impacts on users' well-being.

In summary, applying the Octalysis GEM framework to immersive app creation involves leveraging gamification principles to enhance user engagement, personalization, social connectivity, and overall user experience, while ensuring ethical considerations and user well-being are addressed.

6.7 Applicability and Benefits of the GEM Framework in Doctoral Education

The Gamified Emotion Management (GEM) Framework, inspired by Yu-Kai Chou's Octalysis Framework, emerges as a revolutionary approach in doctoral education, addressing key challenges in student engagement and motivation. This framework integrates the essence of gamification into the educational process, emphasizing the emotional journey of doctoral students in their information-seeking behaviour.

At the core of the GEM Framework are elements like Meaning, Accomplishment, and Empowerment, each catering to different emotional and motivational needs of doctoral students. By aligning these elements with the emotional states experienced during research and learning, the framework fosters a more engaging and supportive learning environment. For instance, the element of Accomplishment aligns with the students'

need to recognize their progress and achievements, a crucial factor in maintaining motivation in the often-isolating journey of doctoral research.

The application of GEM in e-learning environments signifies a paradigm shift from traditional learning methods. Where conventional approaches may fail to adequately engage doctoral students, GEM introduces gamification elements such as storytelling, badges, and leaderboards, transforming the learning experience into an interactive and emotionally resonant journey. This not only aids in better information retention but also enhances the overall learning experience, making it more relevant and engaging.

A comparative analysis with Carol Kuhlthau's Information Search Process (ISP) Model further underscores the framework's effectiveness. Each stage of the ISP Model, such as Initiation or Exploration, finds a corresponding emotional and motivational component in the GEM Framework. This synergy illustrates how gamification can complement traditional information-seeking models, making them more adaptable to the emotional dynamics of doctoral research.

In practical applications, the GEM Framework demonstrates substantial benefits. For instance, the Gamified Academic Research System (GARS) and Self-Regulation and Emotion Management systems, tailored for doctoral students, exemplify how gamification can be effectively integrated into real-world educational settings. These systems not only cater to the diverse emotional needs of students but also provide a structured approach to managing the complexities of doctoral research.

The conceptualization of the EmoQuest app further extends the applicability of the GEM Framework. This app idea, rooted in the principles of the GEM Framework, aims to provide a personalized, immersive gamified experience, focusing on emotional management and engagement. The app's features, such as structured progress systems and community challenges, are designed to cater to the unique emotional and motivational needs of doctoral students.

In conclusion, the GEM Framework presents a transformative approach to doctoral education. Its emphasis on emotional management through gamification addresses critical gaps in traditional educational methodologies. By enhancing student engagement, motivation, and emotional well-being, the GEM Framework stands as a

significant contribution to the field of higher education, particularly in the context of doctoral studies. Its practical applications and potential for expansion into various educational contexts underscore its versatility and effectiveness as a conceptual framework for modern education.

Aspect	Traditional E-Learning	GEM Framework
Engagement	Often limited due to lack of interactivity	Enhanced through gamification elements like storytelling and leaderboards
Emotional Connection	Minimal focus on emotional aspects	Strong emphasis on emotional management and well-being
Motivation	Relies primarily on external motivators	Balances intrinsic and extrinsic motivators, fostering sustained engagement
Learning Experience	Can be isolating and monotonous	Interactive and resonant, tailored to individual emotional journeys
Personalization	Generally, one-size-fits-all approach	Adapts to individual needs and emotional states, offering a personalized experience

Table 6.2 Comparison of Traditional E-Learning and GEM Framework

This summary and Table 6.2 encapsulate the essence of the GEM Framework's applicability and benefits in the context of doctoral education, highlighting its potential as a game-changer in higher education.

6.8 Challenges

Implementing a gamification model in doctoral education, as inspired by the Octalysis Framework, presents several challenges that need careful consideration and strategic planning to overcome.

One significant challenge lies in the **diversity of student preferences** and responses to gamification. Not all students are receptive to gamified learning methods; some might find them unappealing or even distracting from their academic focus. This variation in

preference necessitates the development of a customizable gamification approach. By allowing students to opt into or out of specific gamified elements based on their individual learning styles and preferences, the model can cater to a wider range of students. However, creating such a customizable system adds complexity to the model and requires careful design to ensure it remains coherent and effective for all users.

Another major challenge is the r**esource-intensive nature** of developing and integrating a comprehensive gamification model. The process demands substantial investment in terms of time, technology, and expertise. To mitigate this, starting with a pilot programme focusing on select aspects of the Octalysis Framework can be an effective strategy. This step-by-step approach allows for gradual expansion as resources become available and provide opportunities for iterative refinement based on initial feedback and outcomes. Seeking partnerships with technology providers and leveraging existing platforms can also help manage resource constraints.

Balancing gamification and academic rigor is a delicate act. The primary goal is to enhance the learning experience without compromising the scholarly demands of doctoral research. This balance requires close collaboration with academic staff to ensure that gamification elements are thoughtfully designed to align with educational objectives. The challenge is to integrate these elements in a way that they support and complement traditional learning methods, rather than overshadow or replace them. Maintaining this balance is crucial for the acceptance and success of the gamification model in an academic setting.

Ensuring the **long-term effectiveness and sustainability** of the gamification model is another hurdle. Student interest and engagement levels can fluctuate over time, and keeping the gamification content fresh and relevant is vital to maintain engagement. This requires regular updates to the gamification content and challenges, as well as the establishment of feedback mechanisms where students can voice their opinions and suggest improvements or new ideas. This continuous evolution of the gamification model is essential to keep it appealing and effective for current and future cohorts of doctoral students.

Each of these challenges underscores the need for a flexible, responsive approach to implementing gamification in doctoral education. By recognizing and addressing these potential hurdles, the model can be more effectively tailored to meet the diverse needs of doctoral students, ultimately enhancing their educational experience and academic success.

CHAPTER 7
CONCLUSION

CHAPTER 7: CONCLUSION & RECOMMENDATIONS

The key findings of this study were discussed in Chapters 5 and 6, providing a comprehensive exploration of the research question: *How do emotions and their regulation influence doctoral students' information-seeking behaviour?* This chapter consolidates the study's insights, clearly identifies novel contributions within the context of prior research, and explicitly links these contributions back to the study's objectives. This chapter is structured as follows: a summary of the study (7.1), a detailed discussion of the contributions to knowledge and practice (7.2), the implications for academic development (7.3), reflections on the study (7.4), directions for further research (7.5), and final remarks (7.6).

The overview of this completed study is presented in the following section.

7.1 Research Overview

This study explored the emotional dimensions of information-seeking behaviour among doctoral students, focusing on emotional regulation within self-regulated learning contexts. Through a mixed-methods approach combining diary-interview methodology, phenomenographic analysis, and a gamification model, the study addressed a critical gap in understanding how emotions impact doctoral research processes. By developing the GEM (Gamified Emotion Management) Framework, this research provides a strategic, future-oriented tool to enhance emotional regulation among doctoral students, thus supporting resilience and engagement throughout their research journey.

7.2 Research Contribution

This study offers both theoretical and practical contributions, addressing unique gaps in the literature and proposing innovative strategies to support doctoral students. Key contributions include the development of the G.E.M Framework and the integration of novel methodologies tailored to understanding emotional regulation in doctoral research. These contributions align with the study's objectives, providing valuable insights for improving doctoral students' experiences and extending gamification research into new academic contexts.

7.2.1 Novel Theoretical Contribution: The G.E.M Framework

The **G.E.M Framework** is a novel approach specifically designed to address the emotional challenges faced by doctoral students. While gamification has been applied in various educational contexts, this study uniquely integrates gamification to target emotional regulation in a doctoral setting—a novel perspective within existing research. Through elements such as goal setting, progress tracking, and peer recognition, G.E.M addresses the motivational and emotional needs of students, aligning directly with the research question and objectives to create a practical support structure for emotional resilience in academic research.

Key Novel Elements:

- **Gamified Emotional Support**: This framework is distinct in its integration of emotional support with gamification elements, a concept largely unexplored in doctoral education.

- **Adaptation of Octalysis in Academic Research**: This study applies the Octalysis Framework in a doctoral context, offering a structured model for emotional resilience that goes beyond traditional cognitive and procedural support in research.

- **Focus on Emotional Regulation in Information-Seeking**: G.E.M fills a critical gap in information science literature by addressing the emotional dimensions of information-seeking behaviour, particularly for doctoral students who face unique psychological demands in long-term research.

7.2.2 Methodological Contribution

The research also introduces a multi-method approach that is novel in its application to gamification and emotional regulation within higher education, especially at the doctoral level. This methodology enhances the reliability and depth of the findings by triangulating data from diaries, interviews, and phenomenographic analysis within a gamified framework.

- **Diary-Interview Elicitation**

Real-Time Emotional Insights: Captures participants' immediate emotional reactions, offering a level of depth and authenticity rarely seen in traditional studies.

Empowerment and Longitudinal Depth: Empowers participants to narrate their experiences, providing longitudinal data that reveals shifts in emotional states over time.

- **Phenomenographic Analysis**

Understanding Variation in Emotional Experiences: Phenomenography's focus on varied experiences allows for a rich categorization of how doctoral students conceptualize and manage emotions throughout their research journey, fulfilling the objective of exploring the emotional landscape of doctoral study.

- **Integration with Gamification**

Framework for Examining Gamification's Emotional Impact: By combining these methodologies, the study contributes to understanding how gamification influences emotional regulation, which is particularly valuable in doctoral education—a novel application that can serve as a model for future research in educational and professional contexts.

7.2.3 Contextual Contribution

There are opportunities to expand on this research. There is a significant gap in the literature where this research helps to contribute to the new phenomena and contextual understanding of doctoral research. For example,

1. **Limited Research on Gamification in Doctoral Education**

Currently, there is a significant gap in research specifically targeting the use of gamification in doctoral education. While gamification has been extensively studied in general and undergraduate education, its application and effectiveness in the unique context of doctoral studies still need to be explored. Doctoral students encounter distinct challenges, such as heightened stress and isolation, which demand specialised gamification strategies. This presents an opportunity for the GEM Model to contribute valuable insights and potentially pave the way for new research in this area.

2. Emotional Management through Gamification

A notable research gap exists in exploring gamification's impact on the emotional aspects of learning, especially in doctoral education. Existing literature primarily focuses on cognitive and behavioural outcomes like engagement and learning retention. However, the potential of gamification to aid in managing the emotional journey of doctoral students, a crucial element of their research process, is not well documented. This research addresses this gap by highlighting how gamification can support emotional well-being and resilience, particularly through the Octalysis Framework.

3. Long-Term Impact and Sustainability

The long-term effects and sustainability of gamification in educational contexts, particularly for doctoral students, are areas that require more in-depth research. There is a lack of longitudinal studies assessing the enduring impact of gamification strategies on doctoral candidates. This research has the potential to provide critical data on how these strategies influence doctoral students throughout their studies, filling a significant gap in the current literature.

4. Integration of Octalysis Framework in Academic Settings

Another gap in existing research is the specific application of Yu-Kai Chou's Octalysis Framework in academic settings, especially at the doctoral level. While the framework is renowned in the field of gamification, its direct application in higher education, particularly for doctoral programmes, is not extensively studied. This presents a unique opportunity for this research to demonstrate the practical application and benefits of the Octalysis Framework in an academic context.

5. Cultural and Demographic Variability

Research on how cultural and demographic factors influence the effectiveness of gamification strategies in higher education is limited. Given the diversity of doctoral student populations, understanding how these factors impact the adoption and effectiveness of gamification is crucial. Using this research as a base further study could

explore how different cultural and demographic groups respond to gamification, offering insights into tailoring these strategies to a diverse student body.

6. Quantitative and Qualitative Measures of Gamification Impact

There is a need for research that employs both quantitative and qualitative methods to assess the impact of gamification comprehensively. Such an approach is particularly important in doctoral education, where the effects of gamification on emotional well-being, information-seeking behaviour, and academic performance are multifaceted. By adopting a mixed-methods approach, this research provides a more holistic understanding of gamification's role in doctoral education.

By addressing these gaps, this research not only enriches the academic discourse on gamification in higher education but also offers practical insights for implementing effective gamification strategies in doctoral programmes. This significantly enhances the doctoral student experience, making your work a valuable contribution to the field.

7.3 Reflections on this study

The unified research question enabled a focused exploration into how emotions shape the research experiences of doctoral students and allowed for targeted development of strategies like the G.E.M. Framework. This approach has not only deepened our understanding of emotional regulation in academic research but also provided an actionable framework that can support doctoral students in real-world academic environments.

7.3.1 Limitations of the selected approach

This research, while providing valuable insights, is not without its limitations. These limitations can be better understood by examining specific areas of concern.

Firstly, the validity concerns in exploratory research are notable. This approach, akin to choreography, employs open-ended procedures to capture the complexities of social environments. However, it may lack the rigorous validation processes typical of more structured research methodologies. The subjective nature of the data, particularly in self-reported research, can lead to biases and inaccuracies. Secondly, the subjectivity

and reliability of self-reported research are highly dependent on the investigator's skills and the integrity of the research process. Unlike controlled laboratory experiments, this approach lacks systematic methods to test data reliability and validity, making it susceptible to subjective interpretations and potential biases.

The interpretation of 'truth' is another critical aspect. The validity of findings is contingent upon the interpretation of 'truth', which is verified through observation and interaction. This subjective nature of truth can lead to varied interpretations, potentially impacting the objectivity of the research findings. In terms of data collection methods, diaries and interviews, while providing insight into emotional development and authentic experiences, heavily rely on participant willingness and openness. This reliance can lead to selective reporting and may not accurately represent a broader population.

The researcher's personal involvement also plays a significant role. The researcher's personal experiences and perspectives can influence the findings, introducing bias as the researcher may unconsciously steer the research towards preconceived notions or hypotheses. Interview objectivity and bias are also concerns. Despite efforts to maintain neutrality, interviewer and interviewee biases can skew the data. The time commitment required for interviews may deter some participants, potentially leading to a non-representative sample.

The study's focus on gamification's impact on intrinsic and extrinsic motivation may not adequately consider individual differences in personality and behaviour. This limitation suggests that the findings may not be universally applicable across different demographic groups. Lastly, the use of the GEM and Octalysis frameworks, while providing a structure for the study, may not encompass all aspects of cognitive and emotional engagement. A comparison of these frameworks with others across various domains could offer a more comprehensive understanding.

In summary, the limitations of this research approach stem from its reliance on subjective methods like diaries and interviews, the potential biases introduced by the researcher's involvement and interpretation of 'truth', and the challenges in ensuring objectivity and representativeness in the data. Additionally, the focus on specific

frameworks like GEM and Octalysis may not capture the full spectrum of gamification's impact on different individuals, suggesting a need for broader comparative studies.

7.4 Directions for Future Research

No study can be considered the final verdict, and the participants did express the wish to extend it. Future improvements of an idea are a way to keep it alive. This direction opens doors not only to extend the current understanding but also open new avenues for practical applications and theoretical advancements:

Cross-Cultural Studies: Investigate how cultural differences impact the perception and effectiveness of gamification methodologies. This could involve comparing diary entries and phenomenographic analyses from participants in diverse cultural settings.

Longitudinal Studies: Conduct long-term studies to observe how the impact of gamification methodologies evolves over time. This could provide insights into the sustainability of gamification effects and changes in participant perceptions.

Comparative Studies Across Domains: Apply the methodology in different domains such as education, healthcare, corporate training, and entertainment. Comparing findings across these domains could reveal domain-specific nuances and broader gamification principles.

Technological Advancements in Gamification: Another potential avenue for further research involves the inclusion of emerging technologies like virtual reality (VR), augmented reality (AR), and artificial intelligence (AI) which can enhance gamification strategies. Diaries could capture user experiences with these technologies, and phenomenography could analyse the conceptual understanding of these experiences.

Personalization in Gamification: Investigate how gamification can be personalized based on individual differences revealed through diary entries. This could lead to the development of adaptive gamification systems that respond to individual user needs and preferences.

Impact on Mental Health and Well-being: Examine the effects of gamification on mental health and emotional well-being. This is particularly relevant in contexts like online learning and remote work, where engagement and motivation are critical.

Ethical Considerations and Gamification: Investigate the ethical implications of gamification, especially in terms of user autonomy, consent, and data privacy. This is crucial as gamification becomes more pervasive in various aspects of life.

Gamification and Inclusivity: Research how gamification can be designed to be inclusive and accessible to diverse populations, including those with disabilities or those from marginalized communities.

Educational Outcomes and Gamification: Specifically in the context of education, investigate how gamification impacts learning outcomes, student engagement, and motivation over different educational stages and subjects.

By pursuing these directions, future research can significantly contribute to the understanding of gamification methodologies, their impact, and their potential applications across various fields and contexts.

7.6 Final Remarks

This underscores the vital interplay between emotions and Information Seeking Behaviour (ISB) among doctoral students. This study not only identifies the challenges these students face in navigating the intricate landscape of information seeking but also highlights the pivotal role of emotional self-regulation in this process. By acknowledging the polygonal nature of emotions in the realm of academic research, the study brings to light the often-overlooked emotional dimensions of doctoral research.

Crucially, this study does more than merely identify the problem; it proposes a novel and potentially transformative solution in the form of a gamified framework. By integrating game-like elements such as rewards, challenges, and feedback, the framework aims not just to assist in information acquisition but to revolutionize the emotional landscape of the process. This innovative approach recognizes that the path to effective information seeking is not solely cognitive or procedural but deeply emotional.

The potential of this gamified framework is manifold. First, it offers a tangible solution to the emotional challenges of ISB, effectively bridging the gap between emotional states and academic tasks. By transforming the often-arduous journey of research into an engaging and motivational experience, it addresses the core issue of emotional regulation. Second, the framework is adaptable and can be tailored to suit the diverse needs and emotional profiles of different doctoral students, thus offering a highly personalized approach to information seeking.

Furthermore, this study contributes significantly to the academic discourse on information seeking by highlighting the role of gamification in educational contexts. It opens up new avenues for research into how game elements can be effectively utilized in serious academic settings, challenging traditional notions of academic research processes.

In conclusion, this study not only provides a deeper understanding of the emotional complexities faced by doctoral students in their information-seeking journey but also presents a groundbreaking solution that has the potential to reshape the landscape of doctoral research. The implications of this research are far-reaching, offering valuable insights for educators, researchers, and students alike. By harnessing the power of gamification, this framework sets the stage for a new era in academic research, one that acknowledges and actively engages with the emotional dimensions of learning and information seeking.

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APPENDICES

APPENDIX A: The process of the literature review

The table below demonstrates the literature review process, which is informed by the thesis's aim and objectives.

The Search terms were used. **with (AND, OR ,NOT).**	Doctoral students, information-seeking behaviour of students, the impact of emotions on information behaviour, experiences of students while looking for information, doctoral students' failure, Emotional management strategies of the doctoral student, practical guidelines of the learning curve of students, emotional journey of students especially doctoral student, gamification and motivation, self-learning theories, Motivational strategies for information-seeking behaviour, gamification, Octalysis gamification model, intrinsic and extrinsic motivation as well as various combinations of the preceding terms.
Databases searched	MMU library, MMU online database, google website, JSTOR, ScienceDirect, IEEE Xplore, SpringerLink, ProQuest, google scholar
Years of search	Mostly 2000-2022
Language	English
Inclusion criteria (why did **you include it?)**	This thesis targeted claims or supporting evidence that contribute to the aim of the thesis with any research in information-seeking behaviour, emotions, doctoral students, gamification, and technology.
Exclusion criteria (why did **Do you rule it out?**	Any research in information systems that is not supporting the research aim and objectives, and any research that focuses more on system analysis and library searching algorithm.

APPENDIX B: Ethics Form

Investigate the Emotional Journey of Doctoral Students Through the Lenses Of Information Seeking Behaviour And Gamification

Aims of the Research

This study seeks to explore the emotional journey of Doctoral students from the perspective of information-seeking behaviour (ISB) and gamification. Drawing on mixed methods, the study investigates the feelings and emotions encountered in gathering information and identifies how gamification might help doctoral students overcome the motivational deficit that underpins their knowledge gap. The sample of participants includes PhD students at any UK university. The study takes a micro-approach, allowing for more in-depth data collection that is more suitable for exploring complex behavioural activities.

Invitation

You are being invited to consider taking part in the research study '**To Investigate the Emotional Journey of Doctoral Students through the lenses of Information Seeking Behaviour and Gamification'**. This project is being undertaken by Amira Ahmed, a researcher at Manchester Metropolitan University.

Before you decide whether or not you wish to take part, it is important to understand why this research is being done and what it will involve for you. Please take the time to read this information sheet carefully and discuss it with friends and relatives if you wish. Please ask if there is anything that is unclear or if you would like more information. Please take time to decide whether or not to take part.

What is the purpose of the study?

The aim of the study proposed here is to help better understand the general Information Seeking Process (ISP) of the participants and the patterns of their information-seeking activities and how we can model their behaviour through gamification. The study seeks to find out what emotions they are going through in their information-seeking activities, and to recognize the role of gamification in improving their information-seeking activities. Moreover, the study tries to find out challenges of implementing gamification for behaviour investigation. The research study will form part of Amira Ahmed's doctoral thesis, for the award of Doctor of Philosophy.

Why I have been chosen?

You have been asked to participate in this study as an individual who is currently enrolled as a first year PhD student and are over the age of 25 and are able to provide informed consent.

Do I have to take part?

You are free to decide whether you wish to take part or not. I will describe the study to you and read aloud the information sheet and consent form. If you do decide to take part you will be asked to sign two consent forms, one is for you to keep, the other is for our records. This will show you have agreed to take part. You are free to withdraw from this study at any time and without giving reasons.

If I take part, what will I have to do?

Be available to attend during the course of the seven weeks where possible. The timings of the sessions will take in to account childcare and other commitments, for example they will only run during school term time and finish before 3pm. During the interview I ask that you discuss your emotions and feelings and answer questions to the best of your ability.

What are the risks (if any) of taking part?

Any risks that may occur from taking part in this study relate to the possible identification of the participant. To alleviate this risk all participants will be anonymised and any distinguishing data removed. This will pay particular attention to the problems and psychological perspective.

What are the benefits of taking part?

We hope that this study will help you with emotional guidance while commencing your research and will help you to be better understand your information research process and filled your knowledge gap in gamify way. It is hoped that the programme of sessions will be a positive experience for participants.

How will the information about me be used?

The data collected will be used for this study, this includes the communication of the project at conferences or within academic journals where appropriate. No personally identifiable information will be made available, this includes removing images that show people and editing to obscure any other identifiable features.

Who will have access to information about me?

All information disclosed during the study will be confidential and only used for the purposes of this study. I do work within the confines of current legislation, the Data Protection Act 1998, over such matters as privacy and confidentiality, data protection and human rights, and so offers of confidentiality may sometimes be overridden by law.

All data will be stored on a password-protected computer and the participant will only be identifiable to me as documents will be anonymised. Any hard copies of data will be kept in a locked filing cabinet, the only key holder and password holder will be the researcher Amira Ahmed. The data will be securely stored for ten years, following the England Research Code of Practice as per ERCOP standards, and protected with a password.

What if I don't carry on with the study?

If you do not carry on with the study any information from you may still be used in anonymised form. This includes any images collected. This can be done upon request if you wish for any identifiable data to be destroyed.

Who is sponsoring the research?

The research is self-funded research by the researchers currently studying at Manchester Metropolitan University.

What if there is a problem?

If you have a concern about any aspect of this study, you may wish to speak to the researcher who will do their best to answer any questions you may have. You should contact Amira Ahmed, at amira.ahmed@stu.mmu.ac.uk .Alternatively, if you do not wish to contact the researcher you may contact their Director of Studies, Dr Frances Johnson at f.johnson@mmu.ac.uk.

If you remain unhappy about the research and/or wish to raise a complaint about any aspect of the way that you have been approached or treated during the course of the study please write to Professor David W Raper, who is the University's contact for complaints regarding research using the following details: -

Professor D W Raper
Director of Research and Knowledge Exchange
mailto:d.w.raper@mmu.ac.uk
0161 247 6213

APPENDIX C: Consent Form

investigate the emotional journey of doctoral students through the lenses of information-seeking behaviour and gamification.

Consent Form

Name and contact details of principal investigator: Amira Ahmed mailto:amira.ahmed@stu.mmu.ac.uk.

Please tick the box if you agree with the statement:

Select I confirm that I have read and understood the information sheet for the above study and have had the opportunity to ask questions.

Select I understand that my participation is voluntary and that I am free to withdraw at any time.

Select I agree to take part in this study.

Select I understand that the data collected about me during this study will be anonymised before it is submitted for publication.

Select I agree to the interview and experiment being audio and video recorded.

Name of Participant _____Date_____

Signature _____

Researcher_____Date_____

Signature _____

Consent Form (for the use of quotes)

Name and contact details of principle investigator: Amira Ahmed, amira.ahmed@stu.mmu.ac.uk
 Please note: all quotes are anonymous.
Please select the drop-down if you agree with the statement.
 Select I agree for any quotes to be used.
Name of Participant
_____Date_____
Signature _____
Researcher_____Date_____
Signature _____

PARTICIPANTS NEEDED

FOR DOCTORAL STUDENTS' EMOTIONS REGULATIONS TOWARDS INFORMATION SEEKING
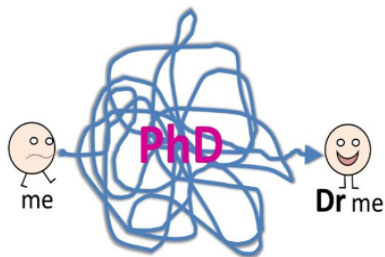
BRIEF DESCRIPTION OF STUDY:

This study uses a mixed method approach to explore **emotional dimensions of the doctoral candidates' journey in information seeking to identify the potential for gamification.** The study focuses on investigating the thoughts, feelings, and emotions encountered in gathering information to identify how gamification might help research students' emotion regulation for better doctoral years.

WHAT IS INVOLVED?

Participation in this study would involve in focused facebook group for day to day observation and four face-to-face interviews (duration: 35 mins each on quarterly basis). To protect participant's identity, no identifying information will be used and all data collected will be anonymised.

WHO CAN PARTICIPATE?

Any doctoral researchers from across any UK University at any stage of research. They can be from any discipline.

If you are interested please contact Amira Ahmed (amira.ahmed@stu.mmu.ac.uk) or her supervisors, Dr. Frances Johnson (F.johnson@mmu.ac.uk), or Dr. Geoff Walton (G.Walton@mmu.ac you can join the Facebook Group:https://www.facebook.com/groups/1988863798016761/

APPENDIX E: Participant's Data Sampling

Participant #	Age	Gender	Marital Status	Nationality	Discipline		Phase
1	19-28	Female	Engaged	China	Arts and Humanities	2nd Year	Middle
2	39-48	Female	Married With kids	Qatar	Computer Sciences	3rd Year	Final
3	29-38	Female	Separated/Divorce	France	Science & Technology	>1st Year	Early
4	19-28	Female	Engaged	China	Arts and Humanities	3rd Year	Final
5	29-38	Female	Married	UK	Computer Sciences	1st Year	Early
6	39-48	Male	Single	Pakistan	Science & Technology	>1st Year	Early
7	29-38	Male	Single with kids	Poland	Health & Social Care	4th Year	Final
8	29-38	Male	Married	UK	Computer Sciences	1st Year	Early
9	39-48	Male	Single	UK	Arts and Humanities	>1st Year	Early
10	19-28	Female	Single	India	Other	2nd Year	Middle
11	49-58	Male	Other	India	Arts and Humanities	2nd Year	Middle
12	19-28	Female	Married	China	Arts and Humanities	2nd Year	Middle
13	49-58	Male	Other	China	Other	2nd Year	Middle
14	19-28	Female	Married	UK	Science & Technology	3rd Year	Final
15	19-28	Female	Single	UK	Health & Social Care	>1st Year	Early
16	29-38	Male	Married	Pakistan	Science & Technology	3rd Year	Final
17	39-48	Female	Single with kids	UK	Arts and Humanities	4th Year	Final
18	29-38	Male	Married	Poland	Health & Social Care	3rd Year	Final
19	29-38	Female	Married With kids	Saudia Arabia	Computer Sciences	2nd Year	Middle
20	39-48	Female	Married With kids	Qatar	Science & Technology	>1st Year	Early
21	29-38	Female	Married	UK	Computer Sciences	>1st Year	Early
22	29-38	Female	Married With kids	UK	Computer Sciences	1st Year	Early
23	29-38	Female	Married With kids	UK	Business &Economics	1st Year	Early
24	39-48	Female	Married	Saudia Arabia	Business &Economics	3rd Year	Final
25	29-38	Female	Engaged	Qatar	Computer Sciences	2nd Year	Middle
26	29-38	Female	Married	China	Science & Technology	>1st Year	Early
27	29-38	Female	Married With kids	Pakistan	Business &Economics	2nd Year	Middle
28	39-48	Female	Engaged	China	Business &Economics	2nd Year	Middle
29	29-38	Female	Married	Qatar	Computer Sciences	2nd Year	Middle
30	29-38	Female	Married	UK	Other	3rd Year	Final
31	19-28	Male	Married	China	Science & Technology	3rd Year	Final
32	19-28	Female	Married	UK	Arts and Humanities	3rd Year	Final
33	19-28	Female	Single	France	Arts and Humanities	1st Year	Early
34	19-28	Female	Engaged	UK	Science & Technology	3rd Year	Final
35	39-48	Male	Separated/Divorce	Pakistan	Computer Sciences	2nd Year	Middle
36	29-38	Male	Married	Saudia Arabia	Computer Sciences	4th Year+	Final

APPENDIX F: Self-Regulatory Emotion Tool(SRET)

For drop-down information follow this link.

For results and findings from SRET follow this link.

Investigating Doctoral Emotional Journey through the Lenses of Information Seeking Behaviour and Gamification.

Feedback Rules

Thank you for taking the time to agree to give part in this research. Please follow the housekeeping rules:

- Please fill in your demographic data, and don't put your name in your diary. All personal data will be anonymised and coded.
- Fill up your diary by keeping in mind your previous week's activities in terms of working on your doctoral research activities, specifically when you are researching and looking for information (it can be researching topics/articles/conference working/self-learning or reading/writing articulating, gathering or linking research)
- This is an emotion recognition tool so you can recognise emotion when a bodily sensation happens (such as your heart beating faster), or you have thoughts coming into your mind that are hard to stop, or you find yourself acting or feeling like working emotionally.
- Please complete it as soon as possible and remember there are no right or wrong answers.
- Please return this diary as soon as you finish so you will be ready for the next phase: a one-to-one interview to explore in depth.

DEMOGRAPHICS

1. Do you identify as : Select Gender

2. How old are you? : Select Age

3. What is your family status: Select Status

4. What is your country of origin: Select Country Specify:_____

5. What phase your PhD journey is: Select study year

6. What is your PhD subject: Select Subject

[1]SELF-REPORTING EMOTION TOOL (SRET)

1. What was your research goal last week? Select one
2. How successful were you in achieving your goal from last week? Select one
3. *How did you feel while <u>trying to accomplish</u> your goal last week? Please indicate your rating for ALL the emotions listed below.
   (a) Enjoyment: Select one   (f) Anxiety:Select one
   (b) Hope: Select one   (g) Shame:Select one
   (c) Pride: Select one   (h) Hopelessness:Select one
   (d) Relief: Select one   (i) Boredom:Select one
   (e) Anger: Select one   (j) Other(Specify_____)
4. What possible <u>reason</u> do you think about causing particular emotions while looking for information? Select one Something else (Specify_____)
5. What external factor influenced your information retrieval behaviour at this research stage?

   Select or specify_____

6. How do you regulate your emotions while engaged in day-to-day dissertation activities at this stage?

   Select or specify_____

Final Thoughts:
Is there anything you want to specify /mention/elaborate on?
Please say briefly.

_____
_____
_____

Are there important things about your emotions that we have not asked about? Please say briefly.

_____
_____
_____

Thank you for taking the time to fill this up. See you during
the interviews

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[1] *Achievement Emotions Questionnaire (Pekrun, Goetz, & Perry, 2015),PANAS Scale (Watson, D.,Clark, L. A., & Tellegen, A. 1988),Social Cognitive Perspective(Zimmerman,B.J.,2012)*

INTERVIEW OPEN QUESTIONS/PROBES

- Could you explain how you perceived emotions?
- What's working and what's not in terms of your research work?
- Significant tasks that are challenging for you? What is an achievement goal for you?
- You mentioned this emotional regulation strategy. Would you elaborate on how it works for you?
- Task: Map your research journey using learning (cognitive) vs emotional (Human) milestones that were kept in mind last week.

Researcher: Amira Ahmed ([amira.ahmed@stu.mmu.ac.uk])

Director of Research: Dr Frances Johnson ([f.johnson@mmu.ac.uk])

APPENDIX G: Participants Coding and Pseudonym

Participant ID	Phase	Pseudonym
P1	Early Phase	Alice
P2	Early Phase	Bruce
P3	Early Phase	Clara
P4	Early Phase	Dexter
P5	Early Phase	Elsa
P6	Early Phase	Frodo
P7	Early Phase	Gandalf
P8	Early Phase	Hermione
P9	Early Phase	Indiana
P10	Early Phase	James
P11	Early Phase	Katniss
P12	Early Phase	Luke
P13	Middle Phase	Monica
P14	Middle Phase	Neo
P15	Middle Phase	Olivia
P16	Middle Phase	Peter
P17	Middle Phase	Quinn
P18	Middle Phase	Rachel
P19	Middle Phase	Sherlock
P20	Middle Phase	Tony
P21	Middle Phase	Ursula
P22	Middle Phase	Vito
P23	Middle Phase	Walter
P24	Middle Phase	Xavier
P25	Final Phase	Yoda
P26	Final Phase	Zelda
P27	Final Phase	Arya
P28	Final Phase	Bilbo
P29	Final Phase	Cedric
P30	Final Phase	Daenerys
P31	Final Phase	Eowyn
P32	Final Phase	Finn
P33	Final Phase	Groot
P34	Final Phase	Han
P35	Final Phase	Ivy
P36	Final Phase	Joker