

Psychological empowerment, employee digital competence and innovative work behaviour

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DECLARATION

I, Uvarajan Naidoo, declare that this research report entitled '*Psychological empowerment, employee digital competence and innovative work behaviour*' is my own unaided work. I have acknowledged, attributed, and referenced all ideas sourced elsewhere. I am hereby submitting it in partial fulfilment of the requirements of the degree of Master of Management in the Field of Digital Business the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this University or any other institution.

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Signed at Centurion, Gauteng, on the 30th day of April 2024

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ABSTRACT

In the digital economy, companies must become more effective at quickly creating, modifying, and providing products and services that can meet customers' constantly changing needs. Given the extremely competitive and dynamic business climate of the telecom industry, innovation has emerged as a crucial driver of growth and survival. Innovation in organisations is driven by the ingenuity and creativity of its employees; hence organisations and leaders are continuously looking for ways to harness the qualities of innovative work behavior (IWB) and understand its determinants. Innovation demands fundamentally that employees in the organisation have the intrinsic motivation, mindset, required competencies and the willingness to promote innovation. To this end, this cross-sectional study focused on an SA telco organisation, with the aim to investigate the mediating effect of psychological empowerment (PE) on the relationship between employees' digital competence (EDC) and employees' innovative work behavior (EIWB). The study evaluated the intricacies of this mediation process, seeking to uncover if PE influenced the association between EDC and EIWB. Data was collected from a sample 358 employees working across six business units (BUs) in a single telco through the use of a self-administered online survey questionnaire. The BUs that were accessible had to be limited to a certain number and selected upfront, hence a non-probability purposive sampling approach had to be used.

Covariance-Based Structural Equation Modeling (CB-SEM) was used to analyse the data. The study's findings revealed all constructs (EDC, EIWB and PE), had a significant positive relationship with each other, and the PE partially mediated the relationship between EDC and EIWB. The findings implies that developing competencies like DC in employees, tends to have a positive influence on their self-motivation and attitude towards their work, which in turn could result in higher levels of IWB. Future researchers could conduct a longitudinal study, which tends to work more effectively for mediation models, as well as evaluate different types of mediation models (serial, multi), as well as introducing moderators like leadership style.

Keywords: digital competence, employee digital competence, innovative work behavior, employee innovative work behavior, psychological empowerment

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LIST OF ACRONYMS

Table 1: List of Acronyms

AI	Artificial Intelligence
AMO	Ability, Motivation and Opportunity model
Amos	IBM SW add-on for structured equation modelling
BPNS	Basic Psychological Needs Satisfaction
DC	Digital Competence / Competency (as per context)
DCA	Digital Capability
DI	Digital Innovation
DL	Digital Literacy
DM	Digital Maturity
DO	Digital Orientation
DT	Digital Transformation
EDC	Employee Digital Competence (Study Construct)
EIWB	Employee Innovative Work Behavior (Study Construct)
FLEs	Front Line Employees
genAI	generative AI
GSMA	Global System for Mobile Communications Association
HR	Human Resources
ICT	Information and Communications Technology
IG	Idea Generation (IG) (Stage 2 of IWB)
IoT	Internet of Things (IoT)
IP	Idea Promotion (IP) (Stage 3 of IWB)
IR	Idea Realization (IR) (Stage 4 of IWB)
IWB	Innovative Work Behavior
JCM	Job Characteristics Model
JP	Job Performance
KH	Knowledge Hiding
LTE	Long Term Evolution
LTE-A	Long Term Evolution-Advanced
MEC	Multi-access Edge Computing
N	Sample size
NTNs	Non-Terrestrial Networks
OE	Opportunity Exploration (Stage 1 of IWB)
OTTs	Over-The-Top service providers
PE	Psychological Empowerment (Study Construct)
PLS-SEM	Partial Least Squares - Structural Equation Modelling
RO	Research Objective

RQ	Research Question
SA	South Africa
SCT	Social Cognitive Theory
SDT	Self-Determination Theory
SEM	Structural Equation Modelling
SMEs	Small and Medium sized Enterprises
SoC	Sense of Community
SPSS	IBM Statistical Package for the Social Sciences
Survey	Online
Telcos	Telephony and Connectivity operators
URL	Uniform Resource Locator
VUCA	Volatile, Uncertain, Complex, and Ambiguous
WPL	WorkPlace Learning

CHAPTER 1. INTRODUCTION

The introductory chapter of this research study sets out to fulfil four key objectives for the reader:

1. Highlighting the purpose, background, and context of the study.
2. Articulating the research problem and rationale.
3. Highlighting the research objectives and research questions of the study.
4. Indicating the delimitations and limitations of the study.

1.1 Statement of purpose

The purpose of this study was to investigate whether psychological empowerment (PE) influences the relationship between employee digital competence (EDC) and employee innovative work behavior (EIWB), by conducting a study on a South African (SA) telephony and connectivity operator (telco).

1.2 Background and Context of the study

1.2.1 *Global Telco Technology Trends*

According to the Global System for Mobile Communications Association (GSMA) Intelligence Global Mobile Trends 2024 report (Hatt et al., 2023), the telco industry globally has to deal with four key trends today:

- Around 20% of people worldwide are using 5G, and that number has risen throughout the past year by 7%. As users switch from 4G to 5G, there is a chance for tariff upselling. However, given the impact of economic instability and the continued difficulty in finding the "killer app," which has not lived up to the hype surrounding AR/VR services, 5G is still some way from dramatically affecting the rise of mobile revenue (Hatt et al., 2023).
- In response to enterprise demand for customized solutions at or near their premises, B2B customers appear to be progressively creating a trend toward looking at private wireless networks (4G or 5G), including multi-access edge computing (MEC) and internet of things (IoT) technology into the service packages offered (Hatt et al., 2023).
- Telcos have begun using artificial intelligence (AI) in chatbots and network fault diagnosis, and it is anticipated that generative AI (genAI) will facilitate growth in the industry via more intelligent services and marketing (Hatt et al., 2023).

- The integration of Non-Terrestrial Networks (NTNs) standards into 5G standards offers a chance for affordable network capacity increases and coverage options.

1.2.2 *The Digital Economy*

The convergence of computing and communications technology has developed and flourished over the last thirty years, such that the internet and mobile communications have become an intrinsic part of today's society and everyone's lives (Levin & Mamlok, 2021). This has given rise to the so-called digital economy which comprises markets using digital technologies to facilitate the exchange of goods and services via online commerce (OECD, 2013).

1.2.3 *Threats to Telco Business Model in the Digital Economy*

In the past telcos' business strategies were centred on long-term infrastructure expenditures paid for by connection fees, recurring subscriptions, and usage-based services. Deregulation in this industry saw changes as a result of new "unsuspected" players, or Over-The-Top service providers (OTTs) offering services online in addition to existing direct competitors (Fernandes & Cruz, 2021). OTTs use telcos' infrastructures to deliver their services via the Internet to the telcos' customers without incurring any fees or being subject to any regulations. competing with comparable services offered by the telcos, threatening viability of the telcos established business models and their survival (Fernandes & Cruz, 2021).

Telcos face another dilemma that is common to most technology organisations, and is best articulated by the theory of ambidexterity (March, 1991; Tushman & O'Reilly III, 1996). The theory of ambidexterity states that an organisation must be able to implement both incremental (exploitation) and revolutionary (exploration) change. In other words, being able to innovate can be constrained by the available resources in the organisation and the prioritisation between delivering on the daily operational needs of the business as well as gearing up to a changing market landscape driven in most cases by advances in technology (Tushman & O'Reilly III, 1996). Revenue gained from the ongoing business very likely has to fund the innovation activities.

The SA mobile market is saturated, limiting the potential for subscriber growth (FitchSolutions, 2024). The rising cost of food and energy has led to increased inflation, which has reduced consumer buying power. Data usage and demand for data continues to increase, despite the average revenue per user (ARPU) taking strain (FitchSolutions, 2024). As is reflected in the technology trends, 5G technology is starved of feasible use cases, and has not really taken off yet (Hatt et al., 2023).

1.2.4 Innovation in the Digital Economy for SA Telcos

From the trends in the telco industry as well as threats faced, for SA telcos it is clear that evolution into digital services providers is a necessity to remain relevant and profitable. In the digital economy, they must become more effective at quickly creating, modifying, and providing services that can meet customers' constantly changing needs (Drobyazko et al., 2019; Ranju & Versha, 2012). The liberalization, privatization, and globalization characteristics of the telco market produces intense competition, which makes it more difficult for telcos to increase their market share and thereby their customer base, sales volume, and profit (Hajar et al., 2020). Given the extremely competitive and dynamic business climate of the SA telco industry, innovation has emerged as a crucial driver of growth and survival.

The necessity and reasons for telcos to leverage innovation as a mechanism to survive and thrive in the turbulent digital economy have been widely covered in research (Amabile, 1988; Ebrahim et al., 2023; van Essen et al., 2022). Innovation is associated with the development of new products, services, and processes to achieve better organisational outcomes from various organisational roles and levels (Contreras et al., 2020). Organisational innovation can be seen in the products and services that consumers buy and use, and importantly also in how businesses produce, deliver, and use value in creative ways (Sorescu & Schreier, 2021). Innovation and driving a culture of innovation in telcos can help drive towards these objectives.

1.3 Research problem

Employees are a vitally important source of innovation in organisations and necessitates organisational and individual approaches that rely on employees' ability to engage in innovative work behaviour (IWB) (Shah et al., 2022). Since innovation in organisations at the grass roots level is driven by the ingenuity and creativity of its employees, organisations, leaders and scholars are continuously looking for ways to harness the qualities of EIWB and understand its determinants. Innovation demands fundamentally that employees in the organisation have the intrinsic motivation, required competencies and the persistence to promote innovation.

Prior studies indicate that there are various organisational, leadership and individual factors that can contribute to and/or enhance IWB (Ebrahim et al., 2023; Shah et al., 2022). The challenge for managers and practitioners is to uncover and understand the mechanisms that promote EIWB, and how they interact and co-exist with other organisational dynamics (Contreras et al., 2020). To this end, organisational leaders and managers must have a sound grasp of the organisational drivers and employee behaviours that can sustainably drive innovation.

Miller and Miller (2020) reasoned that skills, knowledge and competencies can foster intrinsic motivation in individuals, and result in positive work practices such as IWB. Sary et al. (2023) argued that employees' who possess DC are anticipated to demonstrate greater innovativeness in their work behavior, and therefore, organisations should work on improving the competencies of their employees, to reap the benefits that this can have on employee outcomes like innovation, amongst others. Although prior literature has highlighted and acknowledged the importance of EDC (Mungra et al., 2023; Pacheco & Coello-Montecel, 2023) and EIWB (Khan et al., 2022; Shahid et al., 2021) in separate studies, there remains a lack of understanding of the interworking between EDC and EIWB. Furthermore, prior studies have shown that PE is one of the prominent mediators for organisational and individual factors leading to IWB (Grošelj et al., 2021; Khan et al., 2022; Shahid et al., 2021).

This study aims to investigate the mediating effect of PE on the relationship between EDC and EIWB, and will evaluate the intricacies of this mediation process, seeking to uncover if PE might influence the association between EDC and their ability to engage in IWBs, focusing on a single SA telco organisation.

1.4 Research Objectives (ROs) and Research Questions (RQs)

Based on the purpose of the study, and the research problem articulated in the previous sections, this study was guided by the following ROs and RQs.

1.4.1 ROs

[RO1]: To assess if there is a relationship between EDC and EIWB.

[RO2]: To assess if there is a relationship between EDC and PE.

[RO3]: To assess if there is a relationship between PE and EIWB.

[RO4]: To assess if the presence of PE influences any potential relationship between EDC and EIWB.

1.4.2 RQs

[RQ1]: Does EDC have a relationship with EIWB?

[RQ2]: Does EDC have a relationship with PE?

[RQ3]: Does PE have a relationship with EIWB?

1.5 Rationale

Based on the review of prior literature, not many of the studies empirically evaluated the construct of DC in relation to other constructs. A limited number of prior studies evaluated the construct of IWB in conjunction with other organisational or individual constructs being mediated by PE.

To the best of the researchers knowledge, no empirical studies were found that tested the relationship of DC, PE and IWB together. From an academic perspective, firstly, this study will contribute to the body of knowledge of factors that affect IWB in organisations, by empirically evaluating DC as an antecedent to IWB, with PE mediating in the relationship between these two constructs. Secondly, the target organisation for data collection is an SA based telco, which also closes a contextual gap, with an absence of studies focusing on the African continent as well as SA. Most of the studies were carried out in the Far East, and a few of them focused on the telco industry in that specific region.

Organisations typically focus on highlighting the concept of innovation, the growth mindset required, and the potential benefits of the outcomes of innovation. The focus on truly empowering and mobilising employees to be geared up for innovation tends to be overlooked, unknowingly in most cases. As a first practical contribution, this study will attempt to look at and understand innovation from the perspective of individual behavioural determinants (IWB).

As a second practical contribution, the study could potentially assist managers and practitioners to have a better understanding of the mechanisms that collectively promote employees' IWB (DC and PE in this case), and to create the organisational settings for IWB to thrive (Contreras et al., 2020).

1.6 Delimitations of the study

This study focuses on establishing if PE mediates the relationship between EDC and EIWB, using employees of a single telco operating in SA as a sample. As a result, the generalisability of the research outcomes needs to be carefully considered before use. This is further elaborated in the limitations section below.

The progress of Digital Transformation (DT) and Digital Maturity (DM) in the organisation were not considered as influencing factors in this study, although the researcher believes that they are likely to . The assessment of DT and DM of an organisation and how it could impact this study would warrant a study on its own.

DC is a complex concept with many dimensions as highlighted in the definitions section in Chapter 2. When selecting questions for the data collection instrument, the researcher had to be cognisant of the total number of survey questions and had to be selective with the dimensions that could be measured. Furthermore, there were a limited number of studies in prior literature that used the construct DC, so the researcher only had a few references of instruments used in the field, which put some uncertainty on the effectiveness of the DC measurement in the study.

1.7 Limitations of the study

The present study had some limitations, that were beyond the researcher's control.

Firstly, as the study was conducted using cross-sectional data from a part of the employees of a single organisation, the outcomes needed to be interpreted with the necessary consideration and caution. This is particularly applicable in terms of generalisability of the findings to other telcos in SA, telcos operating in other markets on the African continent, or telcos in other markets globally.

Secondly, as part of the ethics approval process with organisation, the researcher was only allowed to select a limited number of BUs by function, which needed to be agreed upon and approved upfront. Under ideal circumstances, having access to survey all employees employed by the organisation would have been preferred, but this was not allowed. There were two possible consequences:

- The diversity of the selected sample was limited, as it included six BUs: a technology division, a traditional products and services division, a digital products and services division, a traditional marketing division and a digital marketing division, and a finance division. This could have introduced the risk of sampling bias.
- Consequently, having used non-probability purposive sampling, the generalisability of the findings of this study are quite limited (Kumar, 2019), and needs to be applied with caution.

Thirdly, the data collection instrument was a single self-administered survey, with the same respondents being assessed for both the IV (EDC) and the DV (EIWB), which both used 7-point Likert scales (ordinal scales). This carries the risk of common method bias, which has been tested for, but is not easily fixed (Kock et al., 2021).

1.8 Chapter Summary

This chapter has fulfilled 4 key objectives as indicated: 1. Highlighting the purpose, background, and context of the study; 2. Articulating the research problem and rationale; 3. Highlighting the research objectives and research questions of the study; and 4. Indicating the delimitations and limitations pertaining to the study.

1.9 Preface to the Research Report

Chapter 1 (above) fulfils four key objectives: 1. Highlighting the purpose, background, and context of the study; 2. Articulating the research problem and rationale; 3. Highlighting the research objectives and research questions of the study; and 4. Indicating the delimitations and limitations pertaining to the study.

Chapter 2 fulfils four broad objectives: 1. to define the key study constructs; 2. to understand the research problem; 3. review and synthesis of prior academic literature to identify the research gap; and 4. develop a conceptual framework to interpret the research findings.

Chapter 3 describes the practical execution component of how the study systematically addresses providing valid and reliable responses to the study's four research questions. Specifically, the chapter aims to meet four key objectives: 1. describe and provide justification for the research philosophy and approach to theory development, 2. justify the research design, procedure and methods, 3. describe the reliability and validity measures applied, and 4. conclude with the technical and administrative limitations of the study.

Chapter 4 aims to present results from the study's analysis, by meeting three key objectives: 1. presenting a description of the valid survey respondents and descriptive statistics of each study construct, 2. presenting confirmatory factor analysis (CFA) results and reliability and validity of the measurement scales, 3. presenting Structural Equation Modelling (SEM) and hypotheses testing results.

Chapter 5 aims to achieve four key objectives: 1. Revisiting the research aims, objectives and hypothesis, and providing a summary of the study's key findings from Chapter 4; 2. Interpretation and discussion of the study outcomes, guided by the research objectives and questions set out in Chapter 1; 3. Discuss the study limitations followed by the contributions of the study and discussion of recommendations for future research; and 4. Rounding off the chapter with a conclusion.

CHAPTER 2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

The previous chapter provided a comprehensive introduction to the study, highlighting the study's purpose, background, context, contribution to research and boundaries.

The four broad objectives of this chapter are:

1. Defining the key study constructs.
2. Unpacking the research problem.
3. Review and synthesis of prior academic literature to identify the research gap.
4. Developing a conceptual framework to interpret the research findings.

2.2 Definition of key Constructs used in the study.

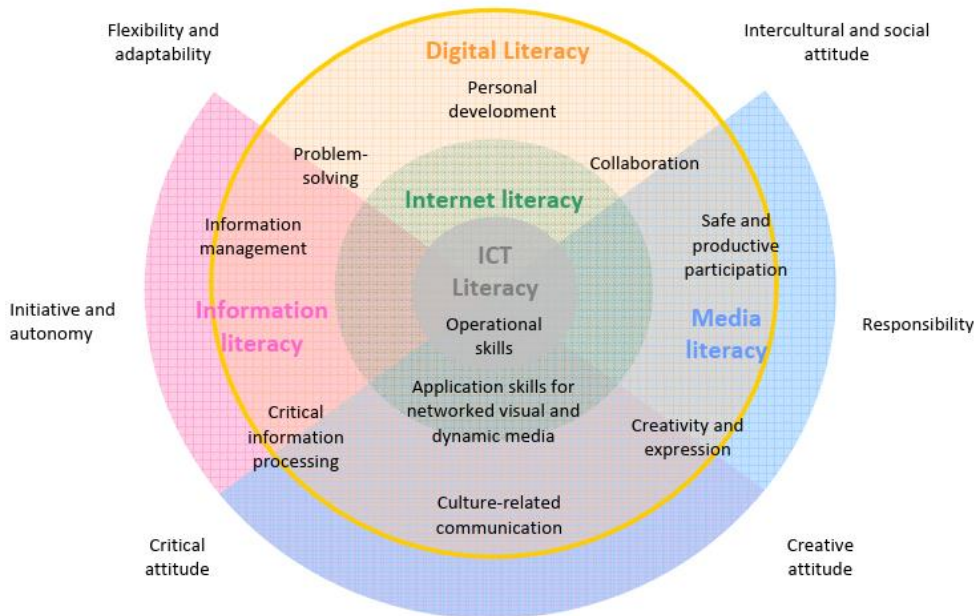
The main constructs used in this study are EDC, EIWB and PE, and are defined in the following sub-sections.

2.2.1 EDC

For the purposes of this study, the phrases digital competence / competency (DC) will be used for generic reference to the term when required, and EDC will be used when referring to the study construct.

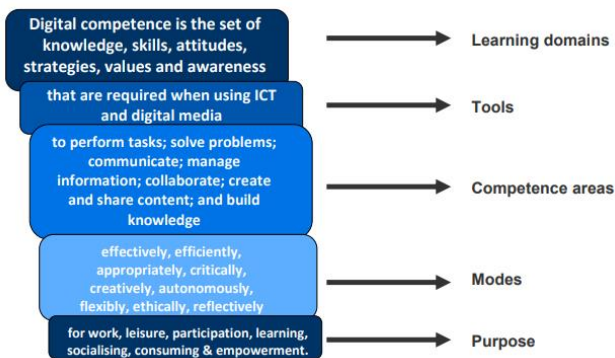
The widespread use of digital technologies in most workplaces today, necessitates lifelong learning and the DC of employees in order to boost productivity and foster innovation that keeps businesses sustainable and competitive (Mungra et al., 2023). According to Ala-Mutka (2011) the concept of DC has so many facets that there is no universally accepted or agreed upon definition. Developing DC should be considered as a continuum starting from “instrumental knowledge and skills for digital tool and media usage” ranging to “advanced skills and knowledge for communication and collaboration, information management, learning and problem-solving, and meaningful participation” (Ala-Mutka, 2011). Softer skills pertaining to attitudes and strategies for use of digital technology are also an important part of this continuum. Figure 1 below provides a visual of the many significant parts that are inherent in the concept of DC.

Figure 1: Visual Landscape of DC for the 21st century (Ala-Mutka, 2011)



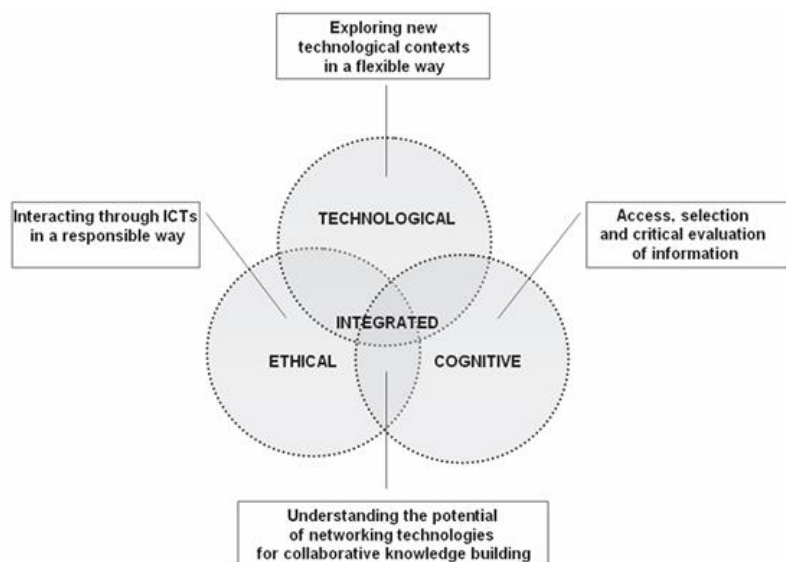
Ferrari (2012) conducted a comprehensive qualitative study of over 100 frameworks and initiatives from existing literature at the time, in a quest to find an all-encompassing definition for DC in the existing literature at the time. (Ferrari)’s definition of DC was quite comprehensive and like Ala-Mutka (2011) portrays the perspective that DC is much more extensive than just technology. Figure 2 below depicts the building blocks of the definition.

Figure 2: Decomposition of the Ferrari (2012) DC definition into distinct building blocks



Calvani et al. (2008) developed a conceptual model for DC based on three dimensions: technological, cognitive, and ethical, as shown in Figure 3 below.

Figure 3: Conceptual model for DC proposed by Calvani et al. (2008)



Based on the dimensions of this conceptual model, Calvani et al. (2008) proposed the following definition: DC consists of the following components: the ability to explore and deal with new technological experiences in a flexible manner; to pick out and critically evaluate data and information; to leverage technological potentials to analyse and solve problems; and to create collaborative and shared knowledge. These abilities should be fostered while being cognisant of one's personal responsibilities and respecting all rights and obligations.

From reviewing prior literature (Calvani et al.)'s definition was selected as the most appropriate and succinct for the construct EDC in the current study. It also sufficiently covered the jest of the definitions proposed by both Ala-Mutka (2011), Ferrari (2012) as well as those of other researchers.

2.2.2 EIWB

For the purposes of this study, the phrase innovative work behaviour (IWB) will be used for generic reference to the term when required, and EIWB will be used to refer to the study construct.

In moving towards a definition for the construct EIWB, it is useful to have clarity on the terms creativity and innovation, which tend to be used indistinguishably in some studies. Scott and Bruce (1994) clarified that creativity is concerned with discovering of new and useful ideas, and innovation is concerned with the adoption and implementation of new and useful ideas. Amabile (1988) stated that creativity and innovation supplement each other, whereby the process of innovation begins with creativity, which is necessary but not adequate as innovation does also depend on other factors.

Kanter (1988) specifies innovation as the generation and application of new ideas. In contrast to managing continuous, established operations, where there is little need or expectation of change, the development of innovation necessitates a different set of methods and organisational structures.

According to Scott and Bruce (1994), IWB at an individual level is as an extra-role, multi-phased process, requiring distinct actions and individual behaviors at each phase. According to Kanter (1988) it consists of four phases which unfold over a period of time:

1. Idea generation involves recognising a problem and generating possible new or adopted ideas or solutions to resolve the problem (Kanter, 1988; Scott & Bruce, 1994).
2. Coalition building entails campaigning for backing and sponsorship in the organisation to realise the idea (Kanter, 1988; Scott & Bruce, 1994).
3. Idea realisation involves making the idea tangible by building a working model (Kanter, 1988; Scott & Bruce, 1994).
4. Idea transfer or diffusion involves the commercialisation of the idea for wider use (Kanter, 1988; Scott & Bruce, 1994).

De Jong and Den Hartog (2007) and De Jong and Den Hartog (2010) leveraged off Farr and Ford (1990)'s definition of IWB: *"IWB is an individual's behavior directed towards the initiation and intentional introduction (within a work role, group or organization) of new and useful ideas, processes, products or procedures"*. De Jong and Den Hartog (2010) added that IWB is a multifaceted broad concept, consisting of four dimensions that captures all behaviors through which employees can contribute to the innovation process: idea exploration, idea generation, idea championing, and idea implementation.

Based on West and Farr (1989) and (West, 1989), Janssen (2000) defined IWB as: *"the intentional creation, introduction, and application of new ideas within a work role, group, or organization, in order to benefit role performance, the group, or the organisation. This definition restricts innovative behavior to intentional efforts to provide beneficially novel outcomes."*

Bak (2020) consolidated the definitions of a number of researchers:

"IWB refers to employee's behaviors to improve individual and/or organizational work outcomes by generating, promoting, implementing, and realizing new ideas and is regarded as a vital factor for organizational performance improvement and sustainable development." (Hansen & Pihl-Thingvad, 2019; Janssen, 2000; Saether, 2019; Scott & Bruce, 1994; Shanker et al., 2017)

This definition is concise and fully covers the important aspects of IWB, hence it was deemed most suitable to define the EIWB. In addition to the other definitions in prior literature, it indicates why IWB is vital for organisations.

2.2.3 PE

Conger and Kanungo (1988) proposed that PE be considered a motivational or enabling construct. Enabling in this context referring to establishing circumstances that will increase motivation to complete tasks by fostering a strong sense of confidence in oneself. They define PE as: *“a process of enhancing feelings of self-efficacy among organizational members through the identification of conditions that foster powerlessness and through their removal by both formal organizational practices and informal techniques of providing efficacy information.”* (Conger & Kanungo, 1988).

Thomas and Velthouse (1990) expanded on a Conger and Kanungo (1988)'s definition, proposing the following enhancements based on their own defined cognitive model of PE:

1. Placing more emphasis on motivation, specifically intrinsic task motivation. Thomas and Velthouse (1990) specify that: *“intrinsic task motivation involves those generic conditions by an individual, pertaining directly to the task, that produce motivation and satisfaction”*.
2. Specifying the attributes that lead to intrinsic task motivation: impact, competence, meaningfulness, and choice (Thomas & Velthouse, 1990).
3. Attempting to represent the processes used to arrive at these four attributes (Thomas & Velthouse, 1990).

According to Conger (2003), *“empowerment can be defined as a psychological state where four cognitions of the individual (meaning, competence, choice, impact) act in concert to foster a proactive, positive, and self-confident orientation towards one's work”*. The effect at an individual level manifests as increased job fulfilment, increased job efficacy, more initiative and maintaining task behavior, and increased creative behavior on the job (Conger, 2003). For managers and organisations it allows setting more ambitious performance criteria, which individuals are more prone to accept and pursue (Conger, 2003).

Figure 4: Six stages of the process of Empowerment Conger (2003)

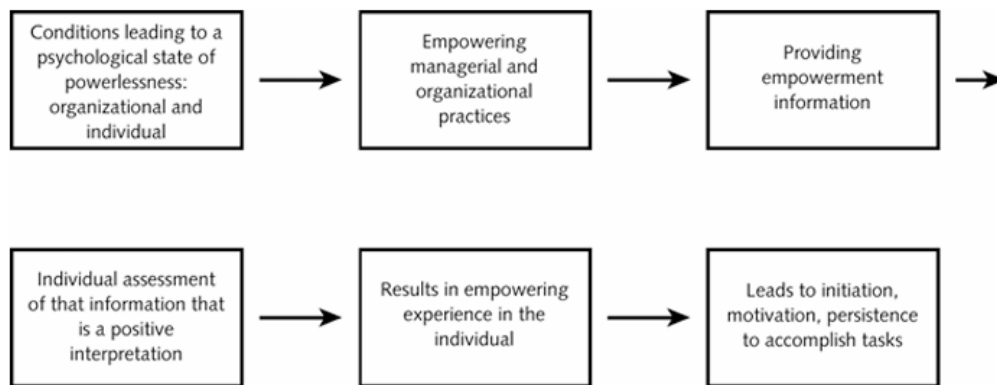


Figure 4 above shows the six stages of the process of empowerment according to Conger (2003). It shows the psychological states, antecedents, and the behavioural outcomes. The six stages are summarised below.

Stage 1: Individual and organisational conditions causing powerlessness.

Stage 2: Management intervention with empowerment strategies.

Stage 3: Managers provide subordinates with empowerment information.

Stage 4: Interpretation by individuals, according to their own styles of assimilation.

Stage 5: Individual feels empowered.

Stage 6: Individual exhibits empowerment behaviors.

The major drawback with this model is that it does not show the actions (feedback loop to previous steps) if the individual doesn't comply with moving forward to the next stage.

Spreitzer (1995) conducted a study to understand if the four dimensions of PE actually contribute to the overall construct of PE, and subsequently to develop and validate a research measurement instrument. Spreitzer (1995) described PE at an individual level as a motivational concept that appears in the form of four thought processes: meaning, competence, self-determination, and impact, which together form a holistic framework that makes an individual believe and aspire towards influencing their job role and context at work. Thomas and Velthouse (1990) argued that if any of the four dimensions are deficient, the degree of PE will diminish, but PE will still be present.

Spreitzer (2008) conducted an in-depth review of prior literature on empowerment, and indicated that there are two complementary approaches to empowerment:

1. Social-structural perspective: This perspective is more broadly based and concentrates on the socioeconomic factors that make empowerment in the workplace possible. This perspective was posited by Kanter (1987) in her book “Men and Women of the Corporation”.
2. Psychological empowerment: This approach is more specific and focuses on the psychological aspects of empowerment at work. This perspective was posited by Conger and Kanungo (1988), intending to improve on Kanter (1987)’s perspective.

Spreitzer (2008) describes PE as: *“a set of psychological states that are necessary for individuals to feel a sense of control in relation to their work. This perspective refers to empowerment as the personal beliefs that employees have about their role in relation to the organization.”*

For the purpose of this study Spreitzer (1995)’s description of PE will be adopted:

PE at an individual level is a motivational concept that appears in the form of four thought processes: meaning, competence, self-determination, and impact, which together form a holistic framework that makes an individual believe and aspire towards influencing their job role and context at work.

This definition is concise, comprehensive, and brings together all the main aspects from prior literature reviewed (Conger, 2003; Conger & Kanungo, 1988; Spreitzer, 1995, 2008; Thomas & Velthouse, 1990).

2.3 Understanding the Research Problem

2.3.1 Research setting or context analysis

Innovation in Digital Age

In the turbulent business environment of the digital age, markets are becoming ever more unpredictable due to a surge of mega-trends like urbanization, environmental concerns, shifting demographics, globalization, and technological advancements, among others (Lee & Trimi, 2021). As a result of this, various industries have been rapidly transformed, and sustainable innovation has become essential to an organisation's existence and success (Busco et al., 2023). Pressure from the competitive nature of the business environment further emphasizes the need for innovation to gain a competitive edge and meet the demands of pulsating markets. The necessity and reasons for organisations to leverage innovation as a mechanism to survive and thrive in business have been widely covered in research (Amabile, 1988; Ebrahim et al., 2023).

Tidd and Bessant (2020) indicated that innovation in organisations can be conceptualized as two complementary modes:

1. The first mode is "doing what we do, but better" innovation. This is a steady business as usual state where innovation occurs but stays within a certain bound where the organisations good practice processes may function.
2. The second mode is "do different" innovation, in contrast to the first mode. Here managing innovation is more a process of discovery and coevolution in highly uncertain conditions because of significant technological or market upheavals.

The difficulty for well-established businesses is learning how to balance both modes of innovation concurrently. For the most part, they will require strong systems and enough resources to cope with "do better," but occasionally, unless they can create a "do different" capability to operate in parallel, they run the risk of being challenged by new competitors who are better prepared to take advantage of the new conditions created by technological or market upheavals (Tidd & Bessant, 2020).

2.3.2 Research Problem Analysis

Making Innovation Business-as-Usual

Although organisation size, assets owned, and other factors can provide an organisation with a competitive edge, there is an emerging trend that seems to favour organisations that can leverage their knowledge, technological know-how, and experience to generate innovation in both their product and service offerings and the processes by which they develop and deliver them (Tidd & Bessant, 2020).

Meyer (2013) defines innovation as any novel idea or solution that generates business value and increases the organisation's competitive advantage. Despite radical, game-changing innovation having its place, to achieve consistency with innovation, organisations need to focus on generating business value by making simple meaningful changes in doing things differently and better. (Meyer) refers to this as making innovation business-as-usual, and part of daily routines. Employees working in the organisation are key to driving such initiatives. Accordingly, organisations require employees who can contribute to the development of innovative solutions to resolve the problems and challenges in work environment, in a bid to doing things differently and better (Messmann & Mulder, 2020; Meyer, 2013). Employee contributions to innovation in the organisation are referred to as innovative work behavior (IWB).

A review of prior literature has revealed that both scholars and working professionals (managers, leaders, supervisors) have taken significant interest in the understanding the concept of IWB. The drivers for this are twofold: the constantly changing business landscape (as discussed in the previous section) has made the stakes of innovation much higher, whereby employee IWB has become a crucial input for organisational

efficiency and gaining a competitive edge; and it has become of vital importance for managers to pursue innovative approaches by leveraging the existing resources that the organisation possesses, in bid to do more with less (Ebrahim et al., 2023).

Several academics have studied the antecedents of IWB over the recent decade (De Jong & Den Hartog, 2010; De Jong & Den Hartog, 2007; Muchiri et al., 2020; Theurer et al., 2018), to enhance understanding of the primary drivers of this phenomenon (Ebrahim et al., 2023). Based on a comprehensive evaluation of prior studies, (Ebrahim et al.) have broadly categorised these antecedents of IWB into three broad impact factors:

1. Individual behaviors and attributes: Employees are pivotal to IWB; hence their behaviours and attributes can have a direct or indirect impact on IWB e.g. workplace happiness, co-worker support and job stress (Bani-Melhem et al., 2018).
2. Leadership styles: Various types of leadership styles can have either a positive or negative impact on IWB in the organisation e.g., transformational leadership (Afsar & Umrani, 2020); ethical leadership (Yidong & Xinxin, 2013); despotic leadership (Mehmood et al., 2023).
3. Organisational factors: Organisational climate and culture can have an impact on IWB e.g. organisational climate (Imran et al., 2010); talent management practices (Khan, 2019); knowledge sharing (Yasir et al., 2023).

The challenge for organisations and managers alike, is to have a solid grasp of the state of these impact factors in their respective organisations, and to put the plans in place to optimise these factors where required. Accordingly, this research study focuses on two possible antecedents of EIWB: EDC and PE, which can be categorised as individual behaviours and attributes (Ebrahim et al., 2023).

2.4 Review and synthesis of prior academic literature

2.4.1 EDC as a predictor for EIWB and PE

[RO1] To assess if there is a relationship between EDC and EIWB.

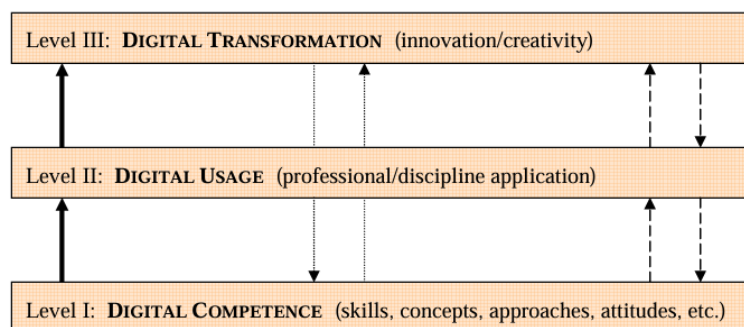
[RQ1]: Does EDC have a relationship with EIWB?

[RO2]: To assess if there is a relationship between EDC and PE.

[RQ2]: Does EDC have a relationship with PE?

Martin and Grudziecki (2006) proposed a conceptual framework with three stages as shown in Figure 5 below. The framework articulates that people transition from a stage of gaining generic DC on top of which they develop digital usage over time, where DC is honed through application for specific purposes e.g. professional use, and eventually arrive at a point in the digital transformation process where using digital tools fosters creativity and innovation, which can lead to major changes in the relevant field.

Figure 5: Levels of Digital Literacy, adopted from (Martin & Grudziecki, 2006)



Vila et al. (2014) carried out a study to better comprehend the connections between the process of competency development and innovation in the work context. The study outcomes showed that a number of competencies influenced individuals' propensity to engage in innovative activities in the workplace. Of specific relevance to the current study are the competencies of alertness to new opportunities; coming with up with new ideas and solutions; and making use of computers and the Internet to enhance technological innovation.

Sary et al. (2023) carried out a quantitative study to investigate whether DC and self-leadership influenced educators' IWB. (Sary et al.) posited that proficiency with digital technology influences participation in the learning process, which in turn influences performance. Furthermore, educators who possess DC are anticipated to demonstrate greater innovativeness in their work behavior and are better able to adjust to a

Volatile, Uncertain, Complex, and Ambiguous (VUCA) business environment (Canzittu, 2022). The study outcomes revealed a positive and significant relationship between DC and IWB, and the researchers emphasised the need for schools to improve development plans for educators, to improve IWB.

Pacheco and Coello-Montecel (2023) conducted a cross-sectional survey study to test the relationship between DC and job performance (JP), with PE acting as a potential mediator. The findings validate and support that DC had a positive impact on JP, and that DC was a key element for achieving success in the workplace because it can enhance employees' creativity (Oldham & Da Silva, 2015), and problem solving skills (Edvard Hatlevik et al., 2015). Furthermore, three of the four dimensions of PE: meaning, competence, and impact presented the highest correlations with selected dimensions of DC. (Spreitzer, 1995).

Mungra et al. (2023) conducted a study that aimed to assess the effect of EDC on flourishing (wellbeing) through basic psychological needs satisfaction (BPNS) factors on working professionals. It also included sense of community (SoC), which is a moderator between BPNS and flourishing. BPNS finds theoretical foundations in SDT and consists of three basic psychological needs for individuals: autonomy (self-determination), relatedness (connection), and competence (self-efficacy) (Ryan & Deci, 2017; Spreitzer, 1995). Amongst other findings, the study showed that the best levels of employees' flourishing were observed with high levels of EDC, mediated by high levels of autonomy, and competence.

Al Daboub et al. (2024) conducted a study investigating the relationships between HR practices (staffing, training, compensation, performance, job design and participation), PE, EIWB and firm innovation capability. The study outcomes showed that training was one of the HR practices that had a positive relationship with IWB through PE (as a mediator), specifically, the competence dimension of PE.

In summation, based on the review of prior literature along with the aforementioned studies, the following hypotheses are proposed:

Research Hypothesis H1: EDC positively affects EIWB.

Null Hypothesis H1₀: EDC has no effect on EIWB.

Research Hypotheses H2: EDC positively affects PE.

Null Hypothesis H2₀: EDC has no effect on PE.

2.4.2 PE as predictor (->EIWB) and mediator (EDC->PE->EIWB)

[RO3]: To assess if there is a relationship between PE and EIWB.

[RQ3]: Does PE have a relationship with EIWB?

[RO4]: To assess if the presence of PE influences any potential relationship between EDC and EIWB.

[RQ4]: Does the presence of PE influence any potential relationship between EDC and EIWB?

Harandi et al. (2019) conducted a study to determine the relationship between knowledge management (KM) and creativity in presence of PE as a mediator. Putting this study into context for the current study, building shared and collaborative knowledge is a facet of EDC (Calvani et al., 2008), and creativity is a component of IWB. The target population included the staff of all the departments of education in Qom Province, Iran (valid sample N=180). The findings revealed that there was a significantly positive relationship between KM and creativity, as well as between PE and creativity. However, PE did not mediate the relationship between KM and creativity.

Khan (2019) carried out a study on Pakistani public university employees to establish the mediating effect of PE as well as the moderating effect of knowledge sharing (KS) on the relationship between talent management practices (TMP) and IWB. The study outcomes showed that TMP has significant positive relationship with both PE and IWB. PE also has a positive relationship with IWB. Furthermore, PE moderates the relationship TMP and IWB.

Singh and Sarkar (2019) conducted a study of female primary school educators (N=1026) in West Bengal, to test the relationship between structural empowerment and EIWB mediated by PE. Structural empowerment consists of four domains: 1) access to resources; 2) access to information; 3) development and recognition; and 4) work environment (Kanter, 1987). The findings of the study showed that PE partially mediated the relationship between structural empowerment and EIWB, with the highest correlation observed between access to information and self-determination at job-level. From a practical perspective this implies that employees exhibit more self-determination if they have better access to information.

Phairat and Potipiroon (2022) conducted a study to investigate if the relationship between high performance work systems (HPWS) and IWB is mediated by two constructs: PE and organisational climate for innovation (OCI). HPWS is made up of three parts: ability-enhancing practices; motivation-enhancing practices; and opportunity-enhancing practices. The sample was made up of employees from six major telcos in Thailand (N=710). The study results revealed that HPWS had a positive relationship with IWB, thorough both mediators, PE and OCI. From a practical implications perspective, companies who want to support IWB should concentrate on having a strict recruitment and selection procedure in order to draw in and choose candidates with growth and innovative mindsets. Giving staff members the training that they need to innovate is also very important.

Yasir et al. (2023) undertook a study to explore how both functional flexibility (FF) and PE mediate the relationship between KS and IWB. The target sample consisted of production line workers of SMEs in a region of Pakistan (N=769). FF in the context of this study referred to employees being able to perform multiple tasks in various positions in the organisation. The study findings showed that KS had a positive association with IWB, as well as with both mediators FF and PE. Also, both mediators had a positive relationship with IWB, and the mediation role was proven as well. From a practical standpoint, employees' in SMEs must share valuable knowledge and use their respective expertise to help each other, to enhance their ability to innovate. In the absence of the required knowledge, skills, and PE, there is little chance of employees IWB.

In summation, based on the review of prior literature along with the aforementioned studies, the following hypotheses are proposed:

Research Hypotheses H3: PE positively affects EIWB.

Null Hypotheses H3₀: PE has no effect on EIWB.

Research Hypotheses H4: PE mediates the relationship between EDC and EIWB.

Null Hypotheses H4₀: PE does not mediate the relationship between EDC and EIWB.

2.4.3 Research Gap and contribution to the academic body of knowledge

Based on the extensive review and synthesis of prior literature, following are the researcher's observations and identification of the research gaps and this study's contributions to the body of knowledge of IWB.

Although prior literature has highlighted and acknowledged the importance of employee competencies and the impact that it can have on IWB (Pacheco & Coello-Montecel, 2023; Sary et al., 2023; Vila et al., 2014) there remains a lack of studies that have focused on understanding the relationship between DC and IWB, despite IWB having been extensively studied with other constructs (Bak, 2020; Khan et al., 2022; Miller & Miller, 2020; Mungra et al., 2023; Sary et al., 2023). Based on a comprehensive review of prior literature, a limited amount of the studies empirically evaluated the construct of DC in relation to other constructs (Huu, 2023; Mungra et al., 2023; Pacheco & Coello-Montecel, 2023; Sary et al., 2023). A big portion of prior studies revealed that PE is one of the prominent enhancing factors for organisational and individual factors leading to IWB (Al Daboub et al., 2024; Grošelj et al., 2021; Khan, 2019; Phairat & Potipiroon, 2022; Shahid et al., 2021; Singh & Sarkar, 2019; Yasir et al., 2023). To the best of the researchers knowledge, no empirical studies were found that specifically tested the relationship of the constructs DC, PE and IWB together, with PE taking the role of mediator. Hence from an academic perspective, it can be stated that this is an original empirical study.

Furthermore, from an academic perspective, this study will contribute to the body of knowledge of factors that affect IWB, by empirically evaluating DC as a determinant to IWB through PE, in an organisational context, but from an individual (employee) behavior lens.

The target organisation for data collection was an SA based telco, which also closes a contextual gap, with an absence of studies focusing on the African continent as well as SA. Most of the studies were carried out in the Far East, Americas, and Europe. A few studies focused on the telco industry, but in the Far East (Al Daboub et al., 2024; Phairat & Potipiroon, 2022).

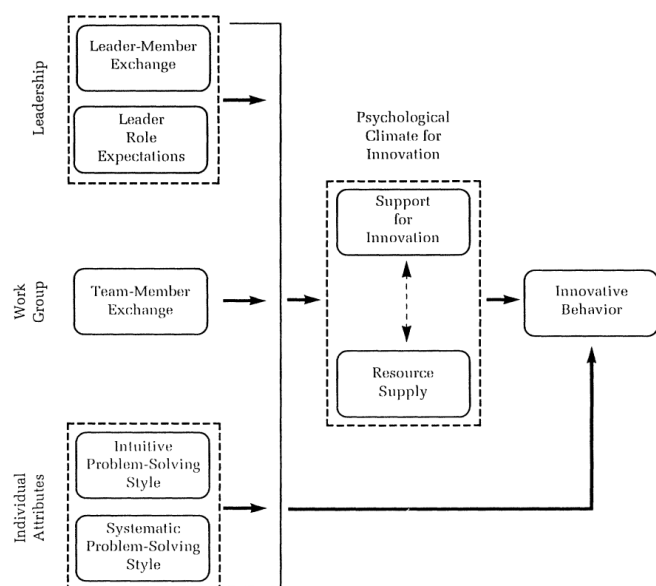
2.5 Analytical Framework

2.5.1 Theoretical Framework

The innovative behaviour of individuals in a working environment, pertaining to the generation and implementation of new useful ideas for the organisation (Amabile, 1988; Scott & Bruce, 1994; Van de Ven, 1986), is of vital importance to organisational innovation and has become essential for organisational performance and sustainability (Busco et al., 2023) in the digital economy. This is further intensified by the VUCA business environment (Canzittu, 2022) that organisations have to adapt to in the digital age. Getz and Robinson (2003) posited that hearing ideas from employees in the frontline, implementing a system for managing these ideas and acting upon these ideas with intent is one of the most crucial mechanisms that contribute to innovation. As a result, understanding the individual factors that contribute to EIWB has become a subject of critical inquiry for scholars.

Typically EIWB is extra-role behaviour (Scott & Bruce, 1994), which implies that it is not expected formally from employees (nor recognised formally in the organisation), and is purely a discretionary behaviour. EIWB is more likely to happen through self-motivation and could be the result of employees beliefs about the fulfilment of the psychological contract obligations with employers (Ramamoorthy et al., 2005).

Figure 6: Interrelated Entities of Innovative Behavior



Scott and Bruce (1994) proposed the conceptual model in Figure 6 above and saw individual innovative behaviour as a result of four interrelated entities: the individual, the leader, the workgroup, and the psychological climate that fosters innovation.

When it comes to extra-role or discretionary behaviours, the underlying factors contributing to an individual's sense of empowerment in the context of the workplace is key. Hence it is necessary to have a good grasp of the theoretical underpinning of PE.

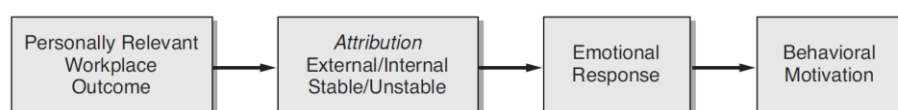
PE was built on the foundational idea that individuals have the capacity to control and affect their own life, make decisions, and take ownership of their personal development, well-being and successes (Spreitzer, 2008). It is made up of four distinct dimensions: meaning, competence, self-determination and impact (Spreitzer, 1995). For each of these dimensions, there are indications that PE drew from different established theoretical frameworks in the psychology and organisational behavior disciplines.

Self-Determination Theory (SDT), developed by psychologists Edward L. Deci and Richard M. Ryan (Ryan & Deci, 2000), views people to have innate basic psychological needs for relatedness, competence, and autonomy. Autonomy refers to the need for self-direction and the ability to make choices and assume responsibility for one's actions (Deci & Ryan, 1985); competence refers to the need to feel effective and capable in achieving desired outcomes (Deci & Ryan, 1985); relatedness pertains to the need for social connections and meaningful relationships (Deci & Ryan, 1985). The self-determination dimension of PE speaks about an individual's sense of autonomy or control regarding their actions in a work environment (Spreitzer, 1995), which is similar to the idea of autonomy in SDT.

Psychologist Albert Bandura created the Social Cognitive Theory (SCT), which highlights the importance of self-efficacy and the belief in one's capacity to affect behavior and produce desired results (Bandura, 1986). The competence dimension of PE highlights an individual's belief in their capability to perform activities with skill (Spreitzer, 1995), which echoes with SCT. There is also semblance with the competence dimension of PE and the competence basic psychological need of SDT (Deci & Ryan, 1985).

Attribution Theory seminally proposed by Fritz Heider and later expanded on by Bernard Weiner (Fritz, 1958; Weiner, 1985), focuses on how people assign internal (or intrinsic) or external (or extrinsic) causes (or attributions) to their own successes and failures, which then lead to an emotional response and then behavioural motivation (Weiner, 1985). A diagrammatic overview is shown in Figure 7 below.

Figure 7: Attribution – Emotion – Behavior Process (Harvey & Martinko, 2009)



The impact dimension of PE is affected by the belief that one's efforts and actions can make a difference and directly lead to the desired outcomes (Spreitzer, 1995). In this regard, a parallel can be drawn from PE with Attribution Theory, where a workplace outcome leads to a worker's attribution of the outcome, and then leads to a positive emotional and behavioural response from the worker.

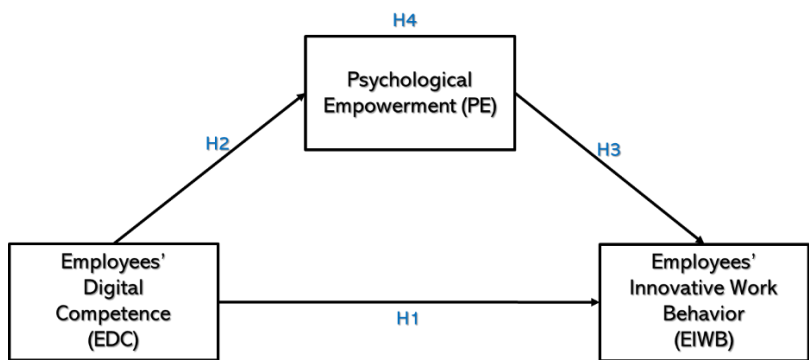
The Job Characteristics Model (JCM) was developed by organisational psychologists Greg R. Oldham and J. Richard Hackman in the 1970s, after they studied people and their jobs in a factory setting to understand why people became disengaged and lost interest in their jobs (Oldham et al., 1976). It highlights how job design can impact employees' sense of empowerment and motivation. The model uses five key job characteristics: skill variety, task identity, task significance, autonomy, and feedback from job to contribute to employees' experiences of meaningfulness, sense of empowerment and purpose in their work roles. This has the potential to result in positive work behaviors and outcomes (Oldham et al., 1976). The PE dimension of meaning echoes very much with the states of work meaningfulness, sense of empowerment and purpose in JCM.

2.5.2 Conceptual Framework

The conceptual framework shown in Figure 8 below was adopted in a number of studies in prior literature (Al Daboub et al., 2024; Pacheco & Coello-Montecel, 2023; Singh & Sarkar, 2019). The structure of the conceptual frameworks used in these studies had some common attributes when using the constructs PE and

EIWB: PE played the role of mediator, and EIWB played the role of dependent variable. Very limited studies in prior literature opted not to use PE, when EIWB was present as construct.

Figure 8: Conceptual Framework – Self drawn by researcher



The diagram depicting the conceptual model in Figure 8 above, is based on a statistical model called mediation analysis. (Baron & Kenny, 1986), as shown in Figure 9 below.

Figure 9: Conceptual diagrams for simple mediation adopted from Baron and Kenny (1986)

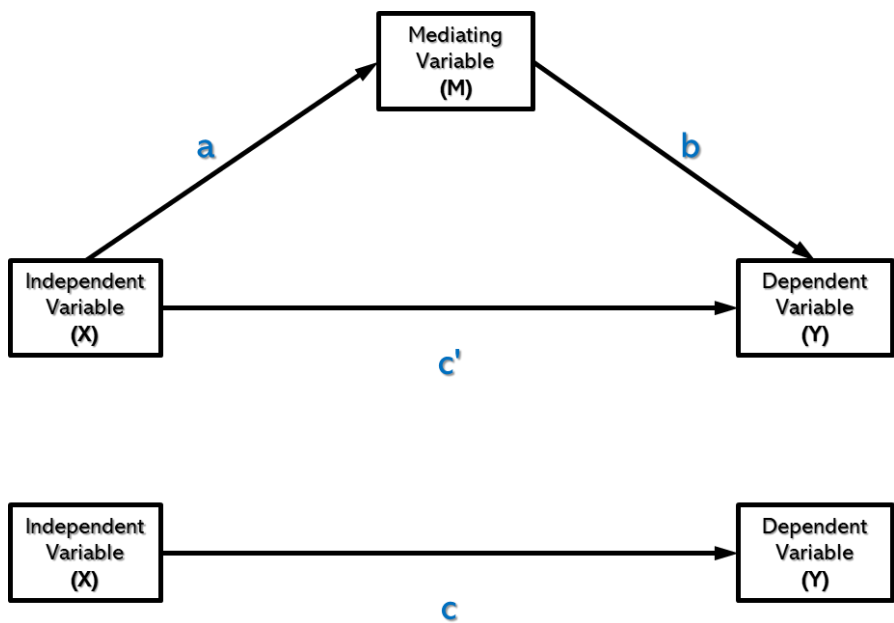


Figure 9 above shows a simple mediation model, which is a causal framework in which one causal antecedent (independent variable X) is proposed as influencing an outcome (dependent variable Y) through a single intervening variable (mediating variable M) (Hayes, 2022).

According to Baron and Kenny (1986), the paths represented by a, b, c and c' have the following relevance:

1. Path c is referred to as the “Total Effect” i.e. the effect of X on Y when M is not present.

2. Path c' is referred to as the “Direct Effect” i.e. the effect of X on Y when M is present.
3. Path a and b, when represented as a product ($a \times b$) is referred to as the “Indirect Effect” i.e. the effect of X on Y through M.

The equation below represents the collective statistical relationships between each of these paths:

Indirect Effect ($a \times b$) = Total Effect (c) – Direct Effect (c') (Baron & Kenny, 1986)

The level of mediation can either be full (complete), partial or no mediation (Hayes, 2022).

2.6 Chapter Summary

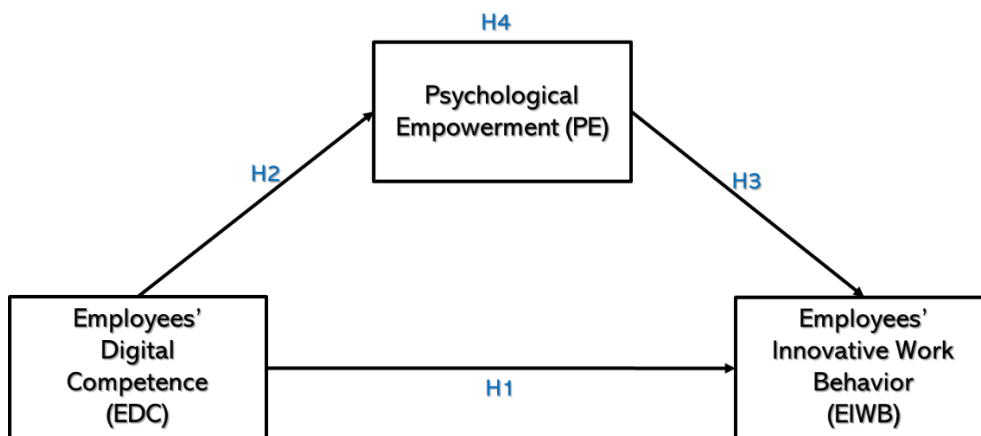
The four broad objectives set out at the beginning of this chapter were met and a summary is provided below to close off the literature review.

1. Defining the key study constructs: section *2.2 Definition of key Constructs used in the study*, reviewed and selected definitions from prior literature to guide on the working definitions of the main constructs that will be used throughout the study (EDC, PE and EIWB). These are shown in Table 2 below.
2. Unpacking the research problem: section *2.3 Understanding the Research Problem*, provided a comprehensive view of the research setting and the research problem.
3. Review and synthesis of prior academic literature to identify the research gap: section *2.4 Review and synthesis of prior academic literature*, provides an overview of selected studies from prior literature that are similar to the current study, and guided the hypotheses of the study, as shown after Figure 10 below. It was found that there was a lack of studies that have focused on understanding the relationship between EDC and EIWB through the presence of PE. The study contributed to the body of knowledge on IWB, by empirically studying EDC as an antecedent of IWB and closed a contextual gap by using an SA based telco for the target sample, whereas studies in prior literature focused outside of the African continent (Al Daboub et al., 2024; Phairat & Potipiroon, 2022).
4. Developing a conceptual framework to interpret the research findings: section *2.5 Analytical Framework* outlined both the foundational theoretical frameworks and the derived empirical conceptual framework (Figure 10 below).

Table 2: Proposed Definitions of study's constructs

Key Construct	Definition adopted for this study
EDC	DC consists of the following components: the ability to explore and deal with new technological experiences in a flexible manner; to pick out and critically evaluate data and information; to leverage technological potentials to analyse and solve problems; and to create collaborative and shared knowledge. These abilities should be fostered while being cognisant of one's personal responsibilities and respecting all rights and obligations. (Calvani et al., 2008).
PE	PE at an individual level is a motivational concept that appears in the form of four thought processes: meaning, competence, self-determination, and impact, which together form a holistic framework that makes an individual believe and aspire towards influencing their job role and context at work (Spreitzer, 1995).
EIWB	"IWB refers to employee's behaviors to improve individual and/or organizational work outcomes by generating, promoting, implementing, and realizing new ideas and is regarded as a vital factor for organizational performance improvement and sustainable development." (Hansen & Pihl-Thingvad, 2019; Janssen, 2000; Saether, 2019; Scott & Bruce, 1994; Shanker et al., 2017), as per Bak (2020).

Figure 10: Derived Conceptual Framework – Self drawn by researcher



Research Hypothesis H1: EDC positively affects EIWB.

Research Hypotheses H2: EDC positively affects PE.

Research Hypotheses H3: PE positively affects EIWB.

Research Hypotheses H4: PE mediates the relationship between EDC and EIWB.

CHAPTER 3. RESEARCH METHODOLOGY

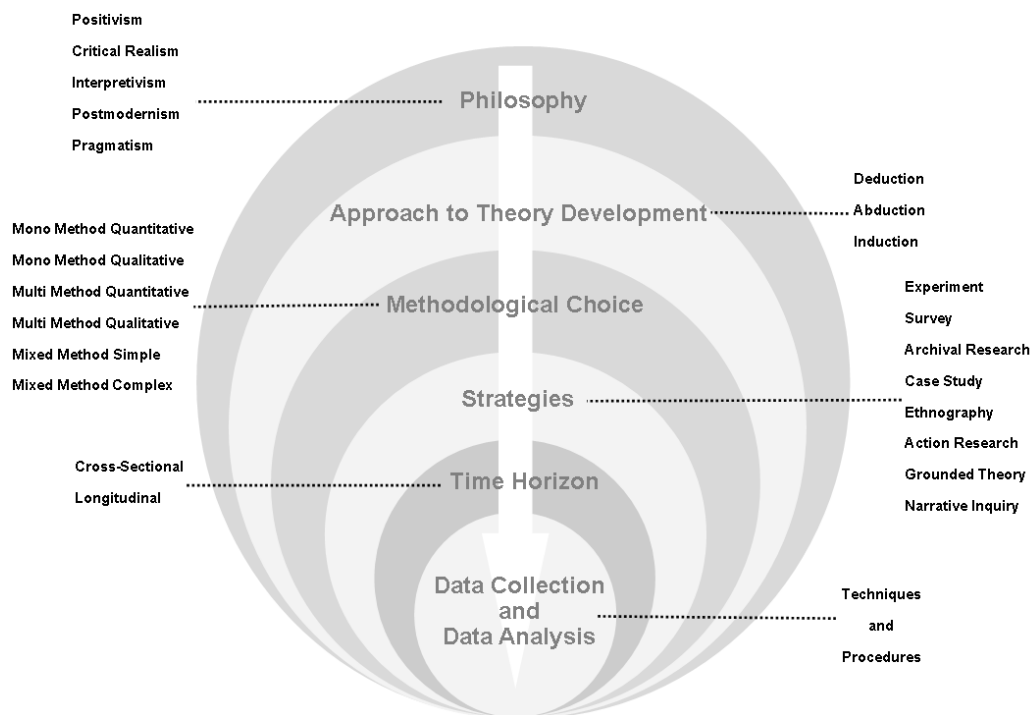
As a departure point for the start of this chapter, the overarching objective of this study was to empirically test whether PE influences the relationship between EDC and EIWB. The setting was in an SA telco, focusing on a sample of employees from this organisation.

This chapter describes the practical execution component of how the study systematically addresses providing valid and reliable responses to the four research questions. Specifically, the chapter aims to meet four key objectives:

1. Describe and provide justification for the research philosophy and approach to theory development.
2. Justify the research design, procedure and methods.
3. Describe the reliability and validity measures applied.
4. Conclude with the technical and administrative limitations of the study.

3.1 Research Philosophy and Approach to Theory Development

Figure 11: Researchers depiction of Saunders et al. (2019) Research Onion



Saunders et al. (2019) proposed a theoretical framework referred to as the “research onion” to provide a systematic approach for researchers to be guided with the research design. As shown by the arrow in the

Figure 11 above, the framework starts from the outside layer of the onion working its way through 6 layers of choices. Each layer forming a basis for the next, to eventually reach the centre of the onion.

Applying the research onion framework, the starting point was establishing a philosophical stance for this study, guided by a set of presumptions and views regarding the advancement of knowledge. As in the figure above, Saunders et al. (2019) proposed five major philosophies that are typically used in business and management studies. This study's philosophical presumptions and views are grounded in the positivist philosophical perspective. This is because positivism is scientific in nature and seeks to draw general conclusions from experimentation and systematic observations of reality (Ragab & Arisha, 2018), which characterised the nature of this study.

The consideration for the next layer pertained to identifying the approach to theory development. This study used 4 well established and widely accepted theoretical models: SDT (Ryan & Deci, 2000), SCT (Bandura, 1986), Attribution Theory (Fritz, 1958; Weiner, 1985) and JCM (Oldham et al., 1976) from existing literature to derive a conceptual framework consisting of 3 constructs (EDC, PE and EIWB), and consequently a set of 4 hypotheses to be tested were derived from this conceptual framework. Since, this study tested an existing theory as opposed to building a theory (inductive), the deductive research approach is appropriate (Saunders et al., 2019).

3.2 Research Design

The considerations for next 3 layers of the framework: methodological choice, research strategy and time horizon are very closely linked to each other and are collectively referred to as the research design (Saunders et al., 2019).

Kumar (2011) indicates that a research design is a blueprint or comprehensive plan that outlines how the research study will be carried out i.e. operationalising the study's constructs for measurement, .choosing the target sample, gathering the information required to support the hypotheses testing and analysing the findings. According to Clark et al. (2021) a research design provides a structure for collecting and analysing data to answer a research question, and depends on the significance it gives to the four dimensions of the research process: articulates the link of causality between two or more variables; generalisability from a sample to a population; comprehending the relevant behavior/s in their social context; and understanding social phenomena and the relationships among them in a time context. Hair Jr et al. (2019) describes research design as offering the fundamental guidelines, or directions for completing the research project, and should be selected by the researcher using the following broad criteria: provide the relevant information required to answer the research questions and hypotheses; and should be the most efficient for the study. The different

descriptions, despite having some commonalities, did not have a clear common thread in all aspects, but essentially all lead to the same end result.

Methodological choice is a very important distinction to be made and shape the research design. Quantitative methods are generally associated with a positivist philosophical stance (Saunders et al., 2019). According to Creswell and Creswell (2017) and Saunders et al. (2019), quantitative research methods are best suited for evaluating the relationship between variables, where the variables are numerically measured and then analysed using statistical methods. Matching the purpose of this study to these attributes, a quantitative methodological choice is fitting.

The next layer required the selection of the relevant research strategy for the study. The characteristics of a survey strategy indicate that the researcher can collect survey data, using a questionnaire, from a large number of respondents economically (Saunders et al., 2019). Clark et al. (2021) indicates that surveys use questionnaires to gather quantitative data on two or more variables, which is subsequently analyzed to look for patterns of association. Leedy et al. (2019) states that survey research obtains information from a sample of people regarding their behaviors, viewpoints, dispositions, or prior encounters, to establish if the findings are representative of the larger population. Considering the research aim and the research objectives, this study investigated the relationships between 3 constructs EDC, EIWB and PE, with the aim to understand the correlation of these relationships i.e., whether they are positive or negative (Creswell & Creswell, 2017), and then to understand the degree of these relationships so that the validity of the proposed outcomes reflected in the hypotheses could be established. Hence, a survey research strategy was deemed most applicable, with its attributes aligning to that of the study. Survey research also provided the added benefits of collecting data at a large scale using an online questionnaire, with a reasonably quick turnaround time in data collection.

The final layer of the research onion model entailed considering the time horizon of the study (Saunders et al., 2019). A cross-sectional time horizon was most practical for this study as opposed to a longitudinal time horizon (Saunders et al., 2019). This is because the entire study needed be completed in the space of approximately 6 months, which was a time constraint to doing a longitudinal study. Hence data had to be collected in a single point in time, having only a single engagement with the target sample for this study (Kumar, 2019).

In summarising the research design chosen for this study using the research onion framework: a deductive study using a cross-sectional survey questionnaire to collect, analyse and interpret quantitative data using quantitative methods. Based on this, the next section looks at the research procedure and methods greater in detail.

3.3 Research Procedure and Methods

3.3.1 *Data Collection and Data Collection Instrument*

For the researcher to test the hypotheses and describe and explain the phenomena of the study, data collection was necessary (Hair Jr et al., 2019). Data collection is the gathering and storage of all information that was required to fulfil the outcomes of this study. Following from the decision made at the research design stage, the quantitative method of data collection was used for this study. There was no availability of previously collected data (secondary data), since the researcher was collecting quantitative data from a sample of respondents in a specific organisation (Hair Jr et al., 2019). This necessitated that data be collected directly from the sample of survey respondents using questionnaires, and is called primary data collection (Hair Jr et al., 2019).

During the research design stage, it was also determined that data collection be carried out using an online survey questionnaire (referred to as a survey further on) as the data collection instrument. The survey was designed using an online survey tool called Qualtrics Experience Management software (referred to as Qualtrics further on). Appendix A provides a view of the complete survey questionnaire.

For this study, the only source of data collection was from a sample of employees working in an SA telco organisation. The questionnaire was structured with a predetermined set of questions to capture the important behavioural aspects for the study constructs (EDC, PE and EIWB) and demographic, career, and employment related screening data of each respondent. This approach is referred to as a self-completion questionnaire (Hair Jr et al., 2019).

The questionnaire was divided into six sections, following in the order: Participant Information and Consent, EDC measurement questions, PE measurement questions, EIWB measurement questions, Demographic, career and employment related screening data. Table 3 below provides a summarised view of all the elements in the data collection instrument. All of the survey questions were close ended (Glasow, 2005), where the responder had to choose single responses to each question either from a list of 2 or more options or from a Likert Scale. The responder was expected to answer all questions for the survey to continue but was also free to stop the survey at any point if they so desired.

Table 3: Elements in the Data Collection Instrument

Constructs (Latent Variables)	Variable	Order in Questionnaire	Question #	# Items	Data Type	Study Variable
	Participant Information & Consent	1	1	1	Nominal	Other
EDC		2	2-11	10	Ordinal	IV
PE		3	12-21	10	Ordinal	MV
EIWB		4	22-31	10	Ordinal	DV
	Gender	5.1	32	1	Nominal	Other
	Age	5.2	33	1	Nominal	Other
	Education Level	6.1	34	1	Nominal	Other
	Years of Employment	6.2	35	1	Nominal	Other
	Job Role	6.3	36	1	Nominal	Other

This study involved 3 constructs (EDC, PE and EIWB) which cannot be measured directly because they are abstract concepts. Part of the process of designing the data collection instrument was finding and specifying indicators or items to measure the construct (questions in the questionnaire), which when combined will sufficiently measure the construct (Hair Jr et al., 2019). It was vitally important to correctly measure the constructs that the study was examining to ensure the accuracy, validity and reliability of the interpretation of the findings and the conclusions drawn from these (Hair Jr et al., 2019). These indicators per construct needed to be assigned a scale of measurement by specifying a predetermined no of outcomes for them to be measured consistently. The scale of measurement entailed coding the responses to the questions for the study's three constructs and the other six variables used. All questions in the questionnaire were closed questions, which simplified the coding. The coding for the three constructs is shown in the tables below. EDC and PE had used the same Likert scale options and EIWB used different ones. The numerical values assigned to the 7-point Likert scale had to be considered in terms of more positive and more negative responses for all items on the scales for EDC, PE and EIWB. Hence the lowest value of 1 was assigned to Strongly Disagree or Never on the one end, and 7 to Strongly Agree or Always at the other end of the Likert scale options. All scales were pre-coded in Qualtrics prior to the start of data collection. Tables 4 and 5 below show the coding for the 7-point Likert scale used in the study. For the coding used for all constructs and variables in the study, refer to Appendix C, Tables 42 to 48.

Table 4: Coding of EDC and PE Likert Scales (self-drawn by researcher)

EDC + PE	Strongly Disagree	Disagree	Mildly Disagree	Not Sure	Mildly Agree	Agree	Strongly Agree
CODING	1	2	3	4	5	6	7

Table 5: Coding of EIWB Likert Scale (self-drawn by researcher)

EIWB	Never	Almost Never	Sometimes	Not Sure	Fairly Often	Often	Very Often
CODING	1	2	3	4	5	6	7

Participant Information and Consent

This is the first screen that the responder sees in Qualtrics. It introduces the researcher and provides an overview of the survey objective, for the respondent's understanding. It also provides affirmation of the anonymity and confidentiality of the survey data. To voluntarily participate, the responder selected the CONTINUE option, and was taken to the first page of the survey. If they chose not to participate by selecting the DECLINE option, the responder would be shown a thank you message, and the survey will end.

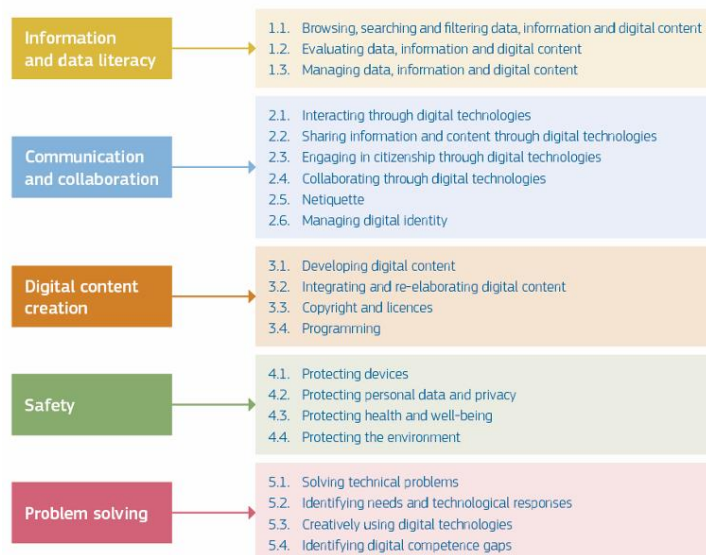
EDC

The review of prior literature revealed a limited number of studies that used the construct DC, hence there were not many proven DC measurement scales to evaluate and select items from.

Deursen and Van Dijk (2010) proposed a framework for measuring Internet Skills, comprising of four skill categories: operational, formal, information, and strategic Internet skills, each having a no. of items for measurement. An evaluation of the items in these four groups revealed that the level of assessment was insufficient for assessing the DC of employees in an organisation that has a strong technology drive. An evaluation of the data collection instrument proposed in Van Deursen et al. (2016), also did not provide a sufficient level of assessment and depth to effectively measure construct EDC in the context of this study.

Subsequently, through the continued review of prior literature, the European Union digital competence framework for citizens (DigComp) was used for selecting 8 of the 10 EDC items. DigComp provides an in-depth set of items (259 in total) that evaluates DC in 5 competence categories: Information and Data Literacy, Communication & Collaboration, Digital Content Creation, Safety, and Problem Solving (VUORIKARI Rina et al., 2022). The DigComp conceptual reference model is shown in the Figure 12 below.

Figure 12: DigComp Conceptual Reference Model (VUORIKARI Rina et al., 2022)



There is also a proficiency scale that ranged from foundation to highly skilled, that provided guidance in terms of the expected behaviors at that level (VUORIKARI Rina et al., 2022). Based on the definition of DC, the areas not covered by adequately DigComp, were the behaviors for information interpretation and the building of digital knowledge in the organisation. Items for these competencies were sourced from Flores et al. (2012), which consisted of 23 items split into 5 categories: Information Acquisition, Information Distribution, Information Interpretation, information Integration, and Organisational Memory. The remaining 2 of the 10 items were selected from the category information interpretation. The full set of items used to measure construct EDC are shown in the Table 6 below.

Table 6: Items for measuring construct EDC (VUORIKARI Rina et al., 2022) and (Flores et al., 2012)

Question No.	Reference Code	EDC Items	Source
2	EDC1	I know how to improve internet search results by using a search engine's advanced features.	
3	EDC2	I know how to check that a piece of digital information is reliable before using it.	
4	EDC3	I can use the appropriate digital tools at work to facilitate and improve collaboration, communication and information sharing (Teams, Zoom, Google Drive, etc.).	(VUORIKARI Rina et al., 2022)
5	EDC4	I can create infographics and posters combining information, statistical content and visuals using available apps or software.	EDC1-7
6	EDC5	I am aware of and can detect different types of cybersecurity risks in digital environments (e.g. identity theft, scams, phishing, malware attacks, etc.).	
7	EDC6	I know how to adopt a proper cyber-hygiene strategy regarding passwords (e.g. using a password manager, creating strong passwords).	
8	EDC7	I take a step-by-step approach to identify the root cause of a problem and explore various solutions to find the most feasible option.	(Flores et al., 2012)
9	EDC8	I am prepared to rethink my decisions or challenge others decisions when presented with different perspectives + new and relevant information.	EDC8-9
10	EDC9	I am interested in knowing what we do at work, but also why we do things.	(VUORIKARI Rina et al., 2022)
11	EDC10	I am curious to explore how digital technologies work.	EDC10

PE

Spreitzer (1995) defined PE as a four-dimensional motivational concept that represents an individual's intent and capability to shape their work role and context. These dimensions are meaning, competence, self-determination, and impact. PE was compiled from the scale of Menon (1999). 2-3 items were selected to measure each of the four dimensions. Each item explicitly measured only a single dimension of PE, with no

overlap. The 7-point Likert scale used in Menon (1999) was also adopted. The full set of items used to measure construct PE are shown in Table 7 below.

Table 7: Items for measuring construct PE (Menon, 1999)

Question No.	Reference Code	PE Items	Source
12	PE1	I am inspired by what we are trying to achieve as an organization.	(Menon, 1999) PE1-10
13	PE2	I am enthusiastic about working toward the organization's objectives.	
14	PE3	I am enthusiastic about how my work can contribute towards the organization's objectives.	
15	PE4	My manager/peers allow me to influence the way work is done in our department.	
16	PE5	My manager/peers allow me to influence decisions taken in our department.	
17	PE6	I have the skills and abilities to do my job well.	
18	PE7	I am equipped to handle the challenges that I face at work.	
19	PE8	I have the drive to perform effectively in my job.	
20	PE9	I can decide on my own how to go about doing my work.	
21	PE10	I have opportunity for independence and freedom in how I do my job.	

EIWB

Bak (2020) defined EIWB as individual behaviors that improve organisational performance and sustainable development by applying four dimensions of EIWB: generating, promoting, implementing, and realising new ideas. Kleysen and Street (2001) defined similar dimensions to Bak (2020), but including opportunity exploration prior to generating ideas. EIWB items were compiled using the scale of Kleysen and Street (2001), which contained 14 items in total. The selected items for the study were grouped in four dimensions, combining and consolidating the dimensions of Kleysen and Street (2001) and Bak (2020): opportunity exploration (2 items), idea generation (3 items), idea promotion (3 items) and idea realisation and operationalisation (2 items). The items were individualised by adding 'I', adding more context to the wording for elaboration, without changing the measure. The 6-point Likert scale was changed to a 7-point Likert scale by adding a neutral category 'Not Sure' in the middle. The full set of items used to measure construct EIWB are shown in the Table 8 below.

Table 8: Items for measuring construct EIWB (Bak, 2020; Kleysen & Street, 2001)

Question No.	Reference Code	EIWB Items	Source
22	EIWB1	I look for opportunities to improve my work environment e.g. improve an existing process, technology, product, service, etc.	(Bak, 2020; Kleysen & Street, 2001) EIWB 1-10
23	EIWB2	I explore problems in the work environment with a broader view to gain better insight.	
24	EIWB3	I generate new ideas or solutions to address problems or unmet needs for my organisation and/or customers.	
25	EIWB4	I experiment with and test new ideas or solutions to evaluate their strengths and weaknesses.	
26	EIWB5	I experiment with and test how new ideas or solutions integrate with and co-exist with existing processes, technologies, products, services, etc.	
27	EIWB6	I am prepared to take the risk to support my new idea or solution.	
28	EIWB7	I am prepared to persuade management / senior leadership of the importance/benefit of implementing a new idea or solution.	
29	EIWB8	I am prepared to put in extra effort to provide substantial backing evidence to promote my new idea or solution.	
30	EIWB9	I follow through with implementing new ideas or solutions that have been approved for implementation.	
31	EIWB10	I ensure that proper processes are in place to continuously maintain and monitor the effectiveness and relevance of implemented ideas or solutions.	

3.3.2 Sampling Approach and Considerations

Hair Jr et al. (2019) proposed a five-step process to be followed for sampling which was used as a guideline for the sampling approach and considerations:

1. Defining the target population.
2. Choosing the sampling frame.
3. Selecting the sampling method.
4. Determining the sample size.
5. Implementing the sampling plan.

Population and Target Population

In ideal circumstances, the researcher would have preferred to have collected data from all elements or cases of the population under investigation. In the context of this study, the population would have referred to all employees (elements or cases) working in telco organisations in SA (Saunders et al., 2019). In the time frame that this study had to be conducted in, it was not feasible to attempt to have access to all telco organisations in SA, to collect data. Hence, the researcher intentionally chose to focus on a single telco organisation with approximately 5000 employees. This single organisation selected from the population is referred to as the target population (Hair Jr et al., 2019).

Sampling Frame and Units

A sample is a smaller subgroup that is a portion of the target population. Sampling was employed for this study because the target population was excessively big and the researcher was faced with time constraints (Saunders et al., 2019). Furthermore, the full directory of employees, could not be made available by the telco organisation, as the conditions for ethics approval specified that access to specific pre-selected divisions within the telco would be permitted.

One of the main purposes of sampling is to choose a sample that fairly represents the larger population under study (Clark et al., 2021). It was very important for the elements or cases under study in the derived sample to share a similar set of attributes with each other and with the target population they were selected from (Hair Jr et al., 2019; Somekh & Lewin, 2005), so that the findings of the study drawn for the sample has the best potential to be generalisable to the target population, as per the fundamental aim of quantitative research (Sukamolison, 2007).

The sample included a mix of employees from a selection of divisions in the telco organisation, that were allocated for data collection by HR, based on the researcher's discretion: 1-2 technology divisions, a traditional products and services division, a digital products and services division, a traditional and digital marketing division, and a finance division. Trainees, employees and contractors in the employ of the telco at the time of data collection were eligible to participate in this study. After the ethical clearance process with the telco was concluded, the researcher was provided with the relevant distribution lists per division by HR. These contained

only email addresses to identify the potential respondents. These lists were combined to form a single list of email addresses. This list of employees (which was a subset of the target population) from which the sample was derived, is called the sampling frame (Hair Jr et al., 2019). The individual employees in the list, which are identified by their email addresses, are referred to as the sampling units (Clark et al., 2021).

Sampling Method

The method used to choose a sample can be of two types. probability and non-probability sampling (Acharya et al., 2013). Hair Jr et al. (2019) indicates that in probability sampling the chances of selection of sampling units into a sample are known, whereas in non-probability sampling the chances of selecting sampling units into a sample are not known.

The telco organisation, as part of their ethics clearance process, requested that the survey distribution be limited to only a selection of divisions (selected at the researcher's discretion) from the target population. For this study, a non-probability judgemental or purposive sampling method was used to select the divisions that could form part of the sample and hence a predetermined number of participants were part of the sample (Kumar, 2019). The thought process used by the researcher, was to get a balance of business units in the technology as well as the commercial business functions. Despite the approved divisions belonging to the same organisation, they were heterogeneous in terms of the business function that they served and the occupation of professionals working there.

Possible drawbacks of Sampling Method

With non-probability sampling it is unlikely that statistical inferences can be made of the population, because probability of the cases selected from the target population are not known (Saunders et al., 2019).

By its very nature, non-probability judgemental sampling is prone to researcher bias, which means that some parts of the target population have a better likelihood of being selected than others based on the researcher's discretion (Bell et al., 2018). The email invites were distributed using a list-based sampling frame (Fielding et al., 2017). The sample frame was made up by the email addresses of six divisions in the telco arranged per division. The researcher cannot be sure that the units in the sample frame were truly representative of a typical telco, despite the selection of a mix of divisions. The heterogeneity of the sample frame could be gauged by the career related screening information collected, with the common attribute being employment at a telco.

Some of individuals surveyed will not get to completing the survey in the allotted time and others might decide not to opt in to complete the survey. This is referred to as non-response bias (Bell et al., 2018). The challenge

with non-response bias is that those who opt-in may differ by varying extents to those that did not complete the survey or opted out. This will affect the adequacy of the sampling frame.

Sample Size

With probability sampling, four elements needed to be considered for the statistical calculation of the sample size, relative to the target population:

1. Size of the target population from which the sample was drawn;
2. The level of certainty that the characteristics of the collected data will represent the characteristics of the target population (confidence level);
3. The margin of error that was tolerable for any estimates made from the sample (confidence interval); and
4. The estimation of how much the received responses varied from each other and from the mean number (standard deviation) (Saunders et al., 2019; Smith, 2013).

The target population size was estimated at approximately 5000 employees. Typically for business and management research, the confidence level is kept at 95% and the confidence interval at 5% (Hair Jr et al., 2019; Saunders et al., 2019). These guideline values were adopted for this study. For standard deviation, the typical value of 50% was opted for (Smith, 2013). Based on the values selected for the elements of this study, the recommended target sample size was 357 responders (Raosoft, 2004).

3.3.3 *Ethical considerations when collecting data*

In business and management research, collecting data from human subjects directly (person-to-person) and/or indirectly (via internet mediated means), ethical considerations are of the greatest concern (Saunders et al., 2019). The researcher had to deal with ethical dilemmas throughout the research process, which required sound ethical judgment before deciding on taking the appropriate action (Hair Jr et al., 2019).

The researcher used the research proposal and the Wits Business School (WBS) research ethics committee application process to obtain ethics approval from WBS. (refer to Appendix B for the WBS ethical clearance certificate).

Saunders et al. (2019) indicated that organisational concerns regarding the application to be used as a source for research data collection can be divided into three categories: the amount of time or resources required from the organisation and its employees; sensitivity to any negative organisational implications arising from the research topic; and maintaining confidentiality of the data collected and anonymity of the organisation and its employees. This study focused on a single telco organisation in SA, and WBS ethics clearance was a

mandatory prerequisite before starting the ethics clearance process with the organisation. One of the key assurances that needed to be provided to the organisation, as part of the ethics approval application, was that the name of the telco organisation will not be revealed in any document and/or communication related to this study. The terms “telco”, “telco organisation” and “SA telco” were used to generically refer to the organisation. Ethics clearance was obtained from the public affairs division in the telco after all compliance requirements were met through their formal application process. It was imperative not to begin any data collection prior to having obtained the WBS ethical clearance certificate and subsequently the ethical clearance certificate from the telco organisation. The final research report had to be reviewed and signed off by the telco prior to final submission to WBS, to ensure compliance to anonymity requirements.

The researcher was obligated to treat respondents to the survey of this study ethically (Hair Jr et al., 2019). The details of the researcher, topic and objective of the research study, and the requirement from the respondents had to be disclosed upfront before the survey commenced. To avoid any deception in terms of the time required from the respondents, “some of your valuable time” was used as an indication as opposed to citing a specific time in minutes. The channels for raising any queries related to the study were clearly specified. It was also emphasised that taking the survey is voluntary, and that the respondent could stop the survey at any time, if they felt the need to. Two very important aspects are the protection of privacy of the respondents and handling of the collected data (Saunders et al., 2019). The respondents had to be assured that that no personal details were required to complete the survey, and that complete anonymity is maintained throughout the engagement. Furthermore, the data collected will only be used for the intended academic research purposes, and that data will solely be handled by the researcher to maintain full confidentiality and will at all times be stored in a secure password encrypted environment.

The measures taken above ensured compliance to the ethical requirements for participant engagement, information disclosure, informed consent from the respondents, protection of respondents’ privacy and data confidentiality (Hair Jr et al., 2019), before the respondent chose to continue or decline taking the survey. All of this information can be viewed in the participant information and consent sheet in Appendix A.

3.3.4 Data Collection, Storage and Processing

3.3.4.1 Data Collection and Storage

During the data collection open phase, the survey data was collected from the respondents and stored securely on the Wits Qualtrics server, which had password-controlled access for the researcher only. The researcher closely monitored the daily response rates and assisted some participants with survey access and/or tool challenges.

Once the data collection was closed, the collected raw data from the respondents had to be exported from Qualtrics (in SPSS .sav format) to the researcher's laptop (password controlled) and thereafter had to go through a preparation phase to be readied for quantitative data analysis and then interpretation. This preparation phase is referred to as data processing, and it typically involves editing and coding (Kumar, 2011).

3.3.4.2. Data Processing

3.3.4.2.1 Editing

The first step in data processing was to ensure that the data was examined for cleanliness i.e. devoid of errors, deficiencies, incorrect classification and free of any inconsistencies as far as possible (Kumar, 2011). This cleaning procedure is referred to as editing.

To accomplish this, the raw data file was loaded into SPSS, and checked for anomalies by using the "Descriptive Statistics -> Frequencies" function in SPSS, to identify values that were missing and/or that fell outside the range of for each of the constructs and variables (Pallant, 2020).

In terms of missing values, this study's questionnaire contained only closed-ended questions, and the respondent had to complete each question before proceeding to the next. This kept missing values to a minimum. If missing data was not identified and dealt with, it could impact the validity of a research findings (Hair Jr et al., 2019).

One type of missing values which was expected (and are normal) in this study, is when participants decline to continue before starting the survey, with participation being completely voluntary. This meant that 35/36 questions contained missing values for these respondents. Enders (2022), categorises these cases as missing completely at random (MCAR). These cases warrant listwise deletion of the complete case since these responses have no values for constructs and variables and cannot impact the empirical outcomes of the study. Apart from these cases, the rest of missing value scenarios e.g. non-completion or partial completion of the survey after opting in, needed to be assessed on a case-by-case basis.

3.3.4.2.1 Coding

The next step in data processing entailed coding of the data for all constructs and variables. In the case of this study all scales were pre-coded in Qualtrics prior to the start of data collection. Section "3.3.1 Data Collection and Data Collection Instrument" provides a comprehensive description of how the measurement scales of each of the constructs and variables in the study were determined. Questions can have both negatively and positively worded statements, and in some cases negative statements might require reverse-coding of the

measurement scale used for the particular construct (Hair Jr et al., 2019). All of the items that make up the constructs EDC, PE and EIWB were positively worded. A complete view of the coding used for all the study's constructs and variables is shown in Appendix C, Tables 42 to 48.

3.3.5 Data Analysis and Interpretation

Once data processing was completed on the dataset, the next step was to start off with the data analysis. The statistical package for social scientists (SPSS V29.0.2.0) and Analysis of Moment Structure software (AMOS V29.0.0) statistical software were used to perform the data analysis.

The first part of the data analysis was to understand the underlying attributes of the dataset using descriptive statistics. There are three main types of descriptive statistics that will be generated using SPSS:

1. Measures of frequency (frequency and percentage).
2. Measures of central tendency (mean, median and mode).
3. Measures of variation/dispersion (standard deviation, range) (Mertler & Vannatta, 2016; Mishra et al., 2019).

This process entailed the following sub-steps, which were performed in order:

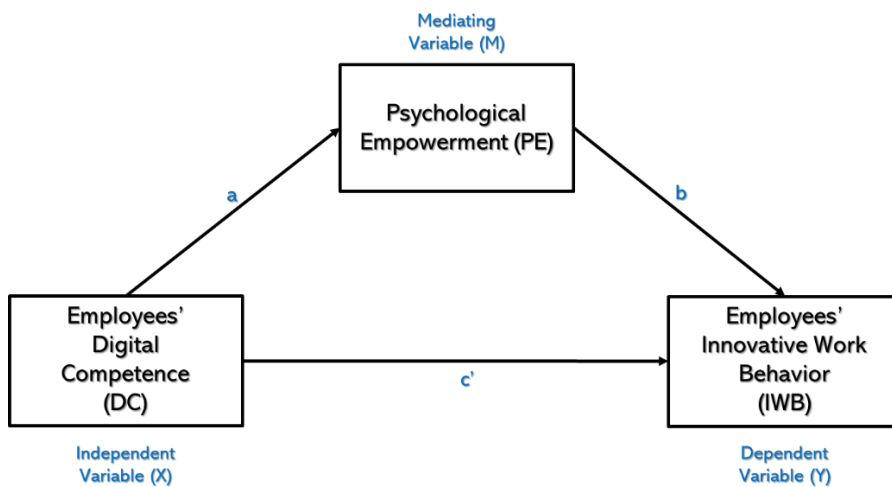
1. Checking the dataset for univariate outlier cases.
2. Checking the dataset for normal distribution.
3. Description the respondents in terms of gender, age range, level of education, number of years working in the organisation, and current job role. This consisted of frequency tables to breakdown the respondents in each of these categories.
4. Frequency distribution and measures of central tendency of the study constructs: EDC, PE and EIWB.

The second part of the data analysis was to perform CFA. The objective of using CFA was used to assess the fit of the measurement model to the collected data. CFA included the following steps:

1. Specifying the measurement model with all of the different constructs (EDC, PE and EIWB), items per construct (EDC, PE and EIWB – 1-10), error terms per item and then creating all of the linkages between the constructs (covariances). The study's conceptual model in Figure 13 below was used as the basis (Zainudin, 2014).
2. Initial testing of the measurement model and assessment for an acceptable model fit. This step entailed evaluating parameters relevant to model fit, making incremental changes, and then re-specifying the measurement model each time, until an acceptable model fit was obtained (Collier, 2020).

3. Evaluating measurement model reliability and validity, and adjusting where necessary, by moving back to step 2 above.

Figure 13: Single Mediator Model adapted from (MacKinnon, 2012)



The third and final step of analysis was performing SEM, using the CFA measurement model as a basis to create the structural model. The step included the hypothesis testing using mediation analysis.

The interpretation of the data analysis results was done, and comparisons made to similar prior studies. Future research topics leveraging off this study's methodology and limitations were proposed.

3.3.6 Description of the Respondents

Trainees, contractors, and permanent employees working at the telco at the time of the study, were all eligible respondents. The online survey was distributed to 1400 candidates and 379 responses were received in total, which yields a response rate of approximately 27%.

3.4 Reliability and validity measures applied

Reliability and validity measures are primarily concerned with the quality criteria in this study (Clark et al., 2021). This study's constructs (EDC, PE and EIWB) had to be operationalised using multi-item scales which were derived from prior studies, which measured similar constructs (Bak, 2020; Flores et al., 2012; Kleysen & Street, 2001; Menon, 1999; VUORIKARI Rina et al., 2022). The quality of the data collected from respondents who participated in this study (by completing the survey), were key to the findings and conclusions posited by the study (Kumar, 2019). Since reliability and validity of the data collection instrument influences the quality of the

data collected, they were important to evaluate for this study (Pallant, 2020), so as to avoid a lack of reliability and validity causing measurement error (De Vaus, 2002).

3.4.1 Reliability

Reliability considers whether the measures developed for this study's constructs will show consistent and stable results if repeated independently under similar conditions (Clark et al., 2021). Kumar (2019) states that reliability of the data collection instrument can be evaluated through internal or external consistency procedures. External consistency involves determining the reliability of a measure by carrying out two independent rounds of data collection and comparing the outcomes, which is usually performed by (1) test-retest methods (same sample, same instrument but time lagged test periods) or (2) parallel testing (different population, two similar instruments but testing runs concurrently). Both of these procedures were out of the scope of this cross-sectional study carried out on a single sample of a single population.

Creswell and Creswell (2023) indicate that internal consistency refers to the extent that a set of items (multi-item instrument) used to measure a construct, are indeed related to each other in that they are evaluating the same construct. Internal consistency is indicated by Cronbach's Alpha co-efficient (α), which can have a value between 0 and 1 (Cronbach, 1951). Pallant (2020) indicate that values above 0.7 are considered acceptable and that values above 0.8 are preferable. Creswell and Creswell (2023) indicate that optimal values range between 0.7-0.9.

According to Kumar (2019) there are multiple factors that could affect the reliability, which are mainly concerned with in person interviews. One way of increasing the chances of better reliability is to use multiple items to operationalise a construct, as was the case for all constructs in this study, which had 10 items each (De Vaus, 2002). Also, in self-administered surveys, question wording and comprehension can cause misinterpretation in terms of what the researcher expects of the respondent in responding to a particular question (De Vaus, 2002). To reduce the risk of this happening, the items used in the instrument for the study's constructs (EDC, PE and EIWB) were evaluated for understanding and ambiguity so that participants interpretation could be the same. Also, a pilot survey was carried out prior to data collection, placing emphasis on participants identifying level of difficulty and comprehension of the questions.

3.4.2 Validity

According to Kumar (2011) validity broadly refers to the suitability and precision of the methods used to address the research questions of the study. Pallant (2020) defines the validity of a scale as the extent to which

it measures what it is intended to measure. Clark et al. (2021) states that validity refers to whether an item or set of items developed to quantify a construct does indeed measure the construct.

There are different types of validity which could be looked from two lenses: (1) the validity of the overall study; and (2) the validity of the measures used in the study (Drost, 2011).

3.4.2.1 Validity of the overall study

Validity of the overall study is concerned with three types of validity:

1. Internal validity is concerned with the degree of confidence that the study's conclusion proposed a causal relationship between the independent variable (EDC) and the dependant variable (EIWB) (Clark et al., 2021).
2. External validity refers to whether any potential causal relationship proposed by the study can be generalised beyond the specific research context i.e. with a time lag, to other populations and to other settings (Drost, 2011).
3. Statistical conclusion validity concerns with whether the inferences made and the subsequent conclusions reached are reflected in the research design used (Clark et al., 2021).

For this study's research design to meet the criteria of internal validity and provide accurate answers to the research questions, the outcome should emanate from the relationship between EDC (IV) and EIWB (DV) and the mediating variable PE, with no interference from any extraneous factors (De Poy & Gitlin, 2015). There are several types of threats to internal validity, and there are steps that can be taken in the study design to avoid or minimize the impact of these threats (Creswell & Creswell, 2017), so that internal validity can be maintained:

- Use probability sampling to select the most diverse characteristics of respondents across the chosen population.
- There is always the likelihood that some respondents will partially complete the survey. This attrition needs to be considered when determining sample size.
- Keeping the data collection instrument consistent across the data collection process to ensure uniformity on the study outcomes.

To get an indication of α for a particular scale on an instrument, the studies where the scale was adopted from or where the scale was applied previously can be evaluated to have some form of guidance during data collection instrument design.

3.4.2.2 Validity of the measures used in the study

Assessing the validity of the measures used in the study is concerned with how adequately the constructs were operationalised, which is termed construct validity (Drost, 2011). Construct validity uses statistical procedures and was determined by establishing the contribution of each construct (EDC and PE) to the total variance observed in this study's phenomenon (EIWB). The bigger the variance that can be attributed to the constructs, the higher the instrument validity (Kumar, 2019).

Construct validity requires the collection of evidence in six types of validity: face validity, content validity, predictive validity, concurrent validity, convergent and discriminant validity. The study assessed convergent and discriminant validity:

1. Convergent validity: Scores on items measuring a construct are related to the other items of the same construct (Drost, 2011).
2. Discriminant (divergent) validity: This study constructs of interest are not redundant with other constructs or are different from other constructs (Drost, 2011).

3.5 Technical and administrative limitations

The construct EDC was not extensively used and tested in prior literature, hence the items for the operationalisation of EDC in the study were mainly selected from the European Union digital competence framework for citizens (DigComp). This instrument was used for the first time in the field with this study, with a level of uncertainty surrounding its reliability and validity. Furthermore, DigComp was developed for the European Union, so applying it in a different setting (SA) could have tempered with its effectiveness.

As part of their ethics clearance process, the telco only consented to the researcher using a limited number of pre-selected divisions in the organisation for data collection. As a result of not having access to the complete employee base of their SA operations, non-probability sampling methods had to be used for this study, which could have brought potential biases into play (Hair Jr et al., 2019).

De Poy and Gitlin (2015) suggest that mediation models are time-based i.e., the independent variable affects the mediating variable, and then over time the mediating variable affects the dependent variable. Hence, longitudinal studies are better suited for mediation models as opposed to cross-sectional studies which was used for this study, based on the time constraints to complete the research.

3.6 Chapter Summary

This chapter described the practical execution component of how the study systematically addresses providing valid and reliable responses to the four research questions.

The four key objectives set at the beginning of the chapter were achieved:

1. Described and provided justification for the research philosophy and approach to theory development.
2. Justified the research design, procedure and methods.
3. Described the reliability and validity measures applied.
4. Concluded with the technical and administrative limitations of the study.

CHAPTER 4. PRESENTATION OF RESULTS

4.1 Introduction

As a departure point for the start of this chapter, the overarching objective of this study is to empirically test whether PE influences the relationship between the constructs' employees' EDC and EIWB. The setting is in an SA telco, focusing on a sample of employees from this organisation.

This chapter aims to present results from the study's analysis, by meeting three key objectives:

1. Presenting a description of the valid survey respondents and descriptive statistics of each study construct.
2. Presenting CFA results and reliability and validity of the measurement scales.
3. Presenting SEM and hypotheses testing results.

4.2 Checking Data for Missing Values

Trainees, contractors, and permanent employees working at the telco at the time of the study, were all eligible respondents. The online survey was distributed to 1400 candidates and 379 responses were received in total, which yields a response rate of approximately 27%.

During the process of editing (Kumar, 2011) the raw data, the following anomalies were found, and appropriately dealt with:

1. Two respondents declined to continue with the survey, and these cases were deleted listwise (Enders, 2022).
2. 17 respondents started the survey but did not answer a single question. These cases were deleted listwise (Enders, 2022).
3. Two respondents completed 56% of the survey and did not answer all 10 questions for construct EIWB as well as the five questions for demographic, career, and employment related screening data. Stewart (2022) stated that if the missing data is not central to the analysis, the responses can still be left in the dataset. However, as EIWB was a key construct and the DV in the study, its measurement key for the analysis, hence these two responses were deleted listwise (Enders, 2022).
4. One respondent completed 83% of the survey but did not answer the five screening questions. Since this screening data was not key to empirical outcomes of the study, this response was kept as valid data (Stewart, 2022).

Based on the amount of responses collected (379), the impact of discarding 21 responses (5.54%) is negligible. This left 358 valid responses for further processing.

4.3 Description of Respondents

The following demographic, career, and employment related screening data was collected from each of the survey respondents, at the end of the survey questionnaire: gender, age, highest level of education, no. of years of working at current organisation and the type of role being fulfilled currently. These are described individually in the tables below, for the 358 valid respondents.

4.3.1 Gender

Table 9 below shows that from the 358 valid respondents, 70.9% were Male, 28.2% were Female, 0.6% were Non-binary, and there was one missing entry.

Table 9: Breakdown of valid survey respondents by Gender (Source: Primary Data)

Gender	Frequency	Percent
Male	254	70.9%
Female	101	28.2%
Non-binary	2	0.6%
Missing	1	0.3%
TOTAL	358	100%

4.3.2 Age Range

Table 10 below shows that from the 358 valid respondents that 0.8% were in the age group 18-24 years, 14% were in the age group 25-34 years, 33.5% were in the age group 35-44 years, 36.9% were in the age group 45-54 years, 14.5% were in the age group 55 years and older, and there was one missing entry.

Table 10: Breakdown of valid survey respondents by Age (Source: Primary Data)

Age Range	Frequency	Percent
18-24 years	3	0.8%
25-34 years	50	14.0%

35-44 years	120	33.5%
45-54 years	132	36.9%
55+ years	52	14.5%
Missing	1	0.3%
TOTAL	358	100%

4.3.3 Level of Education

Table 11 below shows that from the 358 valid respondents 2.5% had a Grade 12 education, 5.9% of respondents a Higher certificate / N4-N6 / Artisan qualification, 24.6% a National Diploma, 20.9% a Bachelor's Degree, 26.5% a Postgraduate or Honours Degree, 18.7% a Master's Degree, 0.6% had a Doctors Degree, and there was one missing entry.

Table 11: Breakdown of valid survey respondents by Level of Education (Source: Primary Data)

Level of Education	Frequency	Percent
Grade 12	9	2.5%
Higher Certificate / N4-N6 / Artisan	21	5.9%
National Diploma	88	24.6%
Bachelor's Degree	75	20.9%
Postgraduate / Honours Degree	95	26.5%
Master's Degree	67	18.7%
Doctors Degree	2	0.6%
Missing	1	0.3%
TOTAL	358	100%

4.3.4 Years Working in Organisation

Table 12 below shows that from the 358 valid respondents that 0.6% are still in training or serving an internship, 2% are contractors, 4.5% have been working at the organisation for less than 1 year, 9.8% for between 1 to 3 years, 12.6% for between 4 to 6 years, 10.3% for between 7 to 9 years, 60.1% for more than 10 years, and there was one missing entry.

Table 12: Breakdown of valid survey respondents by Level of Education (Source: Primary Data)

Years Working in Organisation	Frequency	Percent
Still in training or serving an internship	2	0.6%
Contractor	7	2.0%
Less than 1 year	16	4.5%
1-3 years	35	9.8%
4-6 years	45	12.6%
7-9 years	37	10.3%
10+ years	215	60.1%
Missing	1	0.3%
TOTAL	358	100%

4.3.5 Current Job Role in Organisation

Table 13 below shows that from the 358 valid respondents that approximately 37.4% (134) of the respondents are in management / supervisory roles, systems / cloud / cybersecurity engineer roles and IP data network engineer / architect / support roles, which are roles that would typically be found in a telco organisation. These three categories also have the top three highest number of respondents.

The remaining 62.6% (224) of respondents are spread across 32 job role categories in the organisation, with the no. of respondents in each of these categories ranging from approximately 0.3% (1) to 6.1% (22).

Table 13: Breakdown of valid survey respondents by Current Job Role (Source: Primary Data)

Current Job Role in Organisation	Frequency	Percent
Senior Leadership (C-Suite)	3	0.8%
Leadership (Manager of Managers)	22	6.1%
Management / Supervisory (Manager of Others)	55	15.4%
Portfolio / Product Management	13	3.6%
Programme / Project Management	22	6.1%
Agile Scrum Roles (Product Owner, Scrum Master & Development Team)	6	1.7%
Account Management / Key Account Management	1	0.3%
Facilities Management	2	0.6%

Systems / Cloud / Cybersecurity Engineer	45	12.6%
Software Engineer / Developer	17	4.7%
Artificial Intelligence / Machine Learning Specialist	1	0.3%
Web Designer / Administrator	3	0.8%
Solution Architect	15	4.2%
Business Analyst	11	3.1%
Data Analyst	12	3.4%
Data Scientist	1	0.3%
Business Intelligence	1	0.3%
Brand	4	1.1%
Marketing (Non-digital)	2	0.6%
Digital Marketing (SEM, SEO, Social Media, etc.)	1	0.3%
Customer Care (Frontline / Acquisition / Retention)	2	0.6%
Customer Relationship Management	4	1.1%
FinOps	4	1.1%
Revenue Assurance	3	0.8%
Legal / Regulatory	3	0.8%
Human Resources	10	2.8%
Supply Chain Management	5	1.4%
Strategy	15	4.2%
Innovation	7	2.0%
IP Data Network Engineer / Architect / Support	34	9.5%
Systems Administrator	11	3.1%
DevSecOps / NetOps Specialist	12	3.4%
Cybersecurity Specialist	3	0.8%
Financial Planning / Forecasting	4	1.1%
Financial Accounting / Reporting	3	0.8%
Missing	1	0.3%
TOTAL	358	100%

4.4 Checking Data for Univariate Outliers

A dataset could contain scores for single constructs that are so low or so high that they stand out from the majority of scores. These are referred to as univariate outliers (Brase & Brase, 2019). It is important to identify these outliers in the dataset and understand if they were caused by data collection or data entry error, or if indeed they are valid extreme values, so that they be assessed and dealt with appropriately to avoid further statistical distortions later on (Tabachnick & Fidell, 2006).

Using the box-and-whisker graphical tool from SPSS, six extreme outlier cases were identified across the constructs EDC and PE, as shown in Table 14 below. Tabachnick and Fidell (2006) and Sweet and Grace-Martin (2003) advise that the action taken with outliers should be carefully considered before going the route of deletion out of the dataset, as outliers could turn out to be an important valid case for the observation. For this study, if deletion of the univariate outliers were decided to be the best option, then the entire case would need to be deleted, because the study outcomes were fully dependant on all three of the study's constructs. The researcher decided to take the conservative approach and keep the dataset as is, until later when multivariate outliers were analysed. The graphs and plots for all constructs can be seen in Appendix D, Figures 23 to 25.

Table 14: Univariate Outliers in dataset (Source: Primary data)

	Outlier Case	Case Mean	Construct Mean
EDC	37	3.400	6.091
	80	3.000	6.091
EIWB	-	-	-
PE	42	3.500	6.215
	179	3.500	6.215
	320	2.700	6.215
	326	3.600	6.215

4.5 Checking Data for Normal Distribution

Parametric statistical procedures assume that the sample data follows a normal distribution (normality) around the mean of a particular construct i.e. Gaussian distribution also known as a bell shaped curve distribution (Ghasemi & Zahediasl, 2012). Hence checking for normality is an important data pre-check. Normality is essentially reflective of the distribution of the population from which the sample was extracted. Mertler and Vannatta (2016); Sweet and Grace-Martin (2003); Tabachnick and Fidell (2006) cite two broad methods of

checking for normality: graphical and statistical testing. Graphical methods typically include histograms and quantile-quantile (Q-Q) plots, and statistical tests typically include skewness, Kurtosis, Kolmogorov-Smirnov with Lilliefors Significance Correction (K-SLSC), and Shapiro-Wilk (S-W), among others.

Table 15 below shows the skewness and kurtosis values for each of the composite constructs in the dataset. Various researchers provide different guidelines on the interpretation of these tests. For example, Ghasemi and Zahediasl (2012) indicate that in terms of absolute z-values: 1.96 is significant at $P < 0.05$ (sample size < 200), 2.58 is significant at $P < 0.01$ (sample size > 200), 3.29 is significant at $P < 0.001$, and that these approaches should not be used in very large sample sizes (value not specified). Mertler and Vannatta (2016) indicate that an absolute z-value of 3.00 is within range of normality, and with larger sample sizes ($N > 100$) an absolute z-value of 4.00 is within range of normality.

Table 15: Skewness and Kurtosis tests for study's constructs

	EDC	PE	EIWB
Mean	6.091	6.215	5.659
Std. Deviation	0.590	0.663	0.916
Skewness	-1.214	-1.638	-0.900
Skewness Std. Error	0.129	0.129	0.129
Z _{SKWNESS}	-9.414	-12.707	-6.982
Kurtosis	3.332	4.487	0.611
Kurtosis Std. Error	0.257	0.257	0.257
Z _{KURTOSIS}	12.957	17.448	2.374

According to Mishra et al. (2019) S-W tests are more appropriate for smaller sample sizes ($N < 50$) and K-SLSC tests more appropriate for bigger sample sizes ($N \geq 50$). Table 16 below shows the outcomes of the K-SLSC and S-W tests.

Table 16: Kolmogorov-Smirnov and Shapiro-Wilk tests for study's constructs

Tests of Normality						
	Kolmogorov-Smirnov (Lilliefors Significance Correction)			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
EDC Composite	0.091	358	<,001	0.929	358	<,001
PE Composite	0.130	358	<,001	0.870	358	<,001
EIWB Composite	0.112	358	<,001	0.941	358	<,001

Referring to Appendix D (Figures 23 to 25), a visual inspection of the histograms and Q-Q-Plots for each construct seems to show a more normalised distribution in contrast to Tables 15 and 16 above. According to Mishra et al. (2019) the central limit theorem states that when sample size is greater than 100, violation of the

normality is not a major issue. Similarly Ghasemi and Zahediasl (2012) state that with bigger samples sizes (> 30 or 40) violating normality assumptions should not result in major issues. Since the study's sample size (N=358) exceeds these guidelines, and with respect to visual inspection, the researcher opted not to take any further action on skewness and kurtosis.

4.6 Frequency Distribution and Measures of Central Tendency for Study Constructs

4.6.1 EDC

Reviewing the frequency distribution of the collected EDC responses as per Table 17 below, it is apparent that a big portion of the responses for all EDC items (82.7%) were very positively answered either with 'Agree' or 'Strongly Agree'.

Table 17: Frequency Distribution of collected EDC responses (Source: Primary Data)

Item		Strongly Disagree	Disagree	Mildly Disagree	Not Sure	Mildly Agree	Agree	Strongly Agree	Total
EDC Q1	Count	9	16	10	3	57	169	94	358
	Row N%	2.5%	4.5%	2.8%	0.8%	15.9%	47.2%	26.3%	100%
EDC Q2	Count	5	12	7	15	82	163	74	358
	Row N%	1.4%	3.4%	2.0%	4.2%	22.9%	45.5%	20.7%	100%
EDC Q3	Count	0	2	1	1	17	140	197	358
	Row N%	0.0%	0.6%	0.3%	0.3%	4.7%	39.1%	55.0%	100%
EDC Q4	Count	9	20	18	6	117	114	74	358
	Row N%	2.5%	5.6%	5.0%	1.7%	32.7%	31.8%	20.7%	100%
EDC Q5	Count	0	6	4	2	52	177	117	358
	Row N%	0.0%	1.7%	1.1%	0.6%	14.5%	49.4%	32.7%	100%
EDC Q6	Count	1	5	11	4	44	145	148	358
	Row N%	0.3%	1.4%	3.1%	1.1%	12.3%	40.5%	41.3%	100%
EDC Q7	Count	1	1	3	3	20	165	165	358
	Row N%	0.3%	0.3%	0.8%	0.8%	5.6%	46.1%	46.1%	100%

EDC Q8	Count	0	1	1	2	15	202	137	358
	Row N%	0.0%	0.3%	0.3%	0.6%	4.2%	56.4%	38.3%	100%
EDC Q9	Count	1	2	0	1	9	143	202	358
	Row N%	0.3%	0.6%	0.0%	0.3%	2.5%	39.9%	56.4%	100%
EDC Q10	Count	0	3	1	1	18	141	194	358
	Row N%	0.0%	0.8%	0.3%	0.3%	5.0%	39.4%	54.2%	100%

Reviewing the descriptive statistics from Table 18 below, revealed an overall mean score of 6.09 (SD = 0.590) for EDC. This shows that digital competence of the sample is very high (just above Agree) and complements the strong positive trend in the frequency distribution. EDC Q9 had the highest mean value (6.50, SD = 0.685), indicating that employees of this organisation find purpose in what they are doing as opposed to merely executing tasks. EDC Q4 had the lowest mean value (5.35, SD = 1.468), and as per the frequency distribution in Table 11, indicating that approximately 32.7% (117 responses for Mildly Agree) of the sample are not entirely competent when it comes to creating infographics and posters combining information, statistical content and visuals using available apps or software.

Table 18: EDC – Measures of Central Tendency (Source: Primary Data)

Item	Valid	Missing	Mean	Median	Mode	Std. Deviation	Minimum	Maximum
EDC Q1	358	0	5.70	6.00	6	1.402	1	7
EDC Q2	358	0	5.63	6.00	6	1.238	1	7
EDC Q3	358	0	6.47	7.00	7	0.712	2	7
EDC Q4	358	0	5.35	6.00	5	1.468	1	7
EDC Q5	358	0	6.07	6.00	6	0.928	2	7
EDC Q6	358	0	6.11	6.00	6	1.069	1	7
EDC Q7	358	0	6.34	6.00	7	0.792	1	7
EDC Q8	358	0	6.31	6.00	6	0.649	2	7
EDC Q9	358	0	6.50	7.00	7	0.685	1	7
EDC Q10	358	0	6.44	7.00	7	0.753	2	7
EDC All Q	358	0	6.09			0.590	3.0	7.0

4.6.2 PE

Reviewing the frequency analysis of the collected PE responses as per Table 19 below, it is evident that a big portion of the responses for all PE items (87.32%) were very positively answered either with 'Agree' or 'Strongly Agree'.

Table 19: Frequency Analysis of collected PE responses (Source: Primary Data)

Item		Strongly	Disagree	Mildly	Not Sure	Mildly	Agree	Strongly	Total
		Disagree		Disagree		Agree		Agree	
PE Q1	Count	3	2	3	4	37	165	144	358
	Row N%	0.8%	0.6%	0.8%	1.1%	10.3%	46.1%	40.2%	100%
PE Q2	Count	1	3	6	1	30	160	157	358
	Row N%	0.3%	0.8%	1.7%	0.3%	8.4%	44.7%	43.9%	100%
PE Q3	Count	0	3	2	1	19	155	178	358
	Row N%	0.0%	0.8%	0.6%	0.3%	5.3%	43.3%	49.7%	100%
PE Q4	Count	3	7	13	2	47	134	152	358
	Row N%	0.8%	2.0%	3.6%	0.6%	13.1%	37.4%	42.5%	100%
PE Q5	Count	4	9	14	5	56	143	127	358
	Row N%	1.1%	2.5%	3.9%	1.4%	15.6%	39.9%	35.5%	100%
PE Q6	Count	0	0	3	2	12	173	168	358
	Row N%	0.0%	0.0%	0.8%	0.6%	3.4%	48.3%	46.9%	100%
PE Q7	Count	0	0	1	2	16	192	147	358
	Row N%	0.0%	0.0%	0.3%	0.6%	4.5%	53.6%	41.1%	100%
PE Q8	Count	0	0	5	1	21	154	177	358
	Row N%	0.0%	0.0%	1.4%	0.3%	5.9%	43.0%	49.4%	100%
PE Q9	Count	4	3	6	1	26	147	171	358
	Row N%	1.1%	0.8%	1.7%	0.3%	7.3%	41.1%	47.8%	100%
PE Q10	Count	4	7	8	3	54	159	123	358
	Row N%	1.1%	2.0%	2.2%	0.8%	15.1%	44.4%	34.4%	100%

Reviewing the descriptive statistics from Table 20 below, reveals an overall mean score of 6.21 ($SD = 0.663$) for PE. This shows that PE of the sample is very high (just above Agree) and complements the very strong positive trend in the frequency analysis. PE Q6 had the highest mean value (6.40, $SD = 0.665$), indicating that employees in this sample feel that they have the skills and abilities to their jobs well. PE Q5 had the lowest mean value (5.90, $SD = 1.263$). PE Q4 has the 3rd lowest mean value (6.05, $SD = 1.195$), and together with PE Q5 measure whether an employee feels that they are given the opportunity to influence work outcomes and decisions in their domain of work. This could be indicative of some uncertainty around employee empowerment.

Table 20: PE – Measures of Central Tendency (Source: Primary Data)

Item	Valid	Missing	Mean	Median	Mode	Std. Deviation	Minimum	Maximum
PE Q1	358	0	6.19	6.00	6	0.944	1	7
PE Q2	358	0	6.25	6.00	6	0.910	1	7
PE Q3	358	0	6.39	6.00	7	0.772	2	7
PE Q4	358	0	6.05	6.00	7	1.195	1	7
PE Q5	358	0	5.90	6.00	6	1.263	2	7
PE Q6	358	0	6.40	6.00	6	0.665	1	7
PE Q7	358	0	6.35	6.00	6	0.620	1	7
PE Q8	358	0	6.39	6.00	7	0.735	2	7
PE Q9	358	0	6.26	6.00	7	1.030	1	7
PE Q10	358	0	5.97	6.00	6	1.151	2	7
PE All Q	358	0	6.21			0.663	3.0	7.0

4.6.3 EIWB

Reviewing the frequency analysis of the collected EIWB responses as per Table 21 below, it is evident that a more than half of the responses for all EIWB items (64.9%) were positively answered either with 'Very Often' or 'Always'. If the 'Fairly Often' responses are included, then a significant number of responses are positive (88.4%).

Table 21: Frequency Analysis of collected EIWB responses (Source: Primary Data)

Item		Never	Almost Never	Sometimes	Not Sure	Fairly Often	Very Often	Always	Total
EIWB Q1	Count	0	2	19	1	71	156	109	358
	Row N%	0.0%	0.6%	5.3%	0.3%	19.8%	43.6%	30.4%	100%
EIWB Q2	Count	1	1	15	1	64	165	111	358
	Row N%	0.3%	0.3%	4.2%	0.3%	17.9%	46.1%	31.0%	100%
EIWB Q3	Count	0	3	36	3	98	143	75	358
	Row N%	0.0%	0.8%	10.1%	0.8%	27.4%	39.9%	20.9%	100%
EIWB Q4	Count	0	6	44	4	94	145	65	358
	Row N%	0.0%	1.7%	12.3%	1.1%	26.3%	40.5%	18.2%	100%
EIWB Q5	Count	1	7	42	7	105	133	63	358
	Row N%	0.3%	2.0%	11.7%	2.0%	29.3%	37.2%	17.6%	100%
EIWB Q6	Count	3	8	33	7	93	142	72	358
	Row N%	0.8%	2.2%	9.2%	2.0%	26.0%	39.7%	20.1%	100%
EIWB Q7	Count	3	16	48	6	82	118	85	358
	Row N%	0.8%	4.5%	13.4%	1.7%	22.9%	33.0%	23.7%	100%
EIWB Q8	Count	3	7	35	6	74	131	102	358
	Row N%	0.8%	2.0%	9.8%	1.7%	20.7%	36.6%	28.5%	100%
EIWB Q9	Count	2	2	18	2	68	134	132	358
	Row N%	0.6%	0.6%	5.0%	0.6%	19.0%	37.4%	36.9%	100%
EIWB Q10	Count	2	3	15	4	91	145	98	358
	Row N%	0.6%	0.8%	4.2%	1.1%	25.4%	40.5%	27.4%	100%

Reviewing the descriptive statistics from Table 22 below, reveals an overall mean score of 5.66 ($SD = 0.916$) for EIWB. This shows that EIWB of the sample is fairly high (between 'Fairly Often' and 'Very Often'). EIWB Q2 and EIWB Q9 had the joint highest mean value (5.97 , $SD = 0.997$ and $SD = 1.125$ respectively). EIWB Q7 had the lowest mean value (5.35 , $SD = 1.500$).

Table 22: EIWB – Measures of Central Tendency (Source: Primary Data)

Item	Valid	Missing	Mean	Median	Mode	Std. Deviation	Minimum	Maximum
EIWB Q1	358	0	5.92	6.00	6	1.038	2	7
EIWB Q2	358	0	5.97	6.00	6	0.997	1	7
EIWB Q3	358	0	5.58	6.00	6	1.178	2	7
EIWB Q4	358	0	5.46	6.00	6	1.256	2	7
EIWB Q5	358	0	5.40	6.00	6	1.277	1	7
EIWB Q6	358	0	5.49	6.00	6	1.298	1	7
EIWB Q7	358	0	5.35	6.00	6	1.500	1	7
EIWB Q8	358	0	5.63	6.00	6	1.353	1	7
EIWB Q9	358	0	5.97	6.00	6	1.125	1	7
EIWB Q10	358	0	5.81	6.00	6	1.091	1	7
EIWB All Q	358	0	5.66			0.916	2.2	7.0

4.7 CFA Results

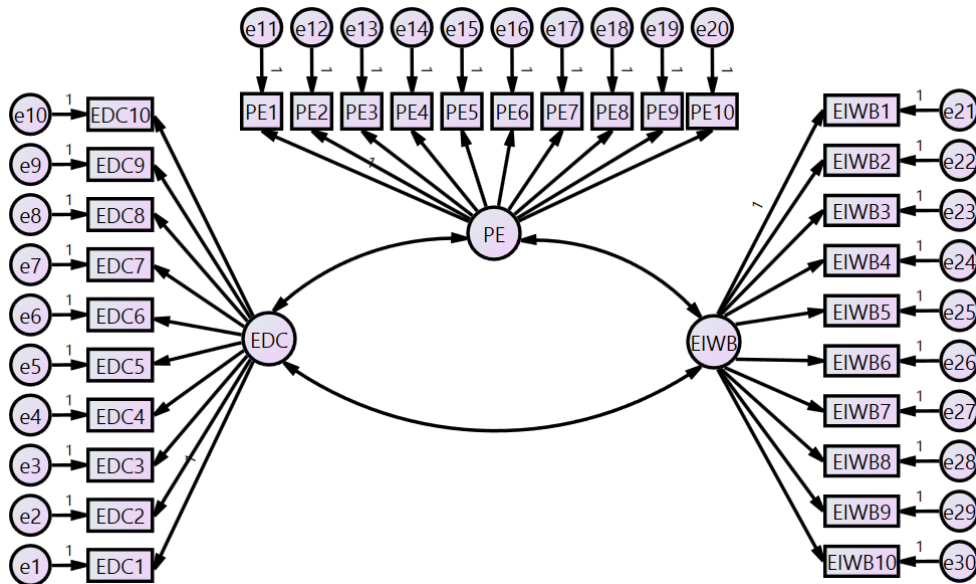
According to Whittaker and Schumacker (2022), traditionally, assessment of validity and reliability scores of a data collection instrument in a specific context formed the basis for further statistical analysis. However investigations by some scholars revealed that traditional approaches did not account for measurement error, and furthermore these had a significant impact on analysis outcomes (Cochran, 1968; Fuller, 1987). Consequently, Jöreskog (1969) created an approach for CFA using maximum likelihood (ML) estimation to mitigate the negative effects of measurement error.

The objective of using CFA is to assess the fit of the measurement model to the collected data. CFA for this study's measurement model was carried out using the SPSS Amos Graphic tool with software version 29.0.0. CFA is an iterative process which starts off by specifying the measurement model in Amos, initially testing the model for fit and assessing compliance with the 'rule of thumb' model fit indicators from prior literature, re-specifying the model with incremental changes (if model fit indicators are not acceptable) and then re-testing after each incremental change for model fit. The final step for CFA is to assess the measurement model's reliability and validity.

4.7.1 Measurement Model Specification

The study's conceptual framework formed the basis of the measurement model specification. The CFA input measurement model prior to any model re-specification is shown in Figure 14 below. The study's latent constructs (EDC, PE and EIWB) are depicted along with their respective observable measurement indicators (10 indicators each, which coincide with the survey questions in Appendix A).

Figure 14: CFA Input Measurement Model for study



4.7.2 Initial Test and Assessment for Model Fit

Table 23: Model Fit values for study prior CFA

Absolute Fit								
CMIN	df	p	CMIN / df	SRMR	GFI	RMSEA	RMSEA 90% CI	
							Lower	Upper
2182.850	402	< .000	5.430	0.0929	0.696	0.111	0.107	0.116
Incremental Fit								
CFI			TLI	NFI	IFI	RFI		
0.690			0.665	0.647	0.692	0.618		
CMIN: Chi-square value				SRMR: Standardised Root Mean squared Residual				
df: degree of freedom				GFI: Goodness of Fit				
p: probability				RMSEA: Root Mean Square Error of Approximation				
CFI: Comparative Fit Index				IFI: Incremental Fit Index				
TLI: Tucker Lewis coefficient				RFI: Relative Fit Index				
NFI: Normed Fit Index								

Table 23 above provides an overview of the key model fit values for the input measurement model in Figure 13 after the initial test. The model fit indicators needed to be assessed against model fit indicators guidance from prior literature. to determine an acceptable fit and the next steps in the CFA process.

To obtain an acceptable model fit, selected key parameters from absolute fit and incremental fit, were assessed each time a change was made on the model, and the estimates calculated:

- Chi-Square value (CMIN) / degree of freedom (df)
- Goodness of Fit Index (GFI)
- Root Mean Square Error of Approximation (RMSEA)
- Comparative Fit Index (CFI)
- Tucker-Lewis co-efficient (TLI)

The researcher used the following iterative approach to obtain an acceptable model fit:

1. The first step was evaluating the modification indices (MIs) in the AMOS output for extreme values, and then adding a covariance to the respective error terms (Collier, 2020). Caution was taken not to add covariances to error terms not belonging to the same construct, as well as adding covariances between error terms and constructs (Collier, 2020). The MIs were evaluated from the highest MI value till reaching a point where there were no values above 20, before continuing to step two (Brown, 2015). After every model re-specification, estimates were calculated, and the model fit parameters monitored. Table 24 below provides a view of the model fit parameters after the first step was concluded.

Table 24: Key model fit parameters after first step

Absolute Fit		
CMIN / df	GFI	RMSEA
2.880	0.823	0.073
Incremental Fit		
CFI		TLI
0.872		0.858

2. The second step entailed evaluating the standardised regression weights (factor loadings). Zainudin (2014) specifies that factor loadings of ≥ 0.5 are acceptable for newly created items. Collier (2020) indicates that factor loadings of > 0.70 are preferred because the variance (R^2) value which is the square of the factor loading ($0.70^2 = 0.49$), indicates the 49% of the variance of the item is accounted for by the latent construct, and the remaining 51% is accounted for by measurement error. Based on (Zainudin)’s criteria, the relationships between each latent construct and the respective items were examined for factor loadings <0.5 starting from the very lowest. (Zainudin) recommends that item deletion be restricted to not exceed 20% of all items in the model. (Collier) cites that in general three items per construct should be sufficient to

calculate α but could vary depending on the complexity of the latent construct being measured. In addition (Collier) recommends that ideally a second data collection should take place if items are dropped from a construct or the best practice is to drop items in the pilot testing phase. During this iterative process of model re-configuration and calculating estimates, four items were removed for EDC (1, 4, 8 & 9), four items were removed for PE (6, 7, 8 & 9) and four items for EIWB (4, 7, 8 & 9). Although this constitutes 40% (12/30) of the total items, the researcher deemed it reasonable since each of the constructs still had six items each remaining, and as can be seen from the table below, it was a trade off since the model fit parameters improved quite a bit after the second step was concluded. On completion of this step, we can say that unidimensionality of the items were reached, because they all had acceptable factor loadings (Zainudin, 2014). Table 25 below provides a view of the model fit parameters after the second step was concluded.

Table 25: Key model fit parameters after second step

Absolute Fit		
CMIN / df	GFI	RMSEA
2.570	0.910	0.066
Incremental Fit		
CFI	TLI	
0.931	0.918	

- The third and final step was the evaluation of was examining the standardised residual covariance matrix. Zainudin (2014) recommends that standardised residual values be ≤ 2 and Collier (2020) indicate that these values should be ≤ 2.58 . For the study constructs EDC, PE and EIWB, standardised residuals did not exceed two, hence no model re-specification was carried out during this step.

The final measurement model and model fit indices are shown in Figure 15 and Table 26 below.

Figure 15: Final Measurement Model after CFA

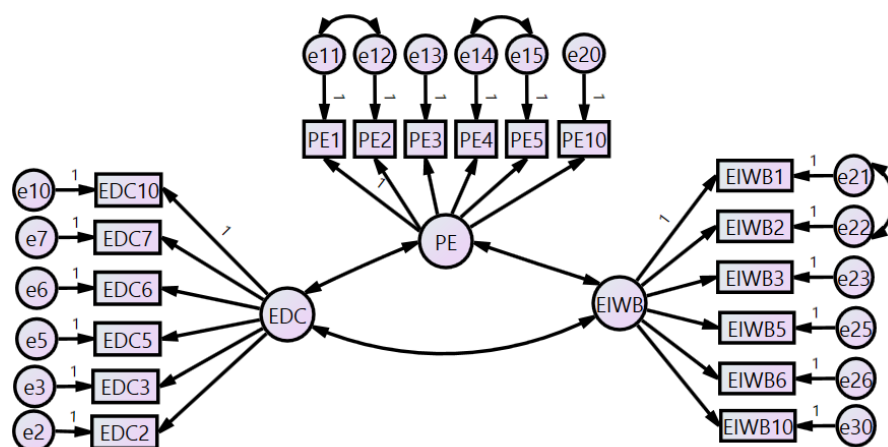


Table 26: Model Fit values for study after CFA

Absolute Fit								
CMIN	df	p	CMIN / df	SRMR	GFI	RMSEA	RMSEA 90% CI	
							Lower	Upper
331.493	129	< .000	2.570	0.0656	0.910	0.066	0.058	0.075
Incremental Fit								
CFI			TLI	NFI	IFI	RFI		
0.931			0.918	0.892	0.931	0.872		
CMIN: Chi-square value				SRMR: Standardised Root Mean squared Residual				
df: degree of freedom				GFI: Goodness of Fit				
p: probability				RMSEA: Root Mean Square Error of Approximation				
CFI: Comparative Fit Index				IFI: Incremental Fit Index				
TLI: Tucker Lewis coefficient				RFI: Relative Fit Index				
NFI: Normed Fit Index								

For CMIN/df Kline (2023) proposes that the ratio should be ≤ 3 for an acceptable fit, and Marsh and Hocevar (1985) indicates that ≤ 5 is a reasonable fit. This study's CMIN/df ratio of 2.570 exceeds the recommended ratios.

GFI can range from 0-1. Hu and Bentler (1998) specified that a value of ≥ 0.9 gives a reasonable fit, and Kline (2023) indicates that a value of ≥ 0.95 gives an excellent fit. The value of this study's GFI is 0.910, which represents a good fit.

RMSEA index, has a minimum value of 0 but no specified upper limit. Values below 0.06 are considered indicative of good fit and values between 0.06 and 0.10 are considered indicative of adequate fit (Roos & Bauldry, 2022). The study's RMSEA value is 0.066, which fits into the category of an adequate to good fit.

Hu and Bentler (1999) indicated that both the comparative fit index (CFI) and Tucker-Lewis index (TLI) range from lower limits of 0 and to upper limits close to 1. (Hu & Bentler); West et al. (2012) and Zimmer (2019) indicated that for a very good model fit values are ≥ 0.95 . This study's model had CFI and TLI values of 0.931 and 0.918 respectively, which can be deemed a good model fit.

In rounding off the absolute fit parameters SRMR index values should range between 0 and 1, with values closer to 0 indicative of better fit. Values below 0.08 suggest reasonable fit for a measurement model (Roos & Bauldry, 2022). This would be appropriate for study's SRMR value of 0.0656.

4.8 Reliability of Measurement Scales

For the current study, the assessment of reliability focused only on internal consistency, with external consistency being out of scope for this cross-sectional study. Internal consistency is the extent to which the items that make up a multi-item measurement scale, are indeed measuring a common construct (Pallant, 2020).

4.8.1 EDC

During the data collection phase, for EDC, the researcher measured the level of digital competency of the respondents, using a 10-item scale based on 7-point Likert scale ranging from strongly agree to strongly agree. The α value of the original full scale was 0.784. Four items (EDC1, 4, 8 and 9) had to be removed in the process of obtaining an acceptable model fit. Table 27 below shows the EDC scale items total statistics, with a collective α value of 0.747. Deleting each scale item successively did not result in an increased α value for any of the scale items. Hence there was no need to delete any more items.

Table 27: EDC Scale Items Total Statistics (Source: Primary Data)

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha (6 items)
EDC Q2	31.42	8.693	0.500	0.251	0.717	0.747
EDC Q3	30.59	11.290	0.434	0.217	0.726	
EDC Q5	30.99	9.571	0.600	0.375	0.678	
EDC Q6	30.95	9.152	0.553	0.343	0.691	
EDC Q7	30.72	10.831	0.463	0.231	0.718	
EDC Q10	30.61	11.196	0.419	0.202	0.728	

The EDC inter-item correlation matrix in Table 28 below, only contained positive values, which met the acceptable criteria.

Table 28: EDC Inter-Item Correlation Matrix (Source: Primary Data)

Item	EDC Q2	EDC Q3	EDC Q5	EDC Q6	EDC Q7	EDC Q10
EDC Q2	1.000					
EDC Q3	0.304	1.000				
EDC Q5	0.408	0.336	1.000			

EDC Q6	0.387	0.255	0.518	1.000		
EDC Q7	0.310	0.286	0.395	0.387	1.000	
EDC Q10	0.290	0.360	0.324	0.300	0.208	1.000

4.8.2 PE

During the data collection phase, for PE, the researcher measured the level of intrinsic motivation of the respondents, using a 10-item scale based on 7-point Likert scale ranging from strongly agree to strongly agree. The α value of the original full scale was 0.881. Four items (PE6, 7, 8 and 9) had to be removed in the process of obtaining an acceptable model fit. Table 29 below shows the PE scale items total statistics, with a collective α value of 0.871. Deleting each scale item successively did not result in an increased α value for any of the scale items. Hence there was no need to delete any more items.

Table 29: PE Scale Items Total Statistics (Source: Primary Data)

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha (10 items)
PE Q1	30.56	18.26	0.640	0.687	0.855	0.871
PE Q2	30.50	18.07	0.702	0.754	0.846	
PE Q3	30.36	19.16	0.676	0.583	0.854	
PE Q4	30.70	16.00	0.720	0.724	0.841	
PE Q5	30.85	15.53	0.724	0.735	0.842	
PE Q10	30.78	16.94	0.640	0.433	0.856	

The PE inter-item correlation matrix in Table 30 below, only contained positive values, which met the acceptable criteria.

Table 30: PE Inter-Item Correlation Matrix (Source: Primary Data)

Item	PE Q1	PE Q2	PE Q3	PE Q4	PE Q5	PE Q10
PE Q1	1.000					
PE Q2	0.822	1.000				
PE Q3	0.664	0.742	1.000			
PE Q4	0.396	0.464	0.460	1.000		
PE Q5	0.411	0.437	0.461	0.841	1.000	

PE Q10	0.419	0.458	0.455	0.581	0.613	1.000
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4.8.3 EIWB

During the data collection phase, for EIWB, the researcher measured the level of IWB of the respondents, using a 10-item scale based on 7-point Likert scale ranging from never to always. The α value of the original full scale was 0.914. Four items (EIWB4, 7, 8 and 9) had to be removed in the process of obtaining an acceptable model fit. Table 31 below shows the EIWB scale items total statistics, with a collective α value of 0.852. Deleting each scale item successively did not result in an increased α value for any of the scale items. Hence there was no need to delete any more items.

Table 31: EIWB Scale Items Total Statistics (Source: Primary Data)

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha (10 items)
EIWB Q1	28.26	20.44	0.629	0.494	0.829	0.852
EIWB Q2	28.21	20.47	0.661	0.513	0.824	
EIWB Q3	28.60	18.59	0.733	0.560	0.808	
EIWB Q5	28.78	18.42	0.672	0.476	0.820	
EIWB Q6	28.69	18.71	0.625	0.412	0.831	
EIWB Q10	28.37	21.01	0.522	0.285	0.847	

The EIWB inter-item correlation matrix in Table 32 below, only contained positive values, which met acceptable criteria.

Table 32: EIWB Inter-Item Correlation Matrix (Source: Primary Data)

Item	EIWB Q1	EIWB Q2	EIWB Q3	EIWB Q5	EIWB Q6	EIWB Q10
EIWB Q1	1.000					
EIWB Q2	0.650	1.000				
EIWB Q3	0.593	0.597	1.000			
EIWB Q5	0.439	0.501	0.612	1.000		
EIWB Q6	0.425	0.425	0.555	0.548	1.000	
EIWB Q10	0.352	0.384	0.409	0.457	0.446	1.000

Nunnally and Bernstein (1994) indicated that an α value of greater than 0.7 is an acceptable measure of reliability. Collier (2020) argued that α has some downsides despite it being a popular method for evaluating reliability. α tends to excessively increase value when a construct has a large number of items, and it also assumes that all items in a construct have the same weighting.

An alternative method that can be used to assess reliability is the composite reliability (CR) test (Hair et al., 2019), using the formula in Figure 16 below:

Figure 16: Composite Reliability Formula Adopted from Hair et al. (2019)

$$CR = \frac{\left(\sum_{i=1}^n L_i\right)^2}{\left(\sum_{i=1}^n L_i\right)^2 + \left(\sum_{i=1}^n e_i\right)}$$

The CR value per construct is calculated by squaring the factor loadings per item, adding them together and then dividing by the number items, and then using this value as the numerator. The denominator uses the same value as the numerator but adds to it the sum of the error variances for all the items in the construct. The same criteria that is used for α is applicable to CR i.e. values ≥ 0.7 represent higher internal consistency (Hair et al., 2019). The CR values for each of the study's constructs are shown in Table 33 below.

Table 33: Composite Reliability for Study's Constructs

Construct	Item	Factor Loading	(Factor Loading) ²	Error Variance	Composite Reliability (CR)
EDC	EDC2	0.577	0.333	0.667	0.766
	EDC3	0.505	0.255	0.745	
	EDC5	0.704	0.496	0.504	
	EDC6	0.655	0.429	0.571	
	EDC7	0.543	0.295	0.705	
	EDC10	0.570	0.325	0.675	
PE	PE1	0.744	0.554	0.446	0.855
	PE2	0.829	0.687	0.313	
	PE3	0.860	0.740	0.260	
	PE4	0.587	0.345	0.655	

	PE5	0.589	0.347	0.653	
	PE10	0.590	0.348	0.652	
EIWB	EIWB1	0.680	0.462	0.538	0.852
	EIWB2	0.706	0.498	0.502	
	EIWB3	0.816	0.666	0.334	
	EIWB5	0.742	0.551	0.449	
	EIWB6	0.672	0.452	0.548	
	EIWB10	0.570	0.325	0.675	

The results revealed that the EDC scale with 6 items ($\alpha = 0.747$ and $CR = 0.766$), the PE scale with 6 items ($\alpha = 0.871$ and $CR = 0.855$), and the EIWB scale with 6 items ($\alpha = 0.852$ and $CR = 0.852$), thus all scales in this study were found to be reliable and consistently represent the respective constructs (Hair et al., 2019). Table 34 below summarise the α and CR values for the scales of each construct in the study.

Table 34: Summary of Reliability Analysis for Study's Constructs

Construct	Code	Cronbach's Alpha Initial	Total Items	Deleted Items	Cronbach's Alpha Adjusted	Composite Reliability (CR)
Employee Digital Competence	EDC	0.784	6	4	0.747	0.766
Employee Innovative Work Behaviour	EIWB	0.914	6	4	0.852	0.852
Psychological Empowerment	PE	0.881	6	4	0.871	0.855

4.9 Validity of Measurement Scales

4.9.1 Construct Validity

Construct validity is the degree to which a set of items captures the latent constructs that they are intended to measure, and hence is concerned with measurement accuracy (Hair et al., 2019). Construct validity requires the collection of evidence in six different types of validity, but only convergent validity and discriminant/divergent validity was in scope for this study (Drost, 2011).

4.9.2 Convergent Validity

Fornell and Larcker (1981) stated that convergent validity can be examined by calculating the average variance extracted (AVE) for each construct in the study's structural model. AVE is calculated by adding the variance extracted values (square of factor loading) of each of the items in the adjusted model and then dividing by the number of items. The formula in Figure 17 below is used for this calculation:

Figure 17: Convergent Validity Formula Adopted from Hair et al. (2019)

$$AVE = \frac{\sum_{i=1}^n L_i^2}{n}$$

Zainudin (2014) and Collier (2020) specify that the AVE value needs to be greater than 0.5 to signify that the items per construct have convergent validity on the respective construct. Only PE (0.503) met these criteria, with EIWB (0.492) coming close and EDC (0.355) didn't meet the criteria. According Hair et al. (2019), we need to consider the CR values in conjunction with the AVE values to better contextualise especially low values of AVE. In the case of the study's constructs the CR values are within acceptable range (CR: EDC=0.766; PE=0.855; and EIWB=0.852). The AVE value per construct is shown in Table 35 below.

Table 35: AVE values for the study's constructs

Construct	Item	Factor Loading	(Factor Loading) ²	AVE
EDC	EDC2	0.577	0.333	0.355
	EDC3	0.505	0.255	
	EDC5	0.704	0.496	
	EDC6	0.655	0.429	
	EDC7	0.543	0.295	
	EDC10	0.570	0.325	
PE	PE1	0.744	0.554	0.503
	PE2	0.829	0.687	
	PE3	0.860	0.740	
	PE4	0.587	0.345	
	PE5	0.589	0.347	

	PE10	0.590	0.348	
EIWB	EIWB1	0.680	0.462	0.492
	EIWB2	0.706	0.498	
	EIWB3	0.816	0.666	
	EIWB5	0.742	0.551	
	EIWB6	0.672	0.452	
	EIWB10	0.570	0.325	

4.9.3 Discriminant / Divergent Validity

The degree to which a construct is genuinely different from other constructs is known as discriminant or divergent validity. Consequently, a higher discriminant validity shows that a construct is distinct and captures some aspects that other measures cannot (Hair et al., 2019).

Fornell and Larcker Method

The Fornell and Larcker (1981) test compares the AVE values of two constructs with square of the correlation estimates between these two constructs. According to their logic, a construct ought to account for a larger proportion of the variation in its own item measures than it does with respect to another construct (Hair et al., 2019). The matrix is shown in Table 36 below. The values in bold on the diagonal from left to right, are the AVE values for each of the study's constructs.

Table 36: Matrix for Fornell and Larcker method results

	EDC	PE	EIWB
EDC	0.355		
PE	0.057	0.503	
EIWB	0.292	0.170	0.492

For EDC => PE, both AVE for EDC (0.355) and for PE (0.503) are larger than the squared correlation of these two constructs (0.057). For EDC => EIWB, both AVE for EDC (0.355) and for EIWB (0.492) are larger than the squared correlation of these two constructs (0.292). For PE => EIWB, both AVE for EIWB (0.492) and for PE (0.503) are larger than the squared correlation of these two constructs (0.170). On the basis of passing the Fornell and Larcker (1981) test, each of the study's constructs had discriminant validity.

Heterotrait-Monotrait Ratio (HTMT) Method

Henseler et al. (2015) argued that despite the (Fornell & Larcker)'s method being widely used for determining discriminant validity, it does not reliably establish the lack of discriminant validity. Consequently (Henseler et al.) proposed by means of a simulation study an alternative method called the HTMT ratio of correlations to assess discriminant validity. The HTMT method looks at the correlations between constructs (Heterotrait Ratio) relative to the relationship between individual constructs and items (Monotrait Ratio) (Collier, 2020).

Prior to calculating estimates in AMOS, the Analysis Properties needs to have "Implied moments" and "All implied moments" enabled under the Output tab. The output then produces an implied correlations matrix for all constructs, which is used as the basis to establish the different HTMT ratios. This is depicted in Figure 18 below.

Figure 18: Implied Correlations Matrix for study's constructs from AMOS

	EIWB10	EIWB6	EIWB5	EIWB3	EIWB2	EIWB1	PE10	PE5	PE4	PE3	PE2	PE1	EDC10	EDC7	EDC6	EDC5	EDC3	EDC2
EIWB10																		
EIWB6	0.383																	
EIWB5	0.423	0.498																
EIWB3	0.465	0.548	0.605															
EIWB2	0.403	0.475	0.524	0.576														
EIWB1	0.388	0.457	0.504	0.555	0.650													
PE10	0.139	0.163	0.180	0.198	0.172	0.165												
PE5	0.138	0.163	0.180	0.198	0.171	0.165	0.347											
PE4	0.138	0.162	0.179	0.197	0.171	0.164	0.346	0.841										
PE3	0.202	0.238	0.263	0.289	0.250	0.241	0.508	0.507	0.505									
PE2	0.195	0.229	0.253	0.279	0.241	0.232	0.489	0.488	0.487	0.713								
PE1	0.175	0.206	0.227	0.250	0.216	0.208	0.439	0.438	0.437	0.640	0.822							
EDC10	0.160	0.189	0.209	0.229	0.199	0.191	0.074	0.073	0.073	0.107	0.103	0.093						
EDC7	0.167	0.197	0.217	0.239	0.207	0.199	0.077	0.077	0.076	0.112	0.108	0.097	0.283					
EDC6	0.202	0.238	0.262	0.288	0.250	0.240	0.093	0.092	0.092	0.135	0.130	0.117	0.342	0.356				
EDC5	0.217	0.255	0.282	0.310	0.268	0.258	0.099	0.099	0.099	0.145	0.140	0.125	0.367	0.382	0.461			
EDC3	0.155	0.183	0.202	0.222	0.192	0.185	0.071	0.071	0.071	0.104	0.100	0.090	0.263	0.274	0.331	0.355		
EDC2	0.177	0.209	0.231	0.254	0.220	0.212	0.081	0.081	0.081	0.119	0.115	0.103	0.301	0.313	0.378	0.406	0.291	

The light grey shaded areas show the Monotrait correlations per construct and were calculated by taking the average of the values per construct. The dark grey shaded areas show the Heterotrait correlations per construct and were calculated by taking the average of the correlation values per construct (Collier, 2020). The HTMT ratio is simply calculated by taken each Heterotrait ratio and dividing it by the square root of the Monotrait ratios of the two constructs involved, as shown in the mathematical equation below:

$$HTMT \text{ Ratio } 1 = \frac{\text{Heterotrait Ratio } 1}{\text{sqrt} (\text{Monotrait Ratio Construct } 1 * \text{Monotrait Ratio Construct } 2)}$$

The results are shown in the Table 37 below:

Table 37: HTMT Ratios for study's constructs

Constructs	Monotrait Correlations	Construct-Construct	Heterotrait Correlations	HTMT Ratio
EDC	0.340	EDC => EIWB	0.220	0.535

PE	0.534	EDC => PE	0.098	0.230
EIWB	0.497	PE=> EIWB	0.201	0.390

Hair et al. (2019) indicate that bigger HTMT ratios signifies problems with discriminant validity. Henseler et al. (2015) indicate that an HTMT ratio above 0.90 indicates that the constructs are similar and thus a lack of discriminant validity. When constructs are more distinct a threshold value of 0.85 is suggested. Based on these guidelines, since all HTMT ratios are well below 0.85, all constructs showed discriminant validity.

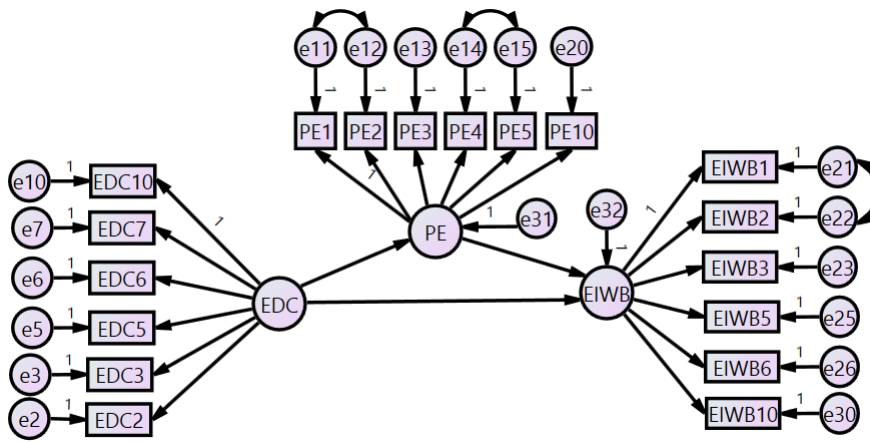
4.10 SEM Results

The measurement model in CFA was respecified to have an acceptable level of model fit, and unidimensionality, reliability and validity was established for the measurement model (Zainudin, 2014). This formed the platform for performing the SEM analysis. Research studies frequently have multiple interrelated constructs and variables that together represent an empirical framework, and that needs to be tested holistically considering all possible information (Hair et al., 2019). Multivariate analysis techniques share one common flaw i.e. the focus is on individual relationships at a time and cannot perform the tests required when dealing with a complex model, as described above (Hair et al., 2019). The technique of SEM is an enhancement of several multivariate techniques (specifically factor analysis and multiple regression analysis), that can perform analysis on multiple interconnected relationships simultaneously (Collier, 2020). Hence SEM was an ideal analysis tool for the current study that needs to assess the relationship between an independent and dependent construct, through an intervening or mediating construct. There are two variants of SEM: covariance based-SEM (CB-SEM) and partial least squares-SEM (PLS-SEM). The current study used CB-SEM because this variant is best used with testing and confirmation of theories (Hair et al., 2019).

4.10.1 Convert measurement model to structural model

The final measurement model from CFA had to be converted into a structural model for the SEM analysis. The latent constructs (EDC, PE and EIWB), the respective items and the measurement errors with the covariances remain unchanged. The covariances between the constructs should be removed and replaced with directional path arrows, following the paths between constructs from the conceptual model. SEM requires that error terms be added on to the dependent constructs (all called endogenous) in the structural model. The resulting structural model is shown in Figure 19 below.

Figure 19: Structural Model for SEM

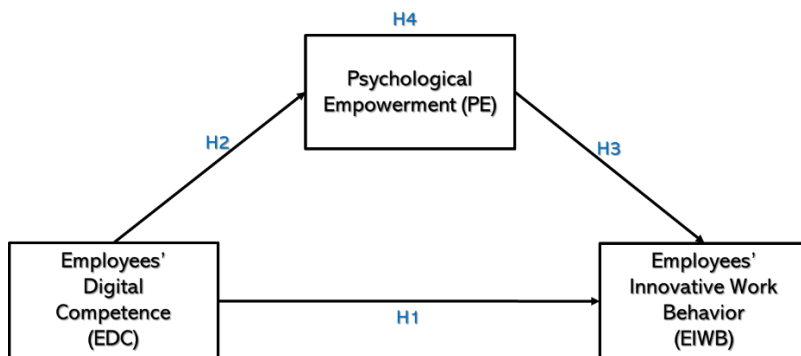


When the model above was run in AMOS, the output showed the following key model indicators CMIN/df = 2.570 (Kline, 2023; Marsh & Hocevar, 1985); GFI=0.910 (Hu & Bentler, 1998; Kline, 2023); RMSEA=0.066 (Roos & Bauldry, 2022); CFI=0.931; TLI=0.918 (Hu & Bentler, 1999; West et al., 2012; Zimmer, 2019) and SRMR=0.0656 (Roos & Bauldry, 2022), which were all in acceptable range based on guidelines from prior literature.

4.10.2 Hypothesis Testing

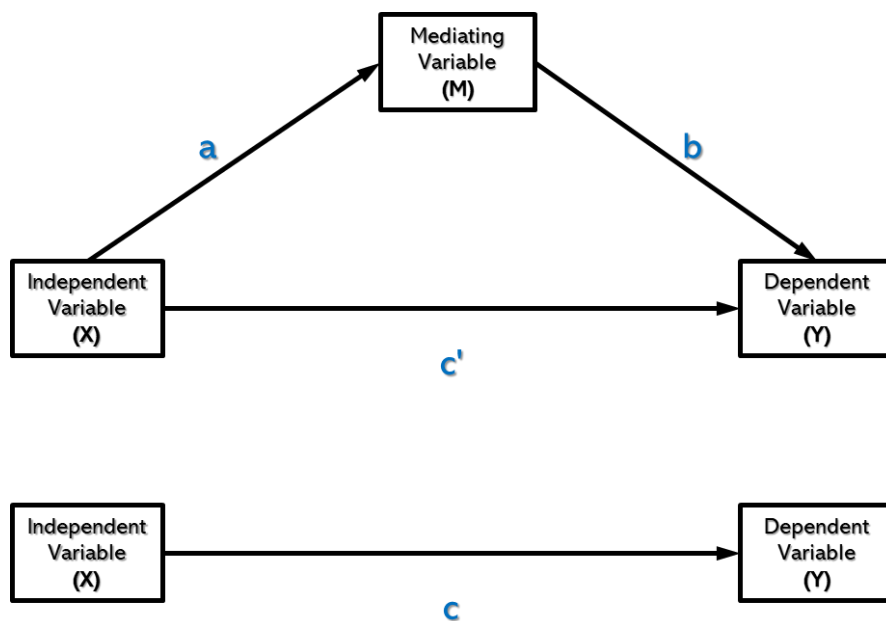
The path diagram for SEM, was based on the study's conceptual model, re-visited in Figure 20 below.

Figure 20: Conceptual Framework – Self drawn by researcher



The primary purpose of this study was to investigate if PE (MV) mediates the relationship between EDC (IV) and EIWB (DV). In practical terms the study intended to understand if the individual behavioural aspects of employee competence (EDC) and empowerment (PE) could be an enhancer for promoting innovation in the workplace. The theoretical model is based on a simple mediation analysis model from the seminal work of Baron and Kenny (1986). The premise of the mediation model is shown in the Figure 21 below.

Figure 21: Conceptual diagrams for simple mediation adopted from Baron and Kenny (1986)



1. Indirect Effect: This element showed the impact of the IV on the DV through the MV. This is represented the relationship of paths $a*b$ from the Figure above. It was required to establish if this relationship was significant or not, so that the null hypothesis $H2_0$ and $H3_0$ (shown below) could be rejected or accepted.

Null Hypothesis $H2_0$: EDC has no effect on PE.

Null Hypotheses $H3_0$: PE has no effect on EIWB.

Research Hypotheses $H2$: EDC positively affects PE.

Research Hypotheses $H3$: PE positively affects EIWB.

2. Total Effect: This element showed the impact of he IV on the DV without the involvement of the MV. This is represented by path c from the Figure above. It was required to establish if this relationship was significant or not, so that the null hypotheses $H1_0$ (shown below) could be rejected or accepted.

Null Hypothesis $H1_0$: EDC has no effect on EIWB.

Research Hypothesis $H1$: EDC positively affects EIWB.

3. Direct Effect: This element showed the impact of the IV on the DV in the presence of the MV. This is represented by path c' from the Figure above. It was required to establish if this relationship was significant or not, so that the null hypotheses $H4_0$ (shown below) could be rejected or accepted.

Null Hypotheses H4₀: PE does not mediate the relationship between EDC and EIWB.

Research Hypotheses H4: PE mediates the relationship between EDC and EIWB.

Table 38: Mediation Results

EDC (IV) -----> EIWB (DV)									No. of bootstrap samples	Percentile Confidence Interval		
Total Effects (c)			Direct Effects (c')			Indirect Effects (a * b)				Lower Bound	Upper Bound	
Co-efficient β	T value	p-value	Co-efficient β	T value	p-value	Co-efficient β	T value	p-value				
0.970	3.452	.000	0.841	3.351	.000	0.129	1.925	.000	5000	95	0.049	1.718

Referring to Table 38 above, mediation analysis was performed to assess the mediating role of PE (MV) in the relationship between EDC (IV) and EIWB (DV). The results revealed a significant indirect effect of EDC on EIWB (H2 and H3: $\beta=0.129$, $t=1.925$, $p=,000$). The total effect of EDC on EIWB was significant (H1: $\beta=0.970$, $t=3.452$, $p=,000$), and also the direct effect of EDC on EIWB was significant (H1: $\beta=0.841$, $t=3.351$, $p=,000$).

Based on the above, the null hypothesis (H1₀, H2₀, H3₀ and H4₀) could be rejected because all the relationships on the respective parts have proven to be significant ($p=,000$). Thus, the alternative hypothesis (H1, H2, H3 and H4) could be accepted.

Research Hypothesis H1: EDC positively affects EIWB.

Research Hypotheses H2: EDC positively affects PE.

Research Hypotheses H3: PE positively affects EIWB.

Research Hypotheses H4: PE mediates the relationship between EDC and EIWB.

Full mediation would have existed if the direct effects of EDC -> EIWB was insignificant, which was not the case with the outcomes of this study. Hence in this case we had partial mediation, where EDC (IV) exerted some of its influence through PE (MV) and also some its influence on EIWB (DV).

This is represented by the following equation using the co-efficient values (Baron & Kenny, 1986):

$$\text{Total Effects (0.970)} = \text{Indirect Effects (0.129)} + \text{Direct Effects (0.841)}$$

4.10.3 Results from the inter-item correlation matrix

The correlation matrix revealed the following inter-item relationships, evaluated between two constructs at a time. Table 39 below specifies the items that show the highest values in the correlation matrix of significant correlations between the study's constructs. The analysis that follows will refer to items in this table.

Table 39: Items with the highest average values in the correlation matrix

Item	Dimension	Survey Question
EDC3	Communication & Collaboration	I can use the appropriate digital tools at work to facilitate and improve collaboration, communication, and information sharing (Teams, Zoom, Google Drive, etc.).
EDC5	Cybersecurity	I am aware of and can detect different types of cybersecurity risks in digital environments (e.g. identity theft, scams, phishing, malware attacks, etc.).
EDC7	Problem Solving	I take a step-by-step approach to identify the root cause of a problem and explore various solutions to find the most feasible option.
EDC10	Build Knowledge	I am curious to explore how digital technologies work.
PE3	Meaning	I am enthusiastic about how my work can contribute towards the organisation's objectives.
PE4	Impact	My manager/peers allow me to influence the way work is done in our department.
PE5	Impact	My manager/peers allow me to influence decisions taken in our department.
EIWB1	Opportunity Exploration	I look for opportunities to improve my work environment e.g. improve an existing process, technology, product, service, etc.
EIWB2	Opportunity Exploration	I explore problems in the work environment with a broader view to gain better insight.
EIWB3	Idea Generation	I generate new ideas or solutions to address problems or unmet needs for my organisation and/or customers.

The average correlation between constructs EDC and EIWB was 0.239, with all correlations significant at the ≤ 0.026 level. The strongest correlations (above the average) were seen from the EDC areas of build knowledge (EDC10) and problem solving (EDC7) correlated with the opportunity exploration (EIWB2) and idea generation (EIWB3) dimensions of EIWB respectively.

The average correlation between EDC and PE was 0.156, with all correlations significant at the ≤ 0.047 level. The strongest correlations (above the average) were from the EDC areas of cybersecurity (EDC5), and communication and collaboration (EDC3) to the PE dimensions of impact (PE5) and meaning (PE3) respectively.

The average correlation between PE and EIWB was 0.217, with all correlations significant at the ≤ 0.025 level. The strongest correlations (above the average) were from the PE (PE5 & PE4) dimension of impact to the EIWB (EIWB2 & EIWB1) dimension of opportunity exploration.

4.11 Summary of the results/findings

Table 40 below shows a summary of the hypothesis testing.

Table 40: Summary of ROs, RQs, Hypothesis and Test Results

Research Objective, Questions & Hypothesis	Description	β Value	T Value	p Value	Hypothesis Testing Result
RO1 RQ1 H1	To assess if there is a relationship between EDC and EIWB. Does EDC have a relationship with EIWB? EDC positively affects EIWB (Total Effect)	0.970	3.452	,000	Supported
RO2 RQ1 H2	To assess if there is a relationship between EDC and PE. Does EDC have a relationship with PE? EDC positively affects PE (Path a)	0.429		,000	Supported
RO3 RQ3 H3	To assess if there is a relationship between PE and EIWB. Does PE have a relationship with EIWB? PE positively affects EIWB (Path b)	0.301		,000	Supported
RO4 RQ4 H4	To assess if the presence of PE influences any potential relationship between EDC and EIWB. Does the presence of PE influence any potential relationship between EDC and EIWB? PE mediates the relationship between EDC and EIWB (Direct Effect) Indirect Effect (a * b)	0.841 0.129	3.351 1.925	,000 ,000	Supported Partial Mediation

As can be seen from Table 40, all of the research hypotheses below were supported. All results were significant and positive.

Research Hypothesis H1: EDC positively affects EIWB.

Research Hypotheses H2: EDC positively affects PE.

Research Hypotheses H3: PE positively affects EIWB.

Research Hypotheses H4: PE mediates the relationship between EDC and EIWB.

The mediation results are represented by the following equation using the co-efficient values (Baron & Kenny, 1986):

$$\text{Total Effects (0.970)} = \text{Indirect Effects (0.129)} + \text{Direct Effects (0.841)}$$

4.12 Chapter Summary

Comprehensive results of the study's analysis were provided as per the three key objectives set at the beginning of this chapter:

1. A description of the demographic, career, and employment related screening data of valid survey respondents as well as frequency distribution and measures of central tendency of each study construct were presented;
2. CFA results were presented by specifying the measurement model, testing and assessing model fit as well as determining reliability and validity of the measurement scales;
3. SEM results were presented for the derived structural model and hypotheses testing carried out and results shown.

CHAPTER 5. DISCUSSION OF THE FINDINGS, LIMITATIONS, CONTRIBUTIONS, RECOMMENDATIONS AND CONCLUSION

5.1 Introduction

This chapter aims to achieve four key objectives:

1. Revisiting the research aims, objectives, questions, hypothesis and providing a summary of the study's key findings.
2. Interpretation and discussion of the study outcomes, guided by the ROs and RQs.
3. Discuss the study limitations followed by the contributions of the study and discussion of recommendations for future research.
4. Rounding off the chapter with a conclusion.

5.2 Research Aim, Objectives, Questions, Hypothesis and Findings Revisited

The main aim of this research study was to investigate if employees' level of DC and the presence of PE factors combined, could have a positive influence on the stimulation of employees' IWB in an organisation. The digital economy has made it critical for organisations from many industries to become much more efficient and creative in delivering services to their customers and to remain in touch with customer's individual needs (Drobyazko et al., 2019; Ranju & Versha, 2012; Sorescu & Schreier, 2021). In this case the organisation under study was an SA based telco.

The study was guided by four research objectives and questions (each linked to a single research hypothesis), as well as by the conceptual framework in Figure 22 below.

Figure 22: Conceptual Framework – Self drawn by researcher

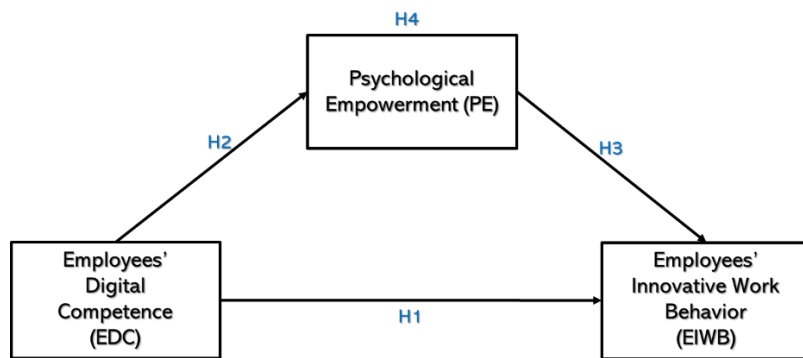


Table 41 below provides a summary of the research objectives , hypothesis, and the respective findings from Chapter 4.

Table 41:Summary of ROs, RQs, Hypothesis and Test Results

Research Objective, Questions & Hypothesis	Description	β Value	T Value	p Value	Hypothesis Testing Result
RO1 RQ1 H1	To assess if there is a relationship between EDC and EIWB. Does EDC have a relationship with EIWB? EDC positively affects EIWB (Total Effect)	0.970	3.452	,000	Supported
RO2 RQ1 H2	To assess if there is a relationship between EDC and PE. Does EDC have a relationship with PE? EDC positively affects PE (Path a)	0.429		,000	Supported
RO3 RQ3 H3	To assess if there is a relationship between PE and EIWB. Does PE have a relationship with EIWB? PE positively affects EIWB (Path b)	0.301		,000	Supported
RO4 RQ4 H4	To assess if the presence of PE influences any potential relationship between EDC and EIWB. Does the presence of PE influence any potential relationship between EDC and EIWB? PE mediates the relationship between EDC and EIWB (Direct Effect) Indirect Effect (a * b)	0.841 0.129	3.351 1.925	,000 ,000	Supported Partial Mediation

5.3 Interpretation and Discussion of Findings

5.3.1 *Discussion pertaining to RO1 / RQ1 / Hypothesis 1*

The first finding indicated that EDC had a significant and strong positive relationship with EIWB and satisfied the requirements of RO1 and RQ1, indicating that employees with higher levels of DC tend to be more likely to display higher levels of IWB (measured without any influence from PE).

Deci and Ryan's SDT (Deci & Ryan, 1985; Ryan & Deci, 2000) can be used to provide an explanation for this finding. SDT is made up of three elements: relatedness, competence and autonomy. When employees have the skills, knowledge and competencies (EDC) to achieve the desired outcomes, they are more intrinsically motivated, and more prone to display IWBs. Albert Bandura's SCT (Bandura, 1986) and the concept of self-efficacy also contributes to the finding from the perspective that an employee should have a growth mindset (Yeager et al., 2019), especially at times when they have to endure failure and persist through rigorous learning experiences to gain experience and grow to eventually achieve the desired outcome. This is the nature of innovation. Siregar et al. (2019) and Momeni et al. (2014) conducted studies that evaluated the individual factors influencing IWB. Both studies showed that self-efficacy amongst others were shown to be contributing factors to IWB.

Martin and Grudziecki (2006), through their conceptual framework illustrated the role of DC as a basis for innovation, echoing the findings in the current study. In their study outcomes, Pacheco and Coello-Montecel (2023) validated that DCs were essential for JP in the workplace since they could improve workers' capacity for creativity and problem-solving. Their findings were also aligned with previous research (Cao et al., 2016; Edvard Hatlevik et al., 2015; Oldham & Da Silva, 2015).

This provides substantiation of the impact that DC has on a work outcome like IWB, as posited in the current study.

5.3.2 *Discussion pertaining to RO2 / RQ2 / Hypothesis 2*

The second finding indicated a significant and positive relationship between EDC and PE, which satisfied the requirements of RO2 and RQ2, indicating that employees with a higher level of DC tend to be more prone to show more intrinsic task motivation. Similar to the first finding, Deci and Ryan's SDT (Deci & Ryan, 1985; Ryan & Deci, 2000) can be used to provide an explanation for this finding. Apart from the competence element (referring to EDC), the autonomy element plays a significant role. Empowered individuals tend to show more

intrinsic motivation because they're trusted to do their jobs using their own approach, but they're also allowed to make decisions and take calculated risks.

Khan (2019) suggested that talent management practices (TMPs) focus on recruiting for the best individuals with the required competencies, but also focus on training and development and retention of prime talent in the organisation already. In both cases this tends to lead to job satisfaction, better performance, and improved productivity, which can enhance PE. Mungra et al. (2023) found that DC positively impacted and was an important antecedent for employees BPNS, which in turn influenced employees fostering, comparable to the positive relationship between EDC and PE in the current study. Al Daboub et al. (2024) found that HR practices, specifically training, had a positive relationship with the competence dimension of PE.

This provides substantiation of the relationship between EDC and a behavioural outcome like intrinsic motivation (PE), as the findings indicate.

5.3.3 Discussion pertaining to RO3 / RQ3 / Hypothesis 3

With respect to RO3 and RQ3, PE had a significant and positive relationship with EIWB, indicating that employees with higher levels of intrinsic motivation might tend to show more IWB. This could be an indication that employees feel empowered and important when they are sincerely trusted by both management and peers to influence decisions in a work area. This empowerment in turn results in the intrinsic motivation that drives employees to always look for ways to improve the work environment and to evaluate problems with a broader view to gain better insights. Similarly Al Daboub et al. (2024) and Harandi et al. (2019) found that PE significantly enhanced IWB, emphasising the importance of employee empowerment in driving IWB in organisations. As mentioned in (Amabile, 1988), the intrinsic motivators of PE in a work context influenced idea generation, and was likely to enhance idea implementation and lead to constructive suggestions for change from employees. A previous study by Javed et al. (2019) showed that employees that are subject to PE and effective belief are motivated to question current work norms and generate creative solutions.

5.3.4 Discussion pertaining to RO4 / RQ4 / Hypothesis 4

The fourth and last finding indicated that PE partially (but significantly) mediated the relationship between EDC and EIWB. From the literature review, Singh and Sarkar (2019) found that PE partially (but significantly) mediated the relationship between structural empowerment and EIWB. Structural empowerment consists of four dimensions (Kanter, 1987), with the dimension development and recognition being relevant in the context of the current study. Consistent with the findings from above, Phairat and Potipiroon (2022) suggested that providing employees with the required knowledge, skills and development opportunities tends to lead them to

perceive that the organisation promotes an environment for innovation, which in turn could result in PE that then fosters EIWB. Yasir et al. (2023) discovered that PE is required as a mediator to promote IWB with knowledge sharing practices (sharing valuable information and expertise) by employees in the organisation.

5.4 Limitations of the study

The present study had some limitations, that were beyond the researcher's control.

Firstly, as the study was conducted using cross-sectional data from a part of the employees of a single organisation, the outcomes needed to be interpreted with the necessary consideration and caution. This is particularly applicable in terms of generalisability of the findings to other telcos in SA, telcos operating in other markets on the African continent, or telcos in other markets globally.

Secondly, as part of the ethics approval process with organisation, the researcher was only allowed to select a limited number of BUs by function, which needed to be agreed upon and approved upfront. Under ideal circumstances, having access to survey all employees employed by the organisation would have been preferred, but this was not allowed. There were two possible consequences:

- The diversity of the selected sample was limited, as it included six BUs: a technology division, a traditional products and services division, a digital products and services division, a traditional marketing division and a digital marketing division, and a finance division. This could have introduced the risk of sampling bias.
- Consequently, having used non-probability purposive sampling, the generalisability of the findings of this study are quite limited (Kumar, 2019), and needs to be applied with caution.

Thirdly, the data collection instrument was a single self-administered survey, with the same respondents being assessed for both the IV (EDC) and the DV (EIWB), which both used 7-point Likert scales (ordinal scales). This introduced the risk of common method bias, which was tested for, but is not easily fixed (Kock et al., 2021).

5.5 Contributions of the study

5.5.1 Theoretical contributions

The theoretical contribution of this study lies in its empirical evaluation of the relationship between EDC and EIWB, which according to the researchers best knowledge was not covered in prior literature. Through this, the study also contributed to the growing body of knowledge of the antecedents of IWB, and how this can be leveraged to enhance innovation at the individual level in the organisation.

Furthermore, the inclusion of PE as a mediating variable to this relationship, adds to the growing body of knowledge that recognises the convoluted connection between psychological factors and the effect on individual level outcomes in the working environment.

5.5.2 *Practical contributions*

The study elaborated on the criticality of most organisations having to use innovation as a differentiator in the digital economy.

Managers and supervisors should focus on all aspects of EDC (technical and non-technical), which can lead employees to a state of PE, which in turn could impact the level of IWB displayed. Becoming digitally competent is a process that has to happen over time in stages and needs to be guided by proper individual development plans (IDPs).

Organisations should have solid TMPs and HRM practices with two main aims:

- To get the right people on board from a competence and innovative mindset perspective during the recruitment process. This includes graduates, interns as well as experienced individuals.
- For existing employees, their individual development and growth should be geared towards providing the all-round competencies required, with a clear understanding that innovation output is a significant criterion, apart from gaining the skills to perform a specific function.

Employers can also help shape employees' abilities, skills, and actions by putting in place robust HR management practices, to guide the training and development of employees.

5.6 Recommendations for Future Research

The current study was conducted using cross-sectional data. Future research should consider using longitudinal data to better understand the structural relationships between EDC, PE, and EIWB.

The study was limited to a test sample from a single telco in SA. A future study could evaluate the same study but using samples from all the major telcos in SA. From this perspective, generalisability of the study outcomes could perhaps be evaluated for major telcos in SA.

The study used a simple mediation conceptual model (Javed et al., 2019). A number of studies in prior literature opted to use different types of mediation e.g. serial mediation (Al Daboub et al., 2024), multiple mediators (Al Daboub et al., 2024; Bani-Melhem et al., 2018; Phairat & Potipiroon, 2022) as well as adding

moderation to their theoretical models (Khan, 2019). The researcher proposes that organisational innovation outcomes be added to the theoretical model, with a view to understand the impact of IWB on organisational innovation outcomes. A second proposal would be to evaluate different leadership styles as a moderator between EDC and EIWB, still keeping the mediation construct PE in the model.

To look from a different lens, a qualitative research study could be conducted to get deeper insights on the factors that deter IWB in organisations. To the researcher's best knowledge, no studies with this aim were found when conducting the literature review.

5.7 Conclusion

It has become a necessity for most organisations to use innovation as a differentiator in the digital economy, as a means to remain both competitive and for sustainability (Drobyazko et al., 2019; Ranju & Versha, 2012). In this context, the purpose of this study was to investigate whether psychological empowerment (PE) influenced the relationship between employee digital competence (EDC) and employee innovative work behavior (EIWB).

The sample was taken from employees working in a South African (SA) telephony and connectivity operator (telco). As per the ethics approval process with the telco, the sample had to be limited to specific BUs that were selected upfront taking into consideration the researcher's input: a technology division, a traditional products and services division, a digital products and services division, a traditional marketing division and a digital marketing division, and a finance division.

The study was driven by the following four ROs and RQs, that were derived from the research problem:

[RO1]: To assess if there is a relationship between EDC and EIWB.

[RQ1]: Does EDC have a relationship with EIWB?

[RO2]: To assess if there is a relationship between EDC and PE.

[RQ2]: Does EDC have a relationship with PE?

[RO3]: To assess if there is a relationship between PE and EIWB.

[RQ3]: Does PE have a relationship with EIWB?

[RO4]: To assess if the presence of PE influences any potential relationship between EDC and EIWB.

[RQ4]: Does the presence of PE influence any potential relationship between EDC and EIWB?

The data collection instrument was an online survey questionnaire, distributed via email to 1400 participants in the telco organisation. For data analysis, the study ended up with 358 valid responses (success rate of approximately 26%).

SEM was used for the statistical data analysis because it can perform analysis on multiple interconnected relationships simultaneously (Collier, 2020), which was necessary for investigating the study's theoretical validity.

The findings of the study indicated that PE was partially responsible for the relationship between EDC and EIWB. In other words, employees that have the required competencies in their working environment (EDC in this case), tend to be more empowered and self-motivated to behave in ways that exhibit innovative work behaviour (EIWB): exploring for new opportunities or ways of improving working procedures, generating ideas from this explorative phase, advocating persistently that these ideas get approved for the benefit of the organisation, and taking this idea to fruition and ensuring that processes are in place to maintain this deployment for its lifespan (Conger, 2003; Conger & Kanungo, 1988; Thomas & Velthouse, 1990). The study's objectives and hence purpose were realised, in that the findings showed that digitally competent employees tend to be more self-motivated and are likely to perform extra-role behaviours that manifest as IWB.

The study had a few limitations. Amongst the most notable were the use of non-probability sampling methods that limited the generalisability of the study outcomes. Also, mediation models are time-based i.e. the independent variable affects the mediating variable, and then over time the mediating variable affects the dependent variable (De Poy & Gitlin, 2015). Hence, longitudinal studies tend to be better suited for mediation models as opposed to cross-sectional studies.

The main theoretical contribution of this study was the deemed first time empirical evaluation of the relationship of EDC as an antecedent of IWB, which contributed to the growing body of knowledge of the antecedents of IWB, and how these can be leveraged to enhance innovation at the individual level in the organisation.

The main practical contribution of this study was aimed towards managers / supervisors. The need to understand the intricacies of the dynamics between enhancing competencies (like EDC) and how they could trigger the psychological states of employees that can promote extra-role behaviours like IWB.

As highlighted in the limitations of the study, an opportunity for future research could consider using longitudinal data to better understand the structural relationships between EDC, PE, and EIWB in a mediation model. Researchers could also introduce additional variables (mediators and/or moderators) to gain more insight into the phenomena of IWB e.g. understanding the impact of IWB on organisational innovation or perhaps look at how different leadership styles could moderate the relationship between EDC and EIWB.

5.8 Chapter Summary

The four key objectives set out at the beginning of the chapter were met:

1. Revisited the research aims, objectives, questions, hypothesis and providing a summary of the study's key findings.
2. Interpreted and discussed the study outcomes, guided by the ROs and RQs.
3. Discussed the study limitations followed by the contributions of the study and discussion of recommendations for future research.
4. Rounded off the chapter with a conclusion.

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APPENDIX A: Data Collection Instrument

Participant Information and Consent

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG



Dear Respondent

My name is Ugan Naidoo, and I am studying towards a Masters Degree in the Field of Digital Business at Wits Business School.

I am conducting a research study to gain an understanding of whether an individual's level of competency with digital technology and their self-motivation in the working environment, together can have an influence on innovative behavior in the workplace. I am kindly requesting for some of your valuable time and attention to complete my online survey. Participation is purely voluntary, and completely anonymous. All collected data will be kept confidential and will only be analysed at an aggregated level. I will gladly share an overview of the research outcomes on request.

If you have any questions during or afterwards about this research study, feel free to email either my supervisor, Dr Tebogo Sethibe (tsethibe@gmail.com) or myself (2400586@students.wits.ac.za). Any concerns about the ethical procedures of this research study should be directed to University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408 or hrecnon-medical@wits.ac.za

To start the survey please click on the CONTINUE button to provide voluntary consent, otherwise click on the DECLINE button if you chose not to take the survey.

☐ CONTINUE

☐ DECLINE

Questions for measuring Employee Digital Competence

The survey consists of 30 multiple choice single answer questions. When choosing 1 of the 7 bullet points to answer the respective question please try and avoid using the "Not Sure" option, unless absolutely necessary.

I know how to improve internet search results by using a search engine's advanced features.

Strongly Disagree ☐ Disagree ☐ Mildly Disagree ☐ Not Sure ☐ Mildly Agree ☐ Agree ☐ Strongly Agree ☐

I know how to check that a piece of digital information is reliable before using it.

Strongly Disagree ☐ Disagree ☐ Mildly Disagree ☐ Not Sure ☐ Mildly Agree ☐ Agree ☐ Strongly Agree ☐

I can use the appropriate digital tools at work to facilitate and improve collaboration, communication and information sharing (Teams, Zoom, Google Drive, etc.).

Strongly Disagree ☐ Disagree ☐ Mildly Disagree ☐ Not Sure ☐ Mildly Agree ☐ Agree ☐ Strongly Agree ☐

I can create infographics and posters combining information, statistical content and visuals using available apps or software.

Strongly Disagree ☐ Disagree ☐ Mildly Disagree ☐ Not Sure ☐ Mildly Agree ☐ Agree ☐ Strongly Agree ☐

I am aware of and can detect different types of cybersecurity risks in digital environments (e.g. identity theft, scams, phishing, malware attacks, etc.).

Strongly Disagree ☐ Disagree ☐ Mildly Disagree ☐ Not Sure ☐ Mildly Agree ☐ Agree ☐ Strongly Agree ☐

I know how to adopt a proper cyber-hygiene strategy regarding passwords (e.g. using a password manager, creating strong passwords).

Strongly Disagree ☐ Disagree ☐ Mildly Disagree ☐ Not Sure ☐ Mildly Agree ☐ Agree ☐ Strongly Agree ☐

I take a step-by-step approach to identify the root cause of a problem and explore various solutions to find the most feasible option.

Strongly Disagree ☐ Disagree ☐ Mildly Disagree ☐ Not Sure ☐ Mildly Agree ☐ Agree ☐ Strongly Agree ☐

I am prepared to rethink my decisions or challenge others decisions when presented with different perspectives + new and relevant information.

Strongly Disagree ☐ Disagree ☐ Mildly Disagree ☐ Not Sure ☐ Mildly Agree ☐ Agree ☐ Strongly Agree ☐

I am interested in knowing what we do at work, but also why we do things.

Strongly Disagree ☐ Disagree ☐ Mildly Disagree ☐ Not Sure ☐ Mildly Agree ☐ Agree ☐ Strongly Agree ☐

I am curious to explore how digital technologies work.

Strongly Disagree ☐ Disagree ☐ Mildly Disagree ☐ Not Sure ☐ Mildly Agree ☐ Agree ☐ Strongly Agree ☐

Questions for measuring Psychological Empowerment

The survey consists of 30 multiple choice single answer questions. When choosing 1 of the 7 bullet points to answer the respective question please try and avoid using the "Not Sure" option, unless absolutely necessary.

I am inspired by what we are trying to achieve as an organization.

Strongly Disagree Disagree Mildly Disagree Not Sure Mildly Agree Agree Strongly Agree

☐ ☐ ☐ ☐ ☐ ☐ ☐

I am enthusiastic about working toward the organization's objectives.

Strongly Disagree Disagree Mildly Disagree Not Sure Mildly Agree Agree Strongly Agree

☐ ☐ ☐ ☐ ☐ ☐ ☐

I am enthusiastic about how my work can contribute towards the organization's objectives.

Strongly Disagree Disagree Mildly Disagree Not Sure Mildly Agree Agree Strongly Agree

☐ ☐ ☐ ☐ ☐ ☐ ☐

My manager/peers allow me to influence the way work is done in our department.

Strongly Disagree Disagree Mildly Disagree Not Sure Mildly Agree Agree Strongly Agree

☐ ☐ ☐ ☐ ☐ ☐ ☐

My manager/peers allow me to influence decisions taken in our department.

Strongly Disagree Disagree Mildly Disagree Not Sure Mildly Agree Agree Strongly Agree

☐ ☐ ☐ ☐ ☐ ☐ ☐

I have the skills and abilities to do my job well.

Strongly Disagree Disagree Mildly Disagree Not Sure Mildly Agree Agree Strongly Agree

☐ ☐ ☐ ☐ ☐ ☐ ☐

I am equipped to handle the challenges that I face at work.

Strongly Disagree Disagree Mildly Disagree Not Sure Mildly Agree Agree Strongly Agree

☐ ☐ ☐ ☐ ☐ ☐ ☐

I have the drive to perform effectively in my job.

Strongly Disagree Disagree Mildly Disagree Not Sure Mildly Agree Agree Strongly Agree

☐ ☐ ☐ ☐ ☐ ☐ ☐

I can decide on my own how to go about doing my work.

Strongly Disagree Disagree Mildly Disagree Not Sure Mildly Agree Agree Strongly Agree

☐ ☐ ☐ ☐ ☐ ☐ ☐

I have opportunity for independence and freedom in how I do my job.

Strongly Disagree Disagree Mildly Disagree Not Sure Mildly Agree Agree Strongly Agree

☐ ☐ ☐ ☐ ☐ ☐ ☐

Questions for measuring Employee Innovative Work Behaviour

The survey consists of 30 multiple choice single answer questions. When choosing 1 of the 7 bullet points to answer the respective question please try and avoid using the "Not Sure" option, unless absolutely necessary.

Please take note of the changed choices for answers!

I look for opportunities to improve my work environment e.g. improve an existing process, technology, product, service, etc.

Never ☐ Almost Never ☐ Sometimes ☐ Not Sure ☐ Fairly Often ☐ Very Often ☐ Always ☐

I explore problems in the work environment with a broader view to gain better insight.

Never ☐ Almost Never ☐ Sometimes ☐ Not Sure ☐ Fairly Often ☐ Very Often ☐ Always ☐

I generate new ideas or solutions to address problems or unmet needs for my organisation and/or customers.

Never ☐ Almost Never ☐ Sometimes ☐ Not Sure ☐ Fairly Often ☐ Very Often ☐ Always ☐

I experiment with and test new ideas or solutions to evaluate their strengths and weaknesses.

Never ☐ Almost Never ☐ Sometimes ☐ Not Sure ☐ Fairly Often ☐ Very Often ☐ Always ☐

I experiment with and test how new ideas or solutions integrate with and co-exist with existing processes, technologies, products, services, etc.

Never ☐ Almost Never ☐ Sometimes ☐ Not Sure ☐ Fairly Often ☐ Very Often ☐ Always ☐

I am prepared to take the risk to support my new idea or solution.

Never ☐ Almost Never ☐ Sometimes ☐ Not Sure ☐ Fairly Often ☐ Very Often ☐ Always ☐

I am prepared to persuade management / senior leadership of the importance/benefit of implementing a new idea or solution.

Never ☐ Almost Never ☐ Sometimes ☐ Not Sure ☐ Fairly Often ☐ Very Often ☐ Always ☐

I am prepared to put in extra effort to provide substantial backing evidence to promote my new idea or solution.

Never ☐ Almost Never ☐ Sometimes ☐ Not Sure ☐ Fairly Often ☐ Very Often ☐ Always ☐

I follow through with implementing new ideas or solutions that have been approved for implementation.

Never ☐ Almost Never ☐ Sometimes ☐ Not Sure ☐ Fairly Often ☐ Very Often ☐ Always ☐

I ensure that proper processes are in place to continuously maintain and monitor the effectiveness and relevance of implemented ideas or solutions.

Never ☐ Almost Never ☐ Sometimes ☐ Not Sure ☐ Fairly Often ☐ Very Often ☐ Always ☐

Demographic Information

Please note that the demographic information requested below is purely for statistical use and will only be used for trend reporting purposes.

Please specify your gender

- ☐ Male
- ☐ Female
- ☐ Non-binary

Please choose your age range

- ☐ 18-24 years
- ☐ 25-34 years
- ☐ 35-44 years
- ☐ 45-54 years
- ☐ 55 years +

Career Related Information

Please note that the education and career information requested below is purely for academic statistical use and will only be used for trend reporting purposes.

Highest Level of Education Achieved

- ☐ Grade 12
- ☐ Higher Certificate / N4-N6 / Artisan
- ☐ National Diploma
- ☐ Bachelors Degree
- ☐ Postgraduate / Honors Degree
- ☐ Masters Degree
- ☐ Doctors Degree

How long have you been working in your current organisation?

- ☐ Still in training or serving an internship
- ☐ Contractor
- ☐ Less than 1 year
- ☐ 1-3 years
- ☐ 4-6 years
- ☐ 7-9 years
- ☐ 10+ years

Please select one of the options from the drop-down list that best describes your current role.

Senior Leadership (C-Suite)
Leadership (Manager of Managers)
Management / Supervisory (Manager of Others)
Portfolio / Product Management
Programme / Project Management
Agile Scrum Roles (Product Owner, Scrum Master & Development Team)
Account Management / Key Account Management
Facilities Management
Systems / Cloud / CyberSecurity Engineer
Software Engineer / Developer
Artificial Intelligence / Machine Learning Specialist
Web Designer / Administrator
Ux Designer
Solution Architect
Business Analyst
Data Analyst
Data Scientist
Business Intelligence
Brand
Marketing (Non-digital)
Digital Marketing (SEM, SEO, Social Media, etc.)
Sales
Customer Care (Frontline / Acquisition / Retention)
Customer Relationship Management
FinOps
Revenue Assurance
Legal / Regulatory
Human Resources
Supply Chain Management
Strategy
Innovation
IP Data Network Engineer / Architect / Support
Systems Administrator
DevSecOps / NetOps Specialist
CyberSecurity Specialist
Financial Planning / Forecasting

APPENDIX B: Wits Business School Ethics Approval

Graduate School of Business Administration
University of the Witwatersrand, Johannesburg



Wits Business School Ethics Committee

Constituted under the University Human Research Ethics Committee (Non-Medical)

Ethics Clearance Certificate

Ethics protocol number: WBS/DB2400586/936

This certificate is only valid with a legitimate ethics protocol number and signed by the Researcher (below)

This certificate is only valid if accompanied by formal permission from the relevant stakeholder(s).

Project title	Psychological empowerment, employee digital competence and innovative work behaviour
Investigator / Researcher	Mr Uvarajan Naidoo
Nature of Project	MM (Digital Business)
Decision of the Committee	Approved, provided stakeholders and participants are guaranteed anonymity and confidentiality.
Issue Date of Certificate	2023/10/17
Expiry date	Date of submission of the project / research report
Chairperson	Dr Pius Oba  ☎ +27 11 717 3976 ☎ +27 82 733 6587 ✉ pius.oba@wits.ac.za

Declaration by Researcher

One copy must be signed by the Researcher and returned to the Chairperson of the Wits Business School Ethics Committee.

I fully understand the conditions under which I am authorized to carry out the abovementioned research and I guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I undertake to resubmit the protocol to the Committee.

Uvarajan
Naidoo

 Digitally signed by Uvarajan Naidoo
DN: cn=Uvarajan Naidoo, o=Vodacom,
ou=Vodacom,
email=ugan.aidoo@vodacom.co.za,
c=ZA
Date: 2023.10.23 12:31:14 +02'00'

Signature

23 October 2023

Date:

APPENDIX C: Coding of study constructs and variables

Table 42: Coding of EDC and PE Likert Scales

EDC + PE	Strongly Disagree	Disagree	Mildly Disagree	Not Sure	Mildly Agree	Agree	Strongly Agree
CODING	1	2	3	4	5	6	7

Table 43: Coding of EIWB Likert Scales

EIWB	Never	Almost Never	Sometimes	Not Sure	Fairly Often	Often	Very Often
CODING	1	2	3	4	5	6	7

Table 44: Coding of Gender Categories

GENDER	Male	Female	Non-binary
CODING	1	2	3

Table 45: Coding of Age Ranges

AGE	18-24 years	25-34 years	35-44 years	45-54 years	55 years +
CODING	1	2	3	4	5

Table 46: Coding of Education Level

EDUCATION LEVEL	Grade 12	Higher Certificate / N4-N6 / Artisan	National Diploma	Postgraduat e / Honors Degree	Masters Degree	Doctors Degree
CODING	1	2	3	4	5	6

Table 47: Coding of Years Employed in Organisation

YEARS EMPLOYED	Still in training or serving an internship	Contractor	Less than 1 year	1-3 years	4-6 years	7-9 years	10+ years
CODING	1	2	3	4	5	6	7

Table 48: Coding of Job Roles

JOB ROLE	Senior Leadership (C-Suite)	----->	Financial Accounting / Reporting
CODING	1	----->	38

Appendix D: SPSS Graphs for Distribution & Outliers per Construct

Figure 23: Distribution & Outliers for EDC

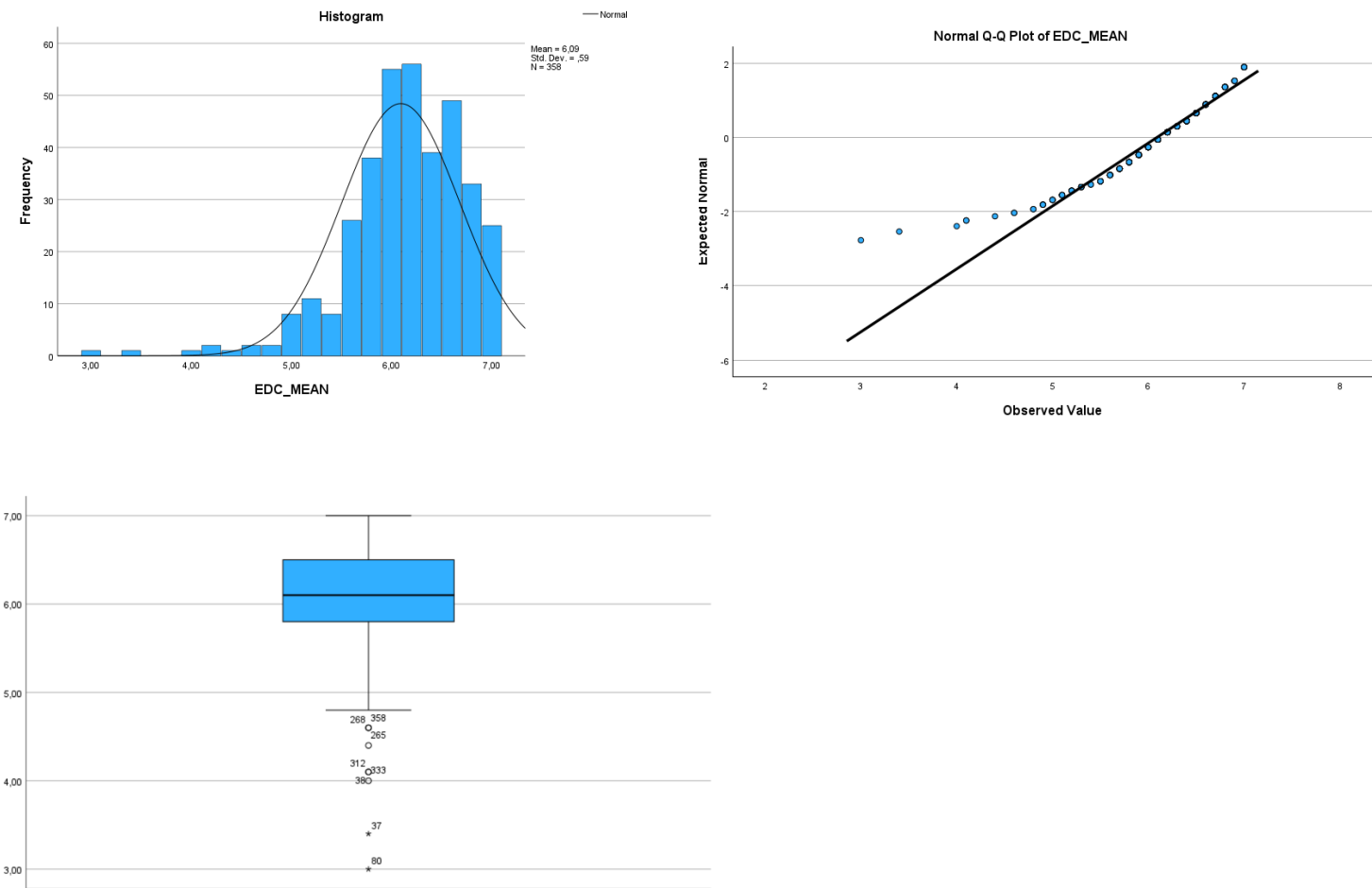


Figure 24: Distribution & Outliers for EIWB

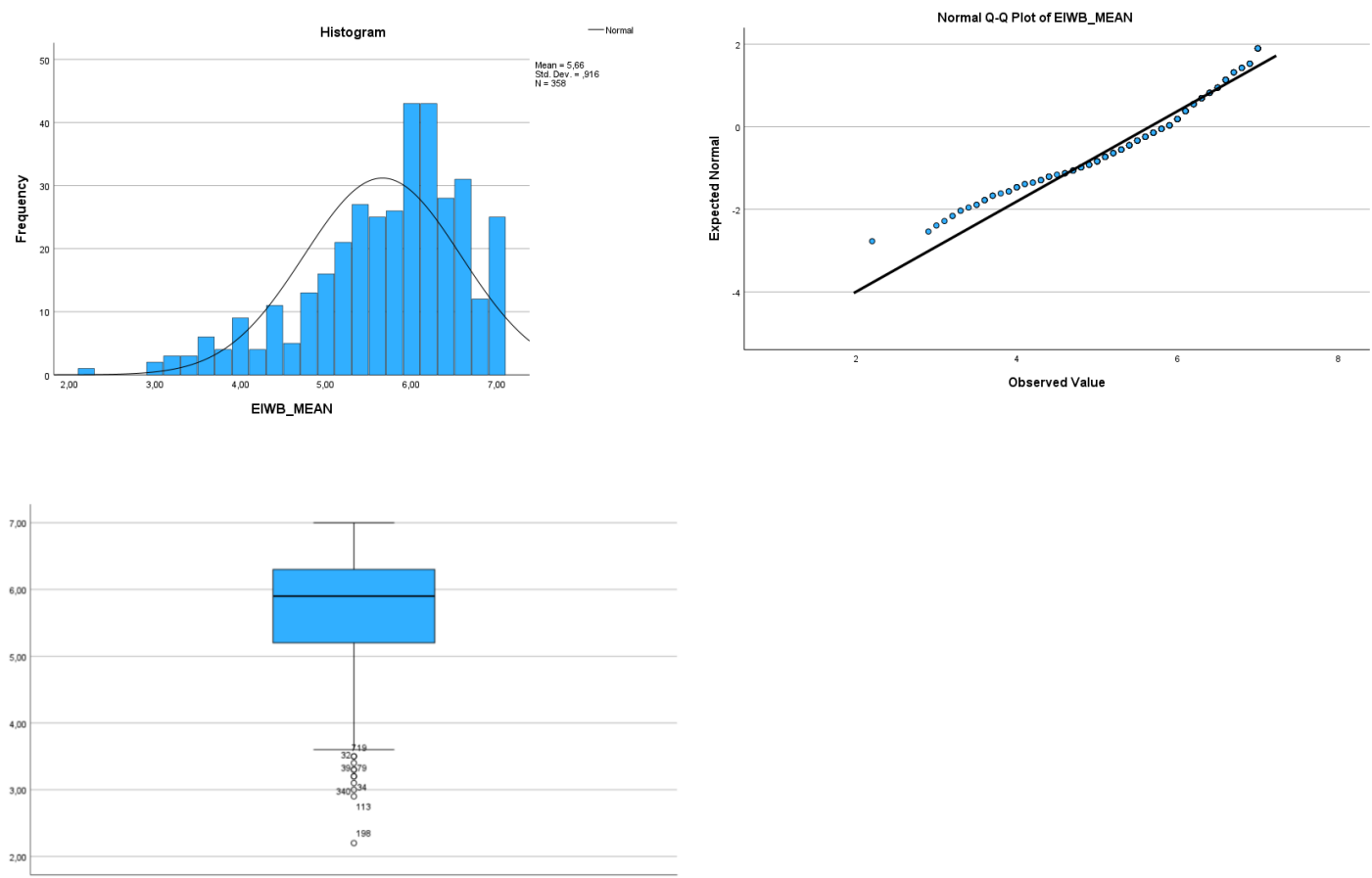


Figure 25: Distribution & Outliers for PE

