Consumer acceptance and adoption of metaverse environments in South Africa

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ABSTRACT

This research focuses on the acceptance and adoption drivers of metaverse (virtual world) environments in South Africa. In particular, it explores the influence of enabling technology, digital identity, access to economic resources in the form of virtual currencies and alternative digital payment capabilities as motivators of metaverse acceptance. The effect of an individual's social circle is also examined in detail. The theoretical model used in this research is the Universal Theory of Acceptance and Use of Technology (UTAUT).

The study used a cross-sectional, quantitative methodology that followed a positivist approach. Primary data was collected from a sample of adult individuals residing in South Africa through a self-administered online questionnaire. Data analysis included correlation analysis, item reduction, exploratory factor analysis, moderation variable analysis and multiple regression analysis for the constructs represented in UTAUT.

The findings indicate that enabling technology, digital identity, social influence and access to economic resources (virtual currencies) are strong predictors of individual behavioural intention and usage behaviour regarding the metaverse technology.

The current state of the metaverse technology in the country is considered nascent, although there is wider acceptance of console and personal computing gaming in virtual world games such as Second Life, Roblox, Minecraft, World of Warcraft and Fortnite. This indicates that immersive virtual reality technology is yet to mature to the point where it can meet the needs of consumers.

KEYWORDS

User acceptance drivers, adoption, virtual world, digital payment strategies, metaverse, virtual reality

DECLARATION

I, Sekete Malebana-Metsing, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Management in the field of Digital Business at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Name: Sekete Malebana-Metsing Signature: 

Signed at Ferndale, Randburg

On the 22nd day of October 2023

DEDICATION

I dedicate this research to my son, Tumagole, and all the young minds of the Ketlhapile and Malebana-Metsing families, whose reflections must always have fortitude and a desire to learn beyond any limitation.

To the memory of the matriarch and my dear grandmother, ke a leboga Mama. You built such a solid foundation for all of us, and I am truly grateful for all the many years of your life you dedicated to us.

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To my fellow MMDB cohort at Wits Business School, well done on staying the course, and thank you for all the time we spent learning from each other, having robust debates and connecting. I look forward to many more years of friendship and opportunities to interact.

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LIST OF ABBREVIATIONS AND ACRONYMS

AR – Augmented Reality

BI – Behavioural Intention

CBDC – Central Bank Digital Currency

C-TAM-TPB – Combined-TAM-TPB

DLT – Distributed Ledger Technology

DOI – Diffusion of Innovation

EE – Effort Expectancy

EFA – Exploratory Factor Analysis

FC – Facilitating Conditions

FSP – Financial Services Provider

IoT – Internet of Things

IT – Information Technology

KMO – Kaiser-Meyer-Olkin

MM – Motivational Model

MMORPG – Massively Multiplayer Online Role-Playing Game

MPCU – Model of PC Utilization

NFT – Non-Fungible Token

OLP – Online Learning Platform

PBC – Perceived Behavioural Control

PCA – Principal Component Analysis

PE – Performance Expectancy

SARB – South African Reserve Bank

SCT – Social Cognitive Theory

SI – Social Influence

SSI – Self Sovereign Identity

TAM – Technology Acceptance Model

TPB – Theory of Planned Behaviour

TRA – Theory of Reasoned Action

UB – Use Behaviour

UCD – User-Centred Design

UI – User Interface

UTAUT – Universal Theory of Acceptance and Use of Technology

VR – Virtual Reality

VRH – Virtual Reality Headset

XR – Extended Reality

3D – Three Dimensional

CHAPTER 1. INTRODUCTION

1.1 Statement of purpose

The purpose of this study is to examine consumer acceptance drivers and digital payment strategies that facilitate the adoption of virtual worlds (metaverse) in South Africa.

1.2 Background of the study

Since its inception in the early 1980s, the internet has been primarily presented and driven by humanity's affinity to the tools that enable the exchange of data. The desire for communication over a connected and distributed network enabled the creation of the earliest form of the internet. Communications technology infrastructure has subsequently evolved to the current form of network capability that extends beyond just connecting personal computers, mobile phones, data centres and other devices to the World Wide Web. Mystakidis (2022) captures this by noting that end users have traditionally benefitted from the enriched experience of technological innovation enabled by the internet and personal computers through interaction, communication and social transactions This advancement has led to the age of decentralised platforms that allow users to create and participate in the virtual realm of Web 3.0 and the metaverse.

The concept of the metaverse virtual ecosystem emerged as the next iteration of the internet when massively multiplayer online role-playing games (MMORPGs) like The Sims and Second Life gained popularity in the early 2000s, as virtual social worlds (Kaplan & Haenlein, 2009). These multiplayer online games enabled users to create and control avatars (virtual representations of themselves) in a virtual world that was simulated by the computer, thus allowing virtual socialisation and the ability to transact within the confines of the game environment (Jiang & Huang, 2013). The evolution of these early immersive iterations of the virtual

worlds introduced the concept of users living a parallel virtual life, making it appealing for escapism, and facilitating conversations beyond reality (Dwivedi, Hughes, Baabdullah et al, 2022).

The metaverse is a shared, three-dimensional (3D)-enabled virtual world environment that allows users to interact and collaborate as communities (Kim, 2021). It is facilitated by the development of advanced technologies such as Virtual Reality (VR) and Augmented Reality (AR), Artificial Intelligence (AI), Deep Learning, Cloud Computing, Blockchain and 5G/6G wireless communications networks, as noted by Kim (2021). Ball (2021) further recognises that the resultant immersive content creation, and payment capabilities made for better immersive capabilities. This converging environment of the physical and virtual worlds is created when users interact as a virtual community in which they can play, work, transact and socialise.

The term “metaverse” emanates from Neal Stevenson’s science-fiction work *Snow Crash* (1992), which describes a post-internet virtual environment in which users are represented through their avatars (Kaplan & Haenlein, 2009). “Metaverse” has two components: “meta” (a Greek prefix meaning post or beyond) and “universe”. The metaverse is thus a persistent and immersive, simulated post-reality, user environment that merges reality and the digital world (Mystakidis, 2021).

The gaming entertainment community is far ahead of general society as early adopters of metaverse immersion through user interfaces (UI) such as those presented by Second Life, Roblox, The Sims, Minecraft, World of Warcraft, Fortnite and Decentraland. This game-developer and consumer-induced growth represents the initial stages of wider metaverse adoption. McKinsey & Company (2022) recently estimated that the marketing opportunities in the metaverse for virtual products (and by extension transaction capability) to be in the region of $60 billion. Other industries have reacted positively to metaverse activity by acknowledging the convergence of digital capabilities at scale, and the economic potential of

the metaverse can be quantified as follows, according to JP Morgan (2022):

- **Transactions**: $54 billion is currently being spent per annum on virtual goods
- **Socialising**: 60 billion messages are sent daily on the Roblox platform
- **Creating**: GDP (Gross Domestic Product) for Second Life in 2021 amounted to $650 million and $80 million was paid to content creators
- **Ownership**: Non-fungible tokens (NFTs) have a market capitalisation of $41 billion

The above discussion supports the view that digitally empowered and ambitious market players have expanded beyond the current constraints of financial transacting capabilities and enable users to explore virtual environments, incorporating sophisticated digital payment methods. In a developing country context such as South Africa, which has experienced an increase in financial services adoption in recent years, industry and consumers continue to use multiple payment methods. Soutter et al. (2019) note that cash is a dominant method of exchanging value owing to its ease of use, wide acceptance and user belief that it has value above all other payment capabilities. However, the latest research conducted by Galal (2021) shows that the most common e-commerce payment capabilities available to South African consumers are credit cards, cash (cash on delivery) and bank transfers, which together comprise approximately 72% of all online payment transactions. A Statista survey shows that of all available digital payment methods, South African consumers tend to prefer credit cards (41%), bank transfer (20%), e-wallets (17%) and cash (11%), with other payment methods comprising the remaining 11% (Galal, 2021).

The South African Reserve Bank (SARB, 2018) outlines that the country's financial services industry is innovative and sophisticated, with a global ranking of 37 out of 137 surveyed countries, according to the World Economic Forum's Global Competitiveness Report. To expand, it can be noted that the financial services industry in the country has experienced

digital disruption that has enabled the further introduction of alternative digital payment capabilities that enable users across the payment landscape to transact in various methods. These alternative payment methods, as explored by Mombeuil (2020), include digital wallets (e-wallets) and scan-to-pay (QR code payments), while others such as cryptocurrency and rapid payments (i.e., PayShap) by proxy are still nascent in their implementation in the country.

The current role of financial institutions in the virtual payment ecosystem is limited to the ability to link credit card details to acquire virtual currencies. Users link their card details and convert fiat currency into the gaming unit of exchange (e.g., Robux in Roblox or MANA in Decentraland) and make in-game purchases for products and services priced in that currency. Blockchain-based digital currencies or tokens (e.g., NFTs) are the latest payment methods that enable users to make borderless, real-time purchases across multiple metaverse environments that are independent of normal financial ecosystem flows, allowing users to bypass traditional financial institutions. The direct result of having the ability to navigate around traditional financial institutions paves the way for disruptive, niche technology-minded firms to explore creative mechanisms of facilitating transactions in virtual environments.

While the financial opportunities showcase the lucrative potential of the metaverse, it is critical to note that the metaverse presents challenges with respect to challenges such as data security, inadequate governance and its potential negative effects on vulnerable groups with incidents of minor exploitation, and racism, as noted by Merre (2022). Further concerns relating to fraud and money laundering create conditions for increased risk (Elliptic, 2022).

This study, therefore, explores the driving forces of consumer acceptance and adoption of virtual worlds. It investigates the associated digital capabilities that the financial industry in South Africa has either implemented or is exploring, and whether these are sufficient motivators for users to accept newer capabilities to transact in virtual worlds.

1.3 Research problem

The change in pace associated with the technological innovations that are placing the metaverse at the forefront of consumer and business consideration has resulted in a need to understand this phenomenon. In the South African context, there is limited research that examines the factors that influence consumer participation in the metaverse. Owing to this limitation, this study addresses a gap in the literature regarding consumer acceptance and adoption of enabling technology components, digital identity and payment capabilities for use in the metaverse.

1.4 Research objectives

1. Explore consumer acceptance behaviour in virtual environments and, in particular, the influence of access to virtual world environments as a motivator of acceptance.
2. Examine consumer purchasing patterns in virtual environments and, in particular, the desire to purchase items in virtual world environments as a motivator of acceptance.
3. Assess user adoption of alternative digital payment strategies in virtual world environments and, particularly, which payment capabilities aid transacting potential for users.

1.5 Rationale

Although the metaverse, and its various applications within the gaming industry has existed under the radar in recent years, its potential has been highlighted through major technological investments that directly influence its adoption. These investments include, but are not limited to, developments pertaining to the following enabling technologies and associated factors:

- Virtual/Augmented Reality (AR/VR)
- Decentralised Finance (DeFi)
- Blockchain
- Digital identity
- Changes in consumer adoption of emerging technologies
- Pre/Post Covid-19 pandemic business initiatives

Industries that have undertaken such investments in a pre- and post-Covid pandemic world have leveraged the capability towards a massive retail shift from traditional storefronts to internet-based sales, which has provided marketers with an opportunity to explore a virtual world branding offerings (Hollensen et al, 2022). Game developers and content creators define the structure and organisation of the virtual landscape. They enable users to interact with the environment as avatars through technological devices and to connect, collaborate and transact with other participants to co-create the virtual experience. This level of immersion and wider possibilities with augmentation lead to the idea of digital transformation and hyper-personalisation (from being *on* the internet to being *in* the internet), as noted by Vargo (2022). For this system to function on a financial basis, the metaverse is dependent on traditional payment (credit cards) and cryptocurrency wallets for transactions.

The transactional volume of the metaverse economy in its current form is a realistic consideration in assessing the opportunities that are inherent in the phenomenon for any financial institution. Payment and financial infrastructure, being the traditional domain of banks through product offerings such as the ability to conduct cross-border trade, financial asset management and foreign currency transactions, is the motivator for these institutions to participate as central role-players in the digital asset landscape. An expansion of the financial capabilities leads to the enhanced tracking and monitoring of metaverse activities and data, which will potentially enable firms to create value propositions that facilitate the adoption of the technology (Mystakidis, 2022).

The metaverse presents a wide variety of growth opportunities, with applications of the technology predominantly in product placement, anti-bias experiences, EdTech, virtual tourism and gamification. Furthermore, innovations and research in metaverse capabilities, especially in consumer electronics (immersion headsets) such as those spearheaded by Meta through Reality Labs and most recently Apple’s introduction into the technology, have the added potential for accelerating adoption and the

resulting economic benefits. Adidas and Nike have launched virtual wearables and branded products, while Lamborghini have introduced virtual artwork to monetise their value propositions in the metaverse, offering expanded retail opportunities for non-traditional consumer technology companies (Gautam, 2022).

Contribution in relation to theoretical framework

The Universal Theory of Acceptance and Use of Technology (UTAUT), forms the theoretical basis on which the study's strength for consumer and broader acceptance of virtual worlds is derived. As such, a deliberate outcome of the endeavour is to associate metaverse technology and acceptance as a natural merging of constructs that are the bedrock of web 3.0. The association is developed, then expanded to support the view that consumers gravitate to immersive applications offered by the metaverse, thus contributing to the growing body of knowledge.

1.6 Delimitations of the study

i. The study does not aim to technically examine the technology behind blockchain and how this can be applied to South African financial markets. The literature review briefly expands on projects that have been initiated for this purpose.
ii. The study has limited scope in terms of existing real-world applications of distributed ledger technology (DLT) as a proven mechanism of transacting adopted by central and commercial banks. This implies further research is required as more commercial and central banks explore the use of DLT as a transacting mechanism in virtual worlds. Notwithstanding this limitation, the South African financial landscape has made significant inroads in developing a Central Bank Digital Currency (CBDC) through the collaboration of financial institutions and regulators in the form of Project Khokha I and II.

1.7 Definition of terms

Web 3.0 – a third generation of the evolution of web technologies such as the internet.

Metaverse – a virtual reality space in which users can interact with a computer-generated environment and other users.

Virtual Reality (VR) – a computer-generated simulation of a 3D image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment.

Augmented Reality (AR) – an interactive experience of a real-world environment where the objects that reside in the real world are enhanced by computer-generated perceptual information.

Crypto currency (Crypto) – a digital currency in which transactions are verified and records maintained by a decentralised system using cryptography.

Central Bank Digital Currency (CBDC) – an electronic form of central bank money that is circulated digitally.

1.8 Assumptions

1. The concept of the metaverse is nascent in practical consideration to financial ecosystems in emerging economies such as South Africa. As such, study participants may not be familiar with this concept and how it may be relevant to them.
2. Financial institutions interact with clients through a variety of channels, particularly for transacting capabilities. As such, the study seeks to explore adoption of alternative transacting capabilities, including electronic payments, and thus excluding cash.

1.9 Chapter outline

This research report is divided into six chapters. The first chapter introduces the study by providing a statement of purpose and the background that forms the context of the study before presenting the research problem and objectives of the study. The key terms of the study are defined, and the study's delimitations and assumptions outlined.

The second chapter introduces the theoretical base of the study, namely the Universal Theory of Acceptance and Use of Technology (UTAUT), as defined by Venkatesh et al. (2003). Using this framework, a literature review is conducted to examine the theory and its compatibility to the metaverse. The review pays particular attention to aspects of user adoption for this new technology, including access to virtual worlds, digital identity and the virtual world experience as primary motivators for user adoption. The review then explores contributing elements such as consumer purchasing patterns and payment capabilities offered in the metaverse. The review of literature then aligns the study with the role of South African banking institutions and regulators as enablers of transacting capabilities.

The third chapter entails a discussion of the research methodology, and how the study conducted the data collection, analysis and evaluation from respondents using a survey questionnaire methodology.

The fourth chapter presents the findings of the study. This discussion focuses on the outcomes of the data collection exercise and analysis of results. In particular, the demographics of the respondents and their experience with gaming. The chapter then delves into an overview of the reliability measurement scales for the different UTAUT variables, exploratory factor analysis, hypothesis testing and a discussion of the regression models.

The fifth chapter interprets and discusses the study findings. This entails discussing the results of chapter four in the context of the literature review and attempts to provide possible explanations and logical arguments relating to the findings and hypothesis testing.

The sixth chapter presents the conclusions of the study and the recommendations for practice that are derived from the conclusions. The research objectives are revisited, and each are discussed within the framework of the hypotheses.

CHAPTER 2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

The purpose of this literature review is to conduct a critical assessment of the available literature in relation to the Unified Theory of Acceptance and Use of Technology (UTAUT) and apply it to the virtual world construct of the metaverse as the next iteration of the internet. In particular, the theory examines consumer adoption of the metaverse technological innovation within the South African context. The reviewed literature explores several topics, including the nature of consumer purchasing behaviours in virtual environments and alternative payment methods that can support transacting capabilities within these 3D immersive worlds.

The literature review map set out in Figure 1 below presents the flow of the topics that are explored according to the research objectives.

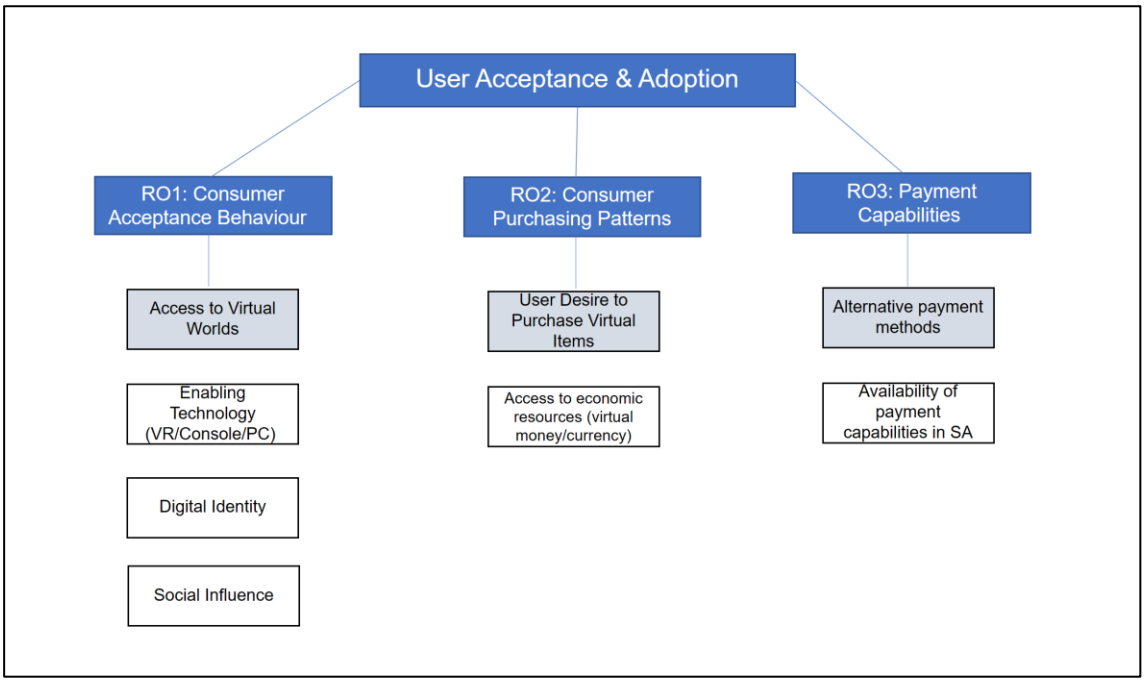

Figure 1: Literature review map

The literature review map presented in Figure 1 guides the investigation. While the UTAUT framework entails the exploration of consumer adoption of new technologies, the metaverse relies on multiple factors to enable wider acceptance, as shown in Figure 1. These factors are established by exploring consumer acceptance behaviour in relation to virtual world environments (RO1), examining their desire to purchase virtual items as part of the immersive experience (RO2) and assessing the available payment capabilities that may drive adoption (RO3).

2.2 Background discussion

The proliferation of virtual gaming environments in the early 2000s, along with the technological innovations pertaining to digital payment methods, has supported the path towards the metaverse as a new construction of the internet. These improvements have scaled and gained a following amongst the gaming community and infused the creation of newer product and service categories together with use cases for exploration by real- and virtual-world participants alike.

The shared parallels between the real- and virtual-world economies are predicated on the sale of goods and services, which is the essence of any commercial undertaking. The literature review presents an outline of research related to user acceptance and participation in the metaverse, as well as how payment ecosystems enable the functioning of virtual worlds, based on the financial platforms and infrastructure required for users to participate in these worlds.

The impact of the metaverse is increasingly showing prominence as a future business model with respect to consumers and businesses, going beyond its previous implementation in gaming. As consumers adopt VR technology to access these virtual worlds, the use cases for business involvement begin to take effect. Businesses in all industries across retail, entertainment, real estate, education and financial services have initiated projects to explore what their presence in the metaverse can be, primarily

as an additional choice of channel to interact with their clients while simultaneously growing their product and service offerings into the virtual realm.

It is the intention of this study to provide insights into and guidance on ways to meet consumer adoption of new technologies, with the aim of stimulating participation in the virtual realm of the metaverse.

2.3 Theory base

The Universal Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2003), as the unifying construct through which user acceptance of information systems can be explained, is used in this study as the theoretical base. The framework has been widely applied in understanding and predicting user behaviour and acceptance across different technological innovations in information systems (Taherdoost, 2018). As such, the use of the UTAUT model in this study provides a valuable tool with which to understand the motivating drivers for consumer and business adoption of the metaverse technology.

The framework is an integrated formulation that combines eight previous acceptance models. These models are the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975); the Social Cognitive Theory (SCT) (Bandura, 1986); the Technology Acceptance Model (TAM) (Davis, 1989); the Theory of Planned Behaviour (TPB) (Ajzen, 1991); the Model of PC Utilization (MPCU) (Thompson et al., 1991); the Motivational Model (MM) (Davis et al., 1992); Combined-TAM-TPB (C-TAM-TPB) (Taylor & Todd, 1995); and the Diffusion of Innovation theory (DOI) (Rogers, 1995). The basis of UTAUT as a unifying framework is a result of the substantial body of evidence amassed through numerous studies conducted across different disciplines, and thus does not have a limitation for application in information systems only.

The Theory of Reasoned Action (TRA) by Fishbein and Ajzen (1975) has psychological beginnings and suggests that human behaviour can be

determined by a person's prior intention and beliefs regarding that behaviour, which in turn are determined by their attitude towards the behaviour. This model, as noted by Davis (1985), was useful in explaining and predicting the actual behaviour of individuals. However, the TRA's core construct of the subjective norm meant that the individual would be driven by whether most people that he or she knew believed that the individual should or should not perform the behaviour (in this case, using technology). The subjective norm as the predicting variable was acknowledged by Fishbein and Ajzen (1975) to be a limitation as it was not well understood under the theoretical prescripts of the TRA.

Recognising this limitation, Davis (1985) developed the Technology Acceptance Model (TAM), specifically focusing the theory on the individual's attitude to accepting the use of information systems. This was the first study to undertake this type of analysis. The author further extended the TRA model by considering the additional beliefs of perceived usefulness and perceived ease of use as predictors of the individual's attitude towards the use of a system (Chuttur, 2009). Perceived usefulness is referred to as the degree to which a person believes that using a particular system would enhance his or her job performance (Davis, 1985), while perceived ease of use is the degree to which a person believes that using a particular system would be free of effort (Davis, 1985).

The Motivational Model (MM) extended the TRA model by focusing on extrinsic and intrinsic motivators as predictors of actual behaviour, which underpins the motivational theory. Extrinsic motivations are those that are "perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself, such as improved job performance, pay or promotions" (Davis et al., 1992, p.112). In contrast, intrinsic motivators are those that make the user want to perform a certain activity "for no apparent reinforcement other than the process of performing the activity per se" (Davis et al., 1992, p.112).

The core construct introduced by Ajzen (1991) into the Theory of Planned Behaviour (TPB) is that the most basic predictor of behaviour is

Behavioural Intention (BI), which is a person's readiness to perform a given behaviour. This is based on the Perceived Behavioural Control (PBC), which is "the perceived ease or difficulty of performing the behaviour" (Ajzen, 1991, p. 188), along with the person's attitudes towards the behaviour and subjective norms. The TPB notes that PBC has a direct influence on actual behaviour. However, in attempting to explain human behaviour, Nguyen (2020) notes that the TPB is limited as it omits other potential determinants of action, including environmental factors such as threats, personality, emotions or demographic variables. Further, the actual measures of attitudes towards behaviour, subjective norms and PBC are indirect, as actual observations of these behaviours may not be feasible (Knabe, 2012).

The Diffusion of Innovation theory (DOI) by Rogers (1995) is a social science theory that proposes that a new idea, product or behaviour gains momentum and thus diffuses (spreads) through social systems, so that ultimately people accept and adopt the innovation. This in effect means that a person, having adopted the idea, then behaves differently from how they behaved previously. Key to this assumption is that a person must perceive the idea, product or behaviour as innovative, and thus provide the conditions that make diffusion into their wider community or social system possible. As such, the model is useful for determining user behaviour with respect to new technology adoption (Moore & Benbasat, 1991).

Developing the C-TAM-TPB model, Taylor and Todd (1995) combined the predictors of the TPB (attitudes, subjective norm and PBC) with the predictors of the TAM model (perceived ease of use and perceived usefulness) to account for the gaps in the individual models. Chuttur (2009) acknowledges that this extended model caters for missing aspects such as the availability of the resources, opportunities and skills as well as their perceived usefulness for achieving outcomes.

While the above models were extended from their formative coherence to the TRA to cater for online purchase behaviour (Pavlou and Fygenson,

2006), they were limited in making a distinction between e-commerce users and VR avatars and do not cater for the complexity inherent in user behaviour in virtual environments. It is in this context that UTAUT is explored in the following discussion.

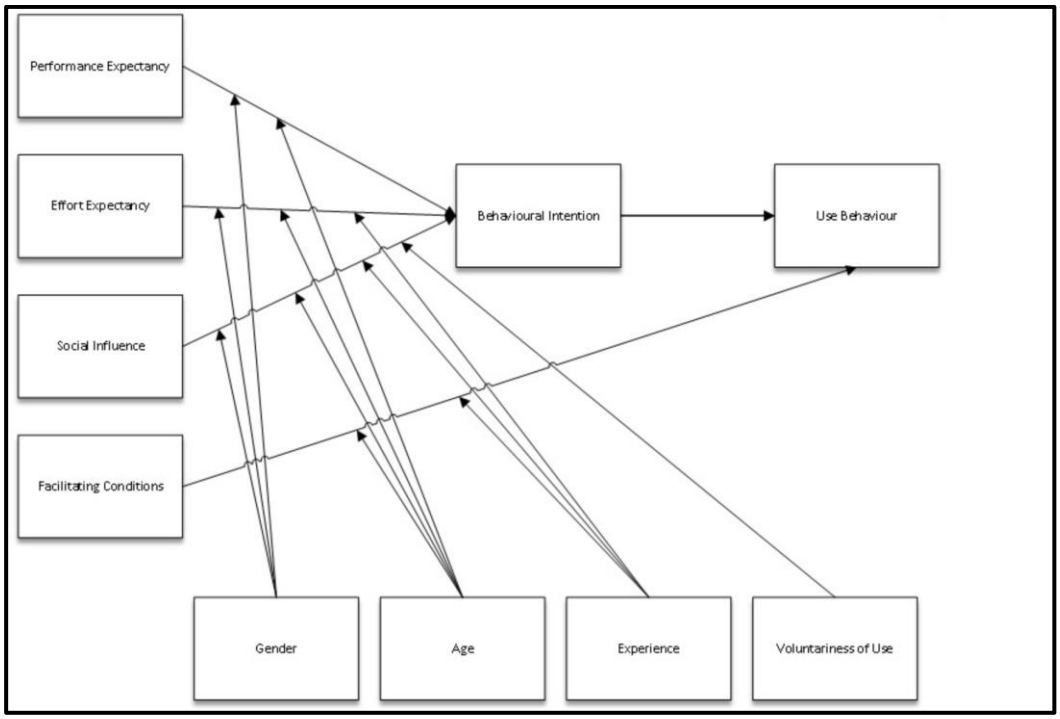

Figure 2 : UTAUT model

Source : Venkatesh et al. (2003)

The model indicates that the actual use of technology is determined by a user's behavioural intention. As such, the likelihood of adopting a particular technology is influenced by four independent variables, which are performance expectancy, effort expectancy, social influence and facilitating conditions. According to Venkatesh et al. (2003), these predictors are moderated by gender, age, experience and voluntariness of use, as shown in Figure 2.

Venkatesh et al. (2003, p.451) define performance expectancy (PE) as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance". High performance expectancy indicates the user's belief that using the system will be helpful in improving their performance. Venkatesh et al. (2003) aggregate

constructs from previous acceptance theories such as perceived usefulness, outcome expectations, extrinsic motivation and job fit as performance expectancy. It is believed to be the strongest independent variable, according to Zhou et al. (2010), as it displays the user's perception of performance improvement.

In the context of this study, it is associated with a user's expectation that accessing a virtual world through enabling technology enables them to adopt the metaverse as an interactive environment in which to socialise, transact and work.

In hypothesis testing, PE is an independent variable that is used to assess an individual's behavioural intention and ultimate usage behaviour towards virtual worlds. Further, the interaction effect of moderating variables of UTAUT (Age and Gender) and their influence on the relationships were assessed and discussed

Effort expectancy (EE) is defined as "the degree of ease associated with the use of a system" (Davis, 1989, p. 320). As a UTAUT variable, it is a determinant of personal intention to use a new technology. It is also constructed from the previous theoretical contributions by expanding on the concepts of perceived ease of use (TAM), complexity (MPCU) and ease of use (DOI) (Nikolopoulou et al., 2021). Within this study's context, it is associated with the idea that a user's expectation of the ease of using enabling technology in a virtual world will result in their adoption of the metaverse. Along these lines, if users expect that the enabling technology (e.g., VR/AR headsets and digital payment capabilities for virtual item purchase) will be easy to use, then they will adopt the metaverse.

In hypothesis testing. EE is an independent variable that is used to examine a user's behavioural intention and actual use towards metaverse environments. Further, the interaction effect of moderating variables of UTAUT (Age and Experience) and their influence on the relationships were assessed and the results are discussed

Social Influence (SI), according to Davis (1989, p.320), is “the degree to which an individual perceives that important others [i.e., relatives, peers and subordinates] believe that he or she should use the new system”. This influencing variable corresponds with the subjective norms, social factors, word of mouth and image as defined in previous theories (TRA, TAM, TPB, C-TAM-TPB, MPCU, DOI), specifically in the way that these theories describe how people adjust their behaviour according to the perception of others about them (Marikyan & Papagiannidis, 2021). Venkatesh et al. (2003) note that the effect of social influence is significant when the use of technology is mandatory (e.g., for work). This idea was extended by Venkatesh and Davis (2000) to include that under a mandatory requirement, individuals may use the technology to comply rather than as a personal preference.

In this study, social influence is determined by the individual’s reliance on their social circle in determining whether they use metaverse technology. If there is a positive influence, they are more likely to adopt this technology.

In hypothesis testing, SI is applied as an independent variable to test the user’s behavioural intention variable towards virtual world environments. Further, the interaction effect of moderating variables of UTAUT (Gender, Age and Experience) and their influence on the relationship are assessed and discussed.

Facilitating conditions (FC) are defined as the degree to which an individual believes that organisational and technical infrastructure exists to support use of the system (Venkatesh et al., 2003). This variable is formed from TPB, C-TAM-TPB, MPCU and DOI constructs such as compatibility and PBC. The influence of this variable results in a positive relationship between facilitating conditions and a user’s behavioural intention to use and adopt a new technology.

In this study, digital identity, VR equipment and digital transacting capabilities are facilitating conditions that would enable consumers to

adopt the metaverse. As such, favourable conditions are deemed to be strong influencers of adoption.

In hypothesis testing, the FC constructs are associated with the influence of access to -and adoption of virtual currencies as motivator for transacting in virtual worlds. Further, the interaction effect of moderating variables of UTAUT (Gender, Age and Experience) and their influence on the relationship were assessed and these are discussed.

There are four moderating variables in the UTAUT framework that define the strength of the abovementioned predicting variables. These are gender, age, experience and voluntariness of use (Venkatesh et al., 2003). These variables are expected to affect the influence of performance expectancy, effort expectancy, social influence and facilitating conditions on the user's behavioural intention (Attuquayefio, 2019). UTAUT posits that age moderates the effect of all four independent variables, while gender moderates the relationship between effort expectancy, performance expectancy, social influence and behavioural intention. The third moderating variable, experience, is believed to moderate the strength of relationships between effort expectancy, social influence, facilitating conditions and behavioural intention. The last moderating variable, voluntariness of use, moderates the strength of the relationship between social influence and behavioural intention.

In the context of this study, the moderating variables have a unique influence on the strength of the relationship between of the independent variables on the dependent variables. This influence positions UTAUT as an appropriate model to determine user acceptance and adoption of the metaverse.

2.4 First research objective

RO1: Explore consumer acceptance behaviour in virtual environments and, in particular, the influence of access to virtual world environments as a motivator of acceptance.

This section discusses customer motivating factors for acceptance of virtual worlds and focuses specifically on access, including elements such as enabling technology, digital identity and gaming experience.

2.4.1 *Enabling technology*

For this investigation into virtual world participation, user motivations to access these environments are explored through the technology that enables consumers to access these environments. Paliokas et al. (2008) note that while a physical user is interacting in the virtual world, the user does not perceive the physical technology that they are using as an obstacle to perform the desired actions within that environment. This is because they are interacting through an avatar, which allows them to cultivate more complex skills for the purposes of participating in the environment.

To effectively understand the construct of a virtual world, and by implication the technology that consumers require to access it, it is necessary to define what constitutes a virtual world environment. In the context of the internet, a virtual world is an online space in which users are represented by avatars, as noted by Li and Lee (2010). Other scholars, such as Briggs et al. (1993), posit that a two-dimensional space with avatars should not be termed a virtual world, and that the term “virtual world” should be reserved for 3D, computer-generated and simulated environments that enable users to inhabit their landscape to interact, work or transact with others as avatars. According to Hendaoui and Limayem (2008), 3D interactive virtual worlds such as Second Life are sophisticated, providing a visual perspective of a persistent reality that enables users to be socially and economically active as avatars. While this mimics physical reality, embodied 3D avatars interact with one another in a shared space, adding a new dimension to physical consumers.

VR is the resulting act and technology of simulating a physical presence of a captive audience in real or imaginary places and involves the sight and sound senses, as noted by Kundalakesi et al. (2017). Key in

differentiating VR from other media is the aspect of presence, which is described as the sense of “being there”, thus allowing the user to be immersed in and surrounded by that environment. This technology, according to Jerome and Greenberg (2021, p. 2), most commonly “employs headsets that rely on stereoscopic displays, spatial audio and motion tracking sensors to wholly simulate the environment”.

VR is complemented by AR, which is the technological innovation that enables users to visualise and interact with graphics that have been superimposed over a real-world environment (Carton, 2019).

The development of immersive technologies in the last three decades has resulted in practical applications of VR and AR as the basis on which individuals are able to interact in virtual worlds to enhance their entertainment, education, gaming, data and concept visualisation, marketing and other experiences. Supporting this view, modern PC- and console-based video games have constituted a major portion of commercial applications that have been achieved as precursors to the extended reality realm (Bohil et al., 2009). As such, by creating a sensory and psychological sensation of being in an alternative space, with newer forms of advanced hardware components such as VR headsets (e.g., Meta Oculus, Microsoft HoloLens, Sony PlayStation VR, Valve Index, HTC Hive and HP Reverb), technological companies can enable faster adoption of these components by consumers.

A recent empirical investigation into the metaverse by Lee and Kim (2022) proposes that the four variables of performance expectancy, effort expectancy, social influence and facilitating conditions positively affect user satisfaction in virtual environments, which increases adoption and participation. These variables in turn positively affect usage intention, purchase intention and word of mouth intention of the virtual consumer. In this manner, the fusion of the real and virtual worlds that exist in parallel can evolve into an influential relationship. Socially, the ability of avatars to form real-world bonds is evidence of a fine margin between the offline and online worlds, thus supporting the view that there is general acceptance of

the UTAUT framework for consumers beyond the technological convergence.

Hypothesis 1 (H1): Access to virtual world environments through enabling technology has a positive effect on user acceptance of the metaverse.

2.4.2 *Digital identity*

As observed in the above section, avatars are the primary means of representing real-life consumers in the virtual realm. This observation requires an examination of representation in the form of identity and digital identity for the purposes of the metaverse. Camp (2004) defines identity in the context of an identification system to be a set of permanent or long-lived temporal attributes associated with an entity. This implies an association with personal identifiers, which can consist of attributes that are specific to that human being. This guiding construct of identity can be further expanded to digital identity. The International Organisation of Standardisation (ISO) defines digital identity as “an item inside or outside an information and communications technology system, such as a person, an organisation, a device, a subsystem or a group of such items that has a recognizably distinct existence” and further implies that non-human entities can possess a digital identity (Domingo & Enriquez, 2018 p. 5).

The above definitions include one or more individual elements of identifying data that, according to Maynard and Morrow (2021, are the digital representation of an entity. The authors further classify forms of digital identity as centralised, federated and decentralised (user centric). “Centralised digital identity” refers to credentials that are held in a single place and used for a single purpose, while “federated digital identity” is similar, but extends the application of credentials to multiple systems. The decentralised form of digital identity is defined as credentials that are created and managed by the owner and stored in a decentralised manner (across multiple devices).

Digital identity capabilities enable users to authenticate, authorise and verify themselves or their actions within a system, and it is in the context of these parameters that digital identity is applied within the metaverse. At the basic level, users of virtual environments must be able to create a digital identity (user profile) that enables their representative avatar. This process is similar to existing capabilities that allow consumers to create email addresses across multiple commercial applications. Tweeddale and Yumasheva (2022) extend the requirement for a digital identity to other levels. They posit that a digital identity in the metaverse is critical for transacting capabilities and for interoperability to enable the user to move their avatar or digital assets from one dimension of the metaverse to another. This supports the decentralised component of digital identity as outlined above.

An extension to the concept of a decentralised digital identity is what researchers have proposed to be the Self Sovereign Identity (SSI), which is enabled by the development of blockchain technology (Muhle et al., 2018). Muhle et al. (2018) acknowledge that the term is still new in the lexicon and can be loosely defined, with a few key properties that have emerged. Primarily, SSI is an identity-management system that allows individuals to fully own and manage their digital identity.

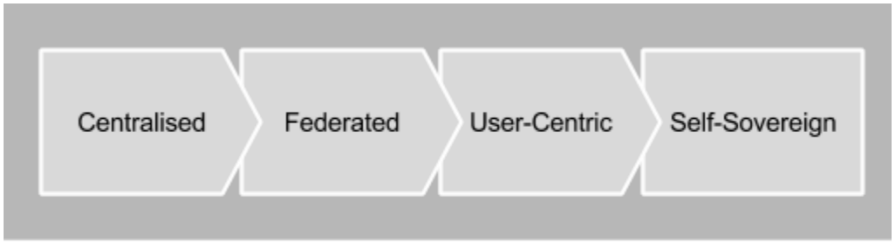

Figure 3: Evolution of online digital identity

Source: Tobin and Reed (2017)

The evolution of identity outlined in Figure 3 above is based on the notion presented by Tobin and Reed (2017) that the internet was created without an identity layer. Exploring this further, it means that the internet's addressing system is based on identifying physical endpoints (machines)

on a network. The implication is that because human beings are not endpoints on a network, the internet therefore has no unique way of identifying people. These authors further suggest that the job of user identification then falls on individual application or website developers, who are primarily concerned about user credentials that pertain to their own domain. This creates the challenge of users having to carry multiple identities and credentials for different purposes and applications (centralised model). The impact of this challenge is noted by Tobin and Reed (2017), who quantify the costs of identity management and security losses for organisations to be in the billions per annum. It is critical to note this because the metaverse construct, as the next iteration of the internet, cannot reasonably achieve significant success unless this question of digital/online identity is resolved. Ultimately, the aim of SSI is to create a secure, portable and user-controlled identity that enables user participation in virtual worlds, thus reducing the limitation imposed by current digital identity capabilities.

Banking institutions face a particular challenge regarding identity management as they possess an enormous amount of personal data because of the nature of their core business (Domingo & Enriquez, 2018. Owing to the sensitivity of financial matters, consumers typically trust financial institutions more than they trust other institutions. In addition, because financial institutions exist within the confines of strict regulations worldwide, they must comply with anti-money laundering and know-your-customer standards. For these reasons, financial institutions can expand their role as digital identity providers over and above their current role, which can enable them to be at the forefront of user access for metaverse transactions. Several use cases have been identified in the United Kingdom, United States, Germany and Canada, where banking institutions are exploring the role of a trust provider as an added value proposition.

At the continental level, the African Union has created an interoperability framework for digital identity as part of the Digital Transformation Strategy for Africa (2020–2030), which emphasises legal digital identification for the

continent (Razzano, 2021). In South Africa, particularly, digital identity has been identified by regulators as a key consideration as an identification system to promote inclusion at the social and economic level. BankServ (2021) recognises that a successful digital identity programme can drive economic value by reducing leakages in service provision for social benefits, while supporting the growth of the digital economy by creating a trusted and secure identity framework to improve online transactions. Applied to the construct of the metaverse, users could be enabled to operate across multiple virtual worlds using a recognised digital identity.

Hypothesis 2 (H2): A secure, portable and user-controlled digital identity has a positive effect on user acceptance and adoption of the metaverse.

2.4.3 *Reliance on social influences*

The third consideration in this study examines user acceptance behaviour of the metaverse, based on the assumption that users are more willing to accept the virtual world if their social circle encourages that behaviour. This predominantly focuses on the views, opinions and recommendations of “important others” and the user’s perceived enjoyment of virtual world environments and whether they deem this enjoyment to be a motivator for adoption in future interactions with the metaverse.

Verhagen et al. (2009) note that escapism, a concept developed by Hirschman in 1983, is an extrinsic motivation and offers the individual an avenue to a more desirable state of being than the one presently experienced. This means that it has a utilitarian function as an anxiety-reduction mechanism and offers users the ability to exit the reality in which they live. In an empirical study on Second Life conducted by Fetscherin et al. (2008), it was found that users’ intentions to participate in virtual worlds were influenced by factors such as collaboration, communication and cooperation as drivers of acceptance.

Li and Lee (2010) note that participation in virtual environments can be defined across three categories of participation: general participation,

lurking and active participation. Describing these categories, general participation behaviour is measured in terms of time spent and frequency of participation in virtual environments. Lurking, on the other hand, has been defined by Brazelton and Gorry (2003), who state that users who lurk in virtual environments do so by viewing messages but not actively posting their views. The primary reason for virtual world success has been noted to be active participation, which primarily refers to user involvement in all aspects of the virtual world gameplay. Verhagen et al. (2009) identify entertainment value to be another motivator for active participation in these environments. This is a form of intrinsic motivation, which is outlined in the DOI theory of Rogers (1995).

Hypothesis 3 (H3): The influence of an individual's social circle has a positive effect on user acceptance and adoption of the metaverse.

2.5 Second research objective

RO2: Examine consumer purchasing patterns in virtual environments and, in particular, the desire to purchase items in virtual world environments as a motivator of acceptance.

2.5.1 *Access to economic resources (virtual currency)*

As virtual world economies mirror real-world ecosystems, certain aspects of transactional capability are available to users. Nazir and Lui (2016) identify two main traditional types of currency-exchange directions in virtual worlds. The first type is a one-way direction, where users exchange real money for virtual currency but are unable to change the virtual currency back to real money. Mikolajewicz-Wozniak and Scheibe (2015) note that virtual money is not a new concept, as it shares similar characteristics with pre-existing funds that society has already adapted to over several decades in the form of credit and debit cards to pay for goods and services. The second type is a two-way currency-exchange direction, in which users can exchange either currency for the other.

Ali et al. (2014) propose that most payments are conducted electronically and therefore create digital records of money transactions that are stored by banks. As such, modern payments are conducted through the reduction of one party's account whilst another party's account is increased by the same amount. Recent innovations in payment technologies include credit/debit cards, mobile money and services such as Gpay and Apple Pay.

The one-way currency-exchange direction has traditionally been used in the virtual world gaming environment, where users use their debit/credit cards to make in-world purchases for "gold-coin" type currencies that are within the control domain of virtual game/world developers. This type of exchange limits the users' capability to liquidate their gold-coin or virtual-currency holdings if they wish to terminate their virtual world experience. To participate in the flexible two-way currency-exchange direction, users must exit the virtual world environment and utilise third-party services, which often results in the termination of user accounts, particularly in game-oriented worlds such as World of Warcraft.

Khan et al. (2017) expand on this view that electronic payment systems are better than cash-based systems as they are pliable and adaptable for modern transactional requirements. Internet payment systems are particularly useful for faster processing to ensure the smooth transferability of capital. Payment gateways act as financial intersections that enable transacting parties to access financial institutions. Consumers are making evolutionary adaptations to increasing their usage of electronic payments. A move from paper-based ledgers and the introduction of low-cost technology to enable new payment schemes in the last 50 years have affected transaction capabilities. Distributed ledgers are the most important innovation of modern payment systems as they enable the payment system to operate in a decentralised manner that disintermediates banks (Ali et al., 2014).

In a study that aimed to assess the purchase of virtual assets, Guo and Barnes (2009) found that in freeform virtual worlds, users had greater

purchase options than game-oriented environments and were more inclined to purchase from other avatars, while retaining the ability to create their own good or services to sell to other avatars, in this way creating a virtual economy that supported trade. Participants were found to pursue virtual items for their perceived value, usefulness and character competency in procuring the items in the virtual environment. User motivation for obtaining virtual items was found to be directly influenced by user assessments of the effort expectancy, which is the degree of use of virtual world transacting mechanisms, and the performance expectancy of the benefit that consumers could derive from performing certain activities on the virtual platform that enabled the purchase of items. Guo and Barnes (2009) concluded that the quality characteristics of the virtual environment were further evidence that the environment influences the user or avatar's pursuit of advanced-level items that enhance their simulated environment.

Hypothesis 4 (H4): Access to virtual currencies has a positive effect on an individual's desire to purchase virtual world items as a motivator of acceptance.

2.6 Third research objective

RO3: Assess user adoption of alternative digital payment strategies in virtual world environments and, particularly, which payment capabilities aid transacting potential for users?

2.6.1 *Availability of alternative digital payment capabilities*

Over time, the evolution of trade between parties has provided various means of transaction fulfilment, from bartering to modern payment systems. Online payment systems are agreements to exchange money between purchasers and sellers or related parties that use a digital financial instrument supported by a financial institution (Khan et al., 2017). Risk is inherent in all payment types, but electronic methods offer significant advantages, such as safety, convenience, and the ability to

track spending and reduce the cost of printing money, notwithstanding the potential of scammers using unmonitored cryptocurrency wallets for illicit criminal activities.

The introduction of new payment types such as mobile wallets and digital currencies has expanded the possibilities for both developers and consumers. These developments have not only created new ways of transacting but have developed new forms of money through decentralisation. Brunnermeier and James (2019) note that new currencies emerge and reshape the nature of competitive currency markets. As examples, the authors indicate that in Africa, mobile money platforms such as Safaricom's M-PESA have redefined how users interact with digital payments and, in China, digital wallets by WeChat and Alipay have been adopted at all levels of societal applications.

Virtual currency schemes differ from fiat currency for two important reasons, among others. First, they are decentralised to the extent that no central authority controls the issuance of virtual currency, and therefore no clearing intermediaries are required as with fiat currency (World Bank, 2014). Second, they offer anonymity for users, while, in contrast, being transparent as a peer-to-peer system that enables all participants to confirm transactions that have been broadcast on the blockchain for verification and confirmation on the distributed ledger (Mikolajewicz-Wozniak & Scheibe, 2015).

Cryptocurrency as a medium of exchange or legal tender, and an extension of the above definitions, has been widely adopted as a result of the faults evident in the current fiat monetary systems. Hamukuaya (2021) notes that these faults are caused particularly by the centralised nature of the fiat currency, high transaction costs associated with making transfers and the low confidence that people have in modern governments and monetary institutions. In addition, financial markets are strictly regulated around the world, with central banks having the sole authority to issue currency, thus posing an existential threat to the potential for virtual

currencies to proliferate and gain wider adoption beyond speculative purposes.

Hypothesis 5 (H5): Access to alternative payment capabilities has a positive effect on user desire to purchase virtual world items as a motivator of acceptance and adoption.

2.7 Organising framework

From the results of the literature reviewed in response to the research objectives, the following organising framework was developed for the study using the UTAUT model as a basis.

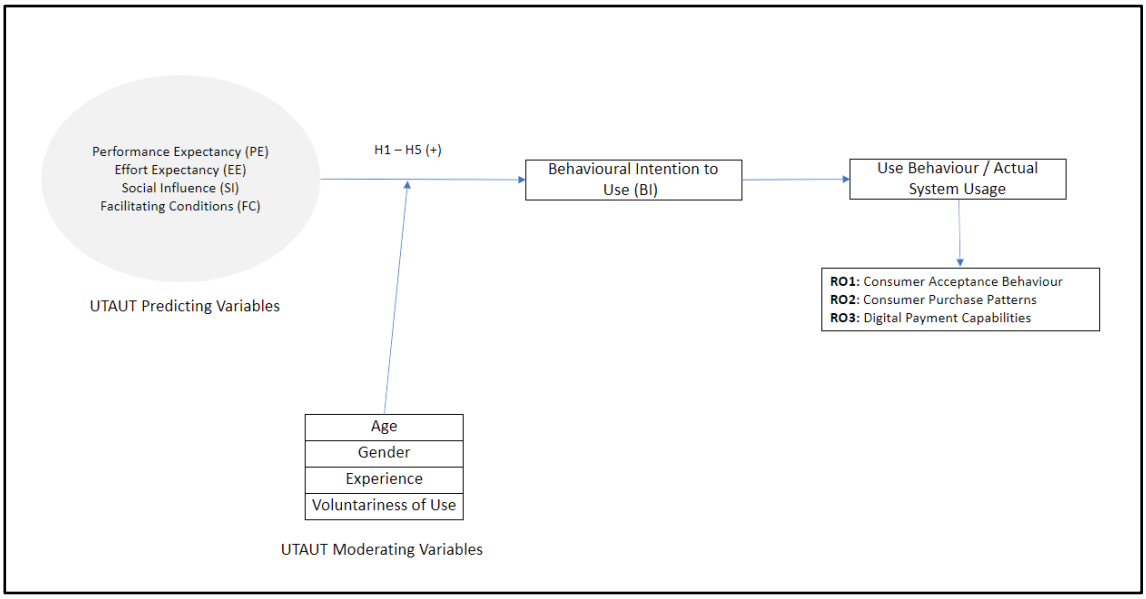

Figure 4: Organising framework

The above organising framework demonstrates the proposed positive relationships between the hypotheses (H1 – H5) and consumer behavioural intention in relation to the acceptance and adoption of the metaverse. These hypotheses are associated with the elements of the UTAUT model as put forward by Venkatesh et al. (2003).

The moderators of the UTAUT model (age, gender, experience and voluntariness of use) are included to validate their individual impacts on

the relationships between the independent variables and behavioural intention and use behaviour.

Hypothesis 1 (H1): Access to virtual world environments through enabling technology has a positive effect on user acceptance of the metaverse.

Hypothesis 2 (H2): A secure, portable and user-controlled digital identity has a positive effect on user acceptance and adoption of the metaverse.

Hypothesis 3 (H3): The influence of an individual's social circle has a positive effect on user acceptance and adoption of the metaverse.

Hypothesis 4 (H4): Access to virtual currencies has a positive effect on an individual's desire to purchase virtual world items as a motivator of acceptance.

Hypothesis 5 (H5): Access to alternative payment capabilities has a positive effect on user desire to purchase virtual world items as a motivator of acceptance and adoption.

2.8 Conclusion of literature review

In conclusion, this chapter began by presenting a discussion of relevant literature to examine the various elements pertaining to the theoretical base of the study (UTAUT). The chapter then presented a review of the literature explored in response to the research objectives. From the results of this review, five hypotheses were proposed for the study. In addition, an organising framework was established in which the original independent variables of the UTAUT model were associated with the variables selected as relevant for exploring the applicability of the metaverse for South African consumers and financial institutions

Chapter 3 presents the research methodology chosen as most suitable to expand on the hypotheses developed from the literature review.

CHAPTER 3. RESEARCH METHODOLOGY

3.1 Research approach

This study followed a quantitative approach in attempting to examine the consumer-acceptance and digital-strategy drivers for the adoption of the metaverse. This approach was considered appropriate for the study as it has the potential to provide deeper insights into the determinants of adoption from a sample chosen as representative of the targeted population. The approach follows a similar pattern as in previous research in technology acceptance, as noted by Tarhini et al. (2014). This deductive approach, as observed by Trochim and Donnelly (2008), is a positivist paradigm, allowing researchers to follow a sequence of examining theory, formulating hypotheses in relation to the theory, measuring relationships between variables and finally confirming or rejecting the hypotheses. It is for this purpose that the approach selected was considered beneficial in testing the UTAUT model against the selected hypotheses.

3.2 Research design

A survey methodology was followed as the research design for this study, primarily because quantitative research targets the quantification of the empirical data to understand root causes, reasons and motivations behind a particular phenomenon, as suggested by Ragin (1987). In relation to the research design chosen for this study, Wang (2018) notes that designing a research framework in this manner enables three main stages: exploration, testing and evaluation. In the literature review, as set out in the previous chapters, there was extensive focus on the exploration stage, while the rest of the study provided a deeper engagement with testing and evaluation, with the results reported and discussed in Chapters 4 and 5 of this research report.

The quantitative enquiry of this research utilised a survey research methodology that was administered online, thus following an established

pattern for quantitative research. Dillman et al. (2014) and Fowler (2014) recognise that this approach is justified on the assumption that each survey respondent answers the same set of questions, making surveys ideal as a data-collection tool that can then be administered to an increased number of people and can allow for generalisation of the findings. Additional advantages of this methodology include the ability to collect data in a limited amount of time while also being cost effective (Galawe, 2017).

Additional considerations required by the researcher when administering survey questionnaires include obtaining informed consent from the respondents, advising them of the purpose of the study and their rights as study participants, and ensuring their privacy by keeping their identity and responses confidential (Dillman et al., 2014; Krosnick & Presser, 2010). In this research, participants were informed upfront of these considerations prior to answering any further questions.

For the purposes of this undertaking on the metaverse, the survey methodology was chosen as it allowed the collection of data at a point in time, specifically in an age when technological innovation pre- and post the Covid-19 pandemic is accelerating the availability of the means through which consumers can meaningfully engage with the metaverse construct. This is particularly useful for testing the hypotheses.

3.3 Data-collection methods

Data was collected through a questionnaire survey created for this study. As observed by Hua and Haughton (2008), surveys reflect a combination of statistical theory and knowledge about research questions, and questionnaires are useful for structured surveys. This method enables structured and standardised data collection that can be distributed to a wider audience. The responses can then be examined in the context of a representative sample and evaluated on this basis.

The questionnaire was based on previous questionnaires that explored consumer acceptance (Hsu & Lu, 2004; Hua & Haughton, 2008); thus, its validity was supported by previous empirical results.

3.4 Population and sample

3.4.1 *Population*

The population of interest (target population) for this study was adult South Africans who had an interest in, had previously interacted with, or intended to be exposed to online, console or pc gaming and simulated-experience environments such as The Sims, Minecraft, World of Warcraft, Second Life, Roblox and Fortnite in any capacity. A study by Newzoo, a games analytics company, estimates that there are 24 million gamers in the country, with roughly 11 million of total gamers being adults (Newzoo, 2020).

3.4.2 *Sample framework*

As outlined in the chapter 1, the goal of this research is to leverage UTAUT as a model for determining user acceptance and adoption of virtual world environments. This is outlined in the research objectives stated below:

1. Explore consumer acceptance behaviour in virtual environments and, in particular, the influence of access to virtual world environments as a motivator of acceptance.
2. Examine consumer purchasing patterns in virtual environments and, in particular, the desire to purchase items in virtual world environments as a motivator of acceptance.
3. Assess user adoption of alternative digital payment strategies in virtual world environments and, particularly, which payment capabilities aid transacting potential for users.

The chosen quantitative method is appropriate for facilitating data gathering, and testing hypothesis, while the literature assists in determining gaps in metaverse research.

3.4.3 *Sample and sampling method*

The criterion for selection for participation in the study was that potential participants should be familiar with and able to transact using virtual currencies. A 2022 report by Triple-A estimates that 9.45% of South Africans (approximately 6 million people) own cryptocurrency, which for the purposes of this study implies an association with different virtual currencies (Triple-A, 2022). A large majority of cryptocurrency owners are in the 18-to-44-year age group. The sample of respondents were further required to have a bank credit or debit card or cryptocurrency portfolio. The distinguishing aspect of the cryptocurrency holding enabled the study to be specific about how respondents would perceive the metaverse given the capabilities at their disposal. The target sample for analysis was 150 respondents, but the data gathering exercise resulted in 93 samples achieved, 90 of which were used in the analysis. Although the intended sample size was not achieved, the final sample size is sufficient to draw meaningful conclusions and meet the objectives of the study. Limitations of not achieving a higher number include recruitment challenges and difficulty in reaching and convincing potential participants to partake in the study. To mitigate these challenges, the data analysis has used robust statistical techniques such as exploratory factor analysis, centring of variables to incorporate mean scores and regression analysis to ensure that the sample size offers reliable estimates. The research discussions and conclusions also consider the limitations of generalizing the findings to a broader population, while providing recommendations for future research for a larger and more diverse sample.

Probability sampling was used for this study, particularly the simple random sampling method. This was conducted by assigning each participant in the defined population a number, and sampling from that. Using this method allowed an equal chance of selection from all participants, regardless of which number they were allocated. The database for the defined population was obtained through word of mouth and professional networks.

3.5 The research instrument

Owing to the nascent nature of the technology being studied, the research instrument was administered online to enable respondents to access and engage with it at their convenience. The instrument was structured as set out below.

Part 1 – Introductory letter (Appendix A)

This explained the research interest, presented the request to complete the survey and provided a declaration that the data collected would be anonymised for privacy when being evaluated.

Part 2 – Questionnaire (Appendix B)

The second section of the instrument covered the socio-demographic background of the respondents regarding their gender, age and experience with gaming. It then looked at virtual worlds (gaming/free-play simulation) to indicate which of the environments the respondent was familiar with on a scale of 1 (no experience) to 6 (very experienced). A Likert scale was chosen as the most universally used for survey collection and therefore considered to be easily understood (Chang, 1994). Using a 6-point Likert scale as opposed to a 5-point scale allowed the respondents to consider the responses more carefully, as suggested by LaMarca (2011).

Part 3 – Constructs

This part of the questionnaire posed several questions to the respondents regarding the constructs explored in the study, particularly those presented by the UTAUT framework. Questions focused on performance expectancy, effort expectancy, social influence, facilitating conditions, behavioural intention and use behaviour.

3.6 Procedure for data collection

Data collection was undertaken through an online questionnaire (Appendix 2) that was distributed via email to identified respondents. This was considered to be the most effective method and would allow participants to forward the survey to their networks for increased participation.

3.7 Data-analysis strategies and interpretation

As this study was quantitative-based research, the data-analysis strategy followed the quantitative method. Using descriptive statistics to gain an understanding of the responses collected from the representative sample through the data-collection method, the study aimed to describe the behaviour of a sample of consumers (cf. Jansen & Warren, 2020). The first set of statistics in the data analysis was descriptive, to depict the data set based on the constructs that had been identified (PE, EE, SI, FC, BI, UB). The responses received were coded and cleaned to guarantee the data integrity and ensure that incomplete survey responses were excluded from the analysis to avoid skewed results.

The data collected was evaluated with the aim of discussing the effects of each of the independent variables (PE, EE, SI and FC) on behavioural intention and use behaviour in relation to consumer acceptance and adoption of the metaverse. According to Hua and Haughton (2008), a Cronbach's alpha that is close to or over 0.7 is the recommended value for confirmatory research. This measure was used in the study to test the quality and consistency of the survey data, and ultimately to test for the effectiveness of the research method.

The data-analysis tool selected for this study was the IBM Statistical Package for the Social Sciences (SPSS) software package. This was selected primarily for its simplicity of language and ability to import the collected data into the software package. The tool is considered specifically valuable for survey-type research for data collection, data output and statistical tests, as suggested by Choudhary (2021).

3.8 Possible limitations and challenges of the study

The research identified the following limitations of the study that might provide challenges:

- The respondents might not be properly representative of the entire population (owing to the relatively small sample size).
- The structured nature of closed questions might not provide deeper insights into user perceptions of the metaverse.
- As this research was conducted at a point in time, it might not provide changing perceptions of consumers as the technology and adoption of the metaverse progresses. Future research may be beneficial in examining this element.

3.9 Quality assurance

3.9.1 *External validity*

This research meets the criterion for external validity as specified by Akinnuwesi et al. (2022) because the UTAUT framework used in the study has been tested for user acceptance and adoption. Previous studies related to the adoption of virtual worlds indicate that the research can be applied to other settings and respondents and at different times (Hendaoui & Limayem, 2008; Hua & Haughton, 2008; Guo & Barnes, 2009).

3.9.2 *Internal validity*

This study meets the test for internal validity as it determines a causal relationship between the independent variables of the UTAUT model (PE, EE, SI and FC), as suggested by Venkatesh et al. (2003). In determining a study's trustworthiness, Stumpfegger (2017) suggests that research will be internally valid if there are few or no confounding variables, which is the case in this instance as the variables used in the study were well known and had been subject to previous analysis. Specifically for this research into consumer acceptance and adoption of the metaverse, the consumer's behavioural intention and use behaviour could be directly associated with the constructs of the theoretical model to determine the relationships.

3.9.3 *Reliability*

According to Stumpfegger (2017), the test for reliability for quantitative research is achieved if a measure consistently provides the same result. This study posited that the independent variables as outlined by the UTAUT theory have a direct and positive influence on a user's acceptance and adoption of the metaverse. As outlined, previous studies have particularly focused on the framework as a tool for assessing this relationship against consumer adoption of various technological innovations, and thus meets the reliability test.

3.10 Ethical considerations

The basis of this research was to conduct an analysis of consumer adoption of the metaverse and its associated technological innovations. As such, the researcher ensured that he was honest in undertaking the research, particularly with the study participants. The researcher ensured that they understood the intention and value of the study upfront by introducing himself and providing the details required for them to ascertain whether they would like to take part in the study. These details were the name and purpose of the study, and the non-personal details of the researcher's academic supervisor should respondents need to contact them for clarification. The data-collection instrument was made accessible to respondents to enable them to complete the questionnaire to ensure that the quality of data collected represented their participation. The researcher further ensured that he followed the ethical prescripts pertaining to the research method as set up by the university.

The nature of the research meant that it relied tremendously on previous academic research undertaken by fellow academics. Their contribution facilitated the researcher's ability to undertake this research and their work provided substantial knowledge. As such, these studies and their authors are acknowledged as required for academic standards where their

contributions have been drawn on. The full details of research publications are listed in a reference list at the end of the report.

3.11 Study schedule and timelines

The study followed the following schedule.

Panel presentations (proposal defence)	4 – 7 July 2022
PGC meeting	13 July 2022
Ethics Approval	06 January 2023
Data collection and report preparation	06 January – 30 June 2023
Research report submission	30 June 2023

CHAPTER 4. PRESENTATION OF RESULTS

4.1 Introduction

This chapter presents and discusses the results from the study's data analysis. The departure point is a presentation of the characteristics of the respondents, including their demographics gathered from the research instrument.

4.1.1 *Sample characteristics*

A total of 93 responses were received from the data-collection exercise. All were valid and usable for the rest of the analysis, apart from three results, which had missing values and were thus removed. The final sample analysed consisted of 90 responses.

4.1.2 *Age group*

As shown in Table 1, the majority (61.1%) of the respondents were in the 29–39 age group, followed by the 40–49 age group (23.3%), the 50–59 age group (8.9%) and, lastly, the 18–28 age group (6.7%). The researcher's primary takeaway from this data was that there is significant potential to explore additional, targeted research in lower age groups for virtual world immersion.

Table 1: Age group

Age Group					
		Frequency	Per cent	Valid per cent	Cumulative per cent
Valid	18 – 28 years old	6	6.7	6.7	6.7
	29 – 39 years old	55	61.1	61.1	67.8
	40 – 49 years old	21	23.3	23.3	91.1
	50 – 59 years old	8	8.9	8.9	100.0
	Total	90	100.0	100.0	

4.1.3 *Gender*

Table 2 presents a breakdown of the participation among the respondents according to gender and indicates that more males (~55%) than females (~45%) were sampled overall.

Table 2: Gender

Gender					
		Frequency	Per cent	Valid per cent	Cumulative per cent
Valid	Male	49	54.4	54.4	54.4
	Female	40	44.4	44.4	98.9
	Non-binary/Third gender	1	1.1	1.1	100.0
	Total	90	100.0	100.0	

4.1.4 *Gaming experience*

The gaming experience of the respondents was also ascertained. Table 3 below presents a cross-tabulation view that shows that among the different age groups, there was a large percentage of respondents in the 29–39 age group who had experience with gaming in one form or another (console or virtual world), followed by the 40–49 age group.

Table 3: Age and gaming experience

Age Group and Gaming Experience Cross-Tabulation				
		Console Gaming	Virtual World Gaming	No Gaming Experience
		I have played console games on Xbox, PlayStation, Nintendo etc.	I have played virtual world games (The Sims, Second life, Minecraft, Roblox, World of Warcraft, Fortnite, Decentraland etc.)	I have no previous experience with gaming.
Age group	18 – 28 years old	5.0%	11.8%	4.0%
	29 – 39 years old	73.3%	67.6%	40.0%
	40 – 49 years old	16.7%	17.6%	36.0%
	50 – 59 years old	5.0%	2.9%	20.0%
Total		100.0%	100.0%	100.0%

The cross-tabulation was again conducted with gender, as shown in Table 4, with the result illustrating that a large percentage (65% and 73%) of males had experience with gaming (console and virtual world respectively). In contrast, a high percentage of female participants (68%) had no prior experience with gaming, although there was wide adoption in the female sample of console and virtual world gaming (35% and 23% respectively).

Table 4: Gender and gaming experience

Gender and Gaming Experience Cross-Tabulation				
		Console Gaming	Virtual World Gaming	No Gaming Experience
		I have played console games on Xbox, PlayStation, Nintendo etc.	I have played virtual world games (The Sims, Second life, Minecraft, Roblox, World of Warcraft, Fortnite, Decentraland etc.)	I have no previous experience with gaming
Gender	Male	65.0%	73.5%	32.0%
	Female	35.0%	23.5%	68.0%
	Non-binary/Third gender	0.0%	2.9%	0.0%
Total		100.0%	100.0%	100.0%

4.2 Reliability of measurement scale results

The Cronbach's Alpha coefficient was used to test the reliability of the measurement scale. This measure is used to assess the internal consistency of the measurement scale, thus indicating the extent to which items in the scale measure the same construct (Cronbach, 1951; Cortina, 1993). In the context of the UTAUT framework, the items measured were reflective of the underlying PE, EE, SI, FC, BI and UB variables. Literature suggests that higher measures of Cronbach's alpha suggest a greater level of internal consistency and reliability (Cronbach, 1951), with a Cronbach's alpha of 0.70 or higher considered acceptable for research. Table 5 indicates that all the alphas measured were higher than 0.70 and the constructs were therefore accepted.

Table 5: Summary – reliability results

Construct	Code	No. of Items	Cronbach's Alpha α
Performance Expectancy	PE	10	0.879
Effort Expectancy	EE	8	0.823
Social Influence	SI	8	0.837
Facilitating Conditions	FC	10	0.877
Behavioural Intention	BI	5	0.895
Usage Behaviour	UB	3	0.932

In the analysis reported on below, the item-total correlation is used to assess the correlation between each of the items measured and the total alpha score, indicating the degree of association between the item and the construct being investigated (cf. DeVellis, 2017). In research, the item-total correlation is used to evaluate the internal consistency of the measurement scale, and a threshold of 0.3 typically indicates a lack of alignment or quality for the measured construct, while higher positive measures of above 0.3 indicate that the item is measuring the same construct as the total scale score (Streiner, 2003). All the values must therefore be as close to the overall alpha as possible to be retained.

The inter-item correlation was also used in this research. This correlation quantifies the relationship between the different items within the scale and measures the extent to which the various items are related to each other (Nunnally & Bernstein, 1994). High positive inter-item correlations reflect that the items are positively related, while lower or negative correlations suggest a weak relationship between the items.

The discussion below focuses on all the constructs: performance expectancy, effort expectancy, social influence, facilitating conditions, behavioural intention and use behaviour.

4.2.1 *Performance expectancy (PE)*

The performance expectancy measure, as set out in Table 6, shows that the 10 items measured for this construct have a total alpha of 0.879, which is acceptable. All items were retained as they have an item-total correlation

of greater than 0.3, thus indicating that the scale is reliable and consistent with the overall alpha value.

Table 6: Item-total statistics (PE)

Item-Total Statistics (PE)						
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted	Alpha
PE Be More Productive (PE001)	32.31	47.359	.783	.728	.853	0.879 (10 items)
PE Express Personal Opinions (PE002)	32.23	51.972	.557	.390	.871	
PE Entertaining Experiences (PE003)	31.22	52.536	.652	.595	.866	
PE Increase Effectiveness (PE004)	32.29	48.522	.719	.730	.859	
PE More Social Contact (PE005)	32.55	50.588	.557	.441	.872	
PE Attain Information (PE006)	31.64	50.467	.680	.560	.862	
PE Provide 3D Experience (PE007)	31.26	55.622	.463	.491	.877	
PE Perform Work (PE008)	32.06	47.905	.758	.682	.855	
PE No Different Physical World (PE009)	33.05	50.829	.468	.376	.882	
PE Transact and Purchase (PE010)	31.35	55.190	.475	.509	.876	

When assessing the inter-item correlation, as reflected in Table 7, the results indicate that the inter-item correlations have a convergence of validity as they are greater than 0.3, apart from a few that do not pose a significant challenge. This means that none of the items with inter-item

correlations of lower than 0.3 could substantially improve the overall alpha when deleted. Therefore, all items were retained.

Table 7: Inter-item correlation matrix

Inter-Item Correlation Matrix (PE)										
	PE001	PE002	PE003	PE004	PE005	PE006	PE007	PE008	PE009	PE010
PE001	1.000									
PE002	.494	1.000								
PE003	.489	.429	1.000							
PE004	.773	.508	.504	1.000						
PE005	.537	.356	.295	.369	1.000					
PE006	.514	.478	.562	.600	.402	1.000				
PE007	.360	.198	.639	.287	.192	.389	1.000			
PE008	.750	.395	.548	.740	.468	.556	.345	1.000		
PE009	.456	.357	.275	.369	.442	.290	.221	.451	1.000	
PE010	.355	.285	.480	.238	.415	.527	.484	.361	.052	1.000

4.2.2 *Effort expectancy (EE)*

The effort expectancy measure, as indicated in Table 8, shows that the eight items measured for this construct have a total alpha of 0.823, which is acceptable. All but one of the items have an item-total correlation of greater than 0.3, thus indicating that the scale is reliable and consistent with the overall alpha value.

When assessing the inter-item correlation reflected in Table 9, the results indicate that the inter-item correlations have a convergence of validity as they are greater than 0.3, apart from a few that do not pose a significant challenge. This means that none of the items with inter-item correlations of lower than 0.3 could substantially improve the overall alpha when deleted. Therefore, all items were retained.

Table 8: Item-total statistics (EE)

Item-Total Statistics (EE)						
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted	Alpha
EE Similarity Physical World (EE01)	26.58	28.585	.335	.208	.839	0.823 (8 items)
EE Learn Navigation (EE02)	25.51	26.383	.720	.806	.778	
EE Gain Skills for Tasks (EE03)	25.53	27.266	.688	.716	.785	
EE Avatar Roleplay (EE04)	25.56	27.418	.600	.623	.795	
EE Continue Participation via Tutorial (EE05)	25.54	27.888	.568	.497	.799	
EE Challenge Self to Learn (EE06)	25.50	27.136	.575	.503	.798	
EE Change Opinion due to Difficulty (EE07)	26.00	30.416	.265	.255	.842	
EE Overall Easy Navigation (EE08)	25.47	26.954	.768	.767	.776	

Table 9: Inter-item correlation matrix

Inter-Item Correlation Matrix (EE)								
	EE01	EE02	EE03	EE04	EE05	EE06	EE07	EE08
EE01	1.000							
EE02	.260	1.000						
EE03	.143	.799	1.000					
EE04	.152	.740	.657	1.000				
EE05	.329	.295	.376	.329	1.000			
EE06	.200	.424	.556	.402	.615	1.000		
EE07	.291	.131	.090	.004	.386	.183	1.000	
EE08	.299	.845	.738	.725	.364	.445	.227	1.000

4.2.3 *Social influence (SI)*

The social influence measure, as presented in Table 10, shows that the eight items measured for this construct have a total alpha of 0.837, which is acceptable. All items have an item-total correlation of greater than 0.3, which indicates that the scale is reliable and consistent with the overall alpha value.

Table 10: Item-total statistics (SI)

Item-Total Statistics (SI)						
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted	Alpha
SI Influenced by Important Others (SI01)	21.64	40.155	.569	.382	.819	0.837 (8 items)
SI Access if Assisted (SI02)	21.31	41.307	.463	.303	.830	
SI Others' View to Participate (SI03)	22.59	36.323	.701	.587	.800	
SI Connecting with Important Others (SI04)	22.21	35.750	.669	.631	.803	
SI New Social Connections (SI05)	21.68	36.117	.678	.562	.802	
SI Only If Important Others Participate (SI06)	22.51	38.902	.543	.394	.821	
SI New Identity Different to Everyday Self (SI07)	21.99	40.013	.353	.211	.850	
SI Socialise with Other People (SI08)	21.71	38.340	.605	.428	.813	

When assessing the inter-item correlation reflected in Table 11, the results indicate that the inter-item correlations have a convergence of validity as they are greater than 0.3, apart from one, which does not pose a significant challenge. This means that none of the items with inter-item correlations of lower than 0.3 could substantially improve the overall alpha when deleted. Therefore, all items were retained.

Table 11: Inter-item correlation matrix

Inter-Item Correlation Matrix (SI)								
	SI01	SI02	SI03	SI04	SI05	SI06	SI07	SI08
SI01	1.000							
SI02	.399	1.000						
SI03	.456	.391	1.000					
SI04	.374	.467	.688	1.000				
SI05	.466	.335	.511	.640	1.000			
SI06	.485	.360	.531	.348	.326	1.000		
SI07	.239	.070	.300	.184	.331	.320	1.000	
SI08	.376	.309	.444	.512	.612	.312	.333	1.000

4.2.4 *Facilitating conditions (FC)*

The facilitating conditions measure, as presented in Table 12, shows that the 10 items measured for this construct have a total alpha of 0.877, which is acceptable. All items have an item-total correlation of greater than 0.3, thus indicating that the scale is reliable and consistent with the overall alpha value.

Table 12: Item-total statistics (FC)

Item-Total Statistics (FC)						
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted	Alpha
FC Secure Digital Identity to Access (FC1)	32.71	55.069	.585	.672	.868	0.877 (10 items)
FC Create Virtual Identity (Avatar) (FC2)	32.88	53.415	.605	.649	.865	
FC Digital identity to Access Multiple Worlds (FC3)	32.77	54.542	.679	.726	.863	
FC Test World Identified (FC4)	34.36	52.038	.451	.292	.880	
FC VR/AR Headset (Must Have) to Participate (FC5)	33.26	56.029	.355	.226	.883	
FC Virtual Currencies to Purchase (FC6)	32.99	50.653	.705	.714	.857	
FC Digital Payments Make Virtual World Enjoyable (FC7)	33.15	48.991	.762	.739	.852	
FC Digital Currencies for Wholesome Experience (FC8)	33.19	48.935	.750	.739	.853	
FC FSP Convert Real Money into Virtual Currency (FC9)	33.68	52.052	.507	.315	.874	
FC Upgrade Devices to be Compatible (FC10)	33.27	48.229	.754	.713	.852	

When assessing the inter-item correlation reflected in Table 13, the results indicate that the inter-item correlations have a convergence of validity as they are greater than 0.3, apart from a few that do not pose a significant challenge. This means that none of the items with inter-item correlations

of lower than 0.3 could substantially improve the overall alpha when deleted. Therefore, all items were retained.

Table 13: Inter-item correlation matrix

Inter-Item Correlation Matrix (FC)										
	FC1	FC2	FC3	FC4	FC5	FC6	FC7	FC8	FC9	FC10
FC1	1.000									
FC2	.740	1.000								
FC3	.727	.673	1.000							
FC4	.198	.245	.359	1.000						
FC5	.229	.293	.299	.293	1.000					
FC6	.411	.380	.600	.325	.219	1.000				
FC7	.458	.465	.533	.352	.174	.728	1.000			
FC8	.381	.437	.488	.328	.271	.784	.771	1.000		
FC9	.264	.246	.307	.421	.205	.376	.457	.447	1.000	
FC10	.492	.549	.412	.362	.345	.584	.752	.704	.447	1.000

4.2.5 *Behavioural intention (BI)*

The behavioural intention measure, as indicated in Table 14, shows that the five items measured for this construct have a total alpha of 0.895, which is acceptable. All items have an item-total correlation of greater than 0.3, thus indicating that the scale is reliable and consistent with the overall alpha value.

When assessing the inter-item correlation reflected in Table 15, the results indicate that the inter-item correlations have a convergence of validity as they are greater than 0.3. All items were therefore retained.

Table 14: Item-total statistics (BI)

Item-Total Statistics (BI)						
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted	Alpha
BI VR Headsets to Access (BI01)	13.09	20.087	.628	.416	.896	0.895 (5 items)
BI VR Headsets in 18–24 Months (BI02)	14.05	18.545	.642	.455	.897	
BI Interested to Purchase Virtual Goods/Services (BI03)	13.57	17.591	.749	.676	.871	
BI Plan for Metaverse Use in Long Term (BI04)	13.42	17.945	.872	.792	.844	
BI Plan to Use More Often as Experience Increases (BI05)	13.32	18.085	.854	.781	.848	

Table 15: Inter-item correlation matrix

Inter-Item Correlation Matrix (BI)					
	BI01	BI02	BI03	BI04	BI05
BI01	1.000				
BI02	.512	1.000			
BI03	.492	.500	1.000		
BI04	.596	.655	.786	1.000	
BI05	.611	.591	.793	.852	1.000

4.2.6 *Use behaviour (UB)*

The actual use behaviour measure, as presented in Table 16, shows that the three items measured for this construct have a total alpha of 0.932, which is acceptable. All items have an item-total correlation that is greater than 0.3, thus indicating that the scale is reliable and consistent with the overall alpha value.

When assessing the inter-item correlation reflected in Table 17, the results indicate that the inter-item correlations have a convergence of validity as they are greater than 0.3. All items were therefore retained.

Table 16: Item-total statistics (UB)

Item-Total Statistics (UB)						
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted	Alpha
UB Use Metaverse in Future (UB001)	7.74	4.623	.897	.850	.870	0.932 (3 items)
UB Increase Usage in Future (UB002)	7.92	4.714	.899	.850	.869	
UB Access Different Worlds (UB003)	7.42	5.314	.787	.619	.956	

Table 17: Inter-item correlation matrix

Inter-Item Correlation Matrix (UB)			
	UB001	UB002	UB003
UB001	1.000		
UB002	.916	1.000	
UB003	.769	.771	1.000

4.3 Exploratory factor analysis (EFA)

This stage of the data analysis entailed performing an exploratory factor analysis (EFA) using SPSS to determine the number and structure of factors, and primarily to reduce the number of variables per construct. The Principal Component Analysis (PCA) extraction method was used with Kaiser's criterion and scree plot. The rotation method used to optimise the structure was orthogonal (varimax), with the assumption that the factors would be uncorrelated, with a resultant Rotated Component Matrix. All six UTAUT constructs (PE, EE, SI, FC, BI and UB) were analysed and the results are presented and interpreted in the sections below.

4.3.1 *Performance expectancy (independent variable)*

The result of a principal factor analysis conducted on the 10 items of Performance Expectancy (PE) is presented in Table 18 below, which shows that two factors were extracted with eight and seven items respectively. These factors have loadings of .372 to .822 and .268 to .808 respectively, while showing a convergence between the scree plot and Kaiser normalisation of eigenvalue that is greater than one.

Table 18: Rotated component matrix (PE)

Rotated Component Matrix[a]		
	Component	
	PEFA1	PEFA2
PE001	.822	.302
PE002	.799	.268
PE003	.774	.344
PE004	.716	
PE005	.629	
PE006	.621	
PE007		.808
PE008		.805
PE009	.372	.753
PE010	.521	.589
Extraction Method: PCA. Rotation Method: Varimax with Kaiser Normalisation.[a] a. Rotation converged in 3 iterations.		

Table 19 shows that the two factors extracted explain a total of 62.45% of the variance (with PEFA1 = 49.46%; PEFA2 = 12.99%), which means that the retained factors can explain a large variance in each item.

Table 19: Total variance explained (PE)

Total Variance Explained (PE)									
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.946	49.462	49.462	4.946	49.462	49.462	3.644	36.442	36.442
2	1.299	12.986	62.447	1.299	12.986	62.447	2.601	26.006	62.447
3	.837	8.373	70.820						
4	.777	7.772	78.593						
5	.676	6.757	85.350						
6	.447	4.471	89.820						
7	.338	3.376	93.197						
8	.311	3.105	96.302						
9	.205	2.047	98.349						
10	.165	1.651	100.000						
Extraction Method: PCA.									

To test whether the sample size and variables are suitable for factor analysis, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is used. An overall KMO=0.829 was achieved, which is well above the 0.5 cut-off and considered ideal. This indicates that the sample size and variables are suitable for factor analysis, as noted by Hair et al. (2019).

The Bartlett's Test of Sphericity was also used to determine whether the correlation matrix of the variables was appropriate for factor analysis. The result indicates that the correlation between the items is significant and suitable for conducting a factor analysis (cf. Field, 2013). In addition to the above, the determinant of 0.004>0.00001 is indicative that there is no issue of multicollinearity that requires attention. To counteract the potential for multicollinearity, the variables were centred by subtracting the means from each of the independent and moderating variables, then multiplying the residuals together to create a centred product term, which was used for regression analysis.

Table 20: KMO and Bartlett's test (PE)

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.829
Bartlett's Test of Sphericity	Approx. Chi-Square	393.988
	df	45
	Sig.	<,001

4.3.2 *Effort expectancy (independent variable)*

Eight items were initially measured for effort expectancy and the result of the EFA retained two factors, following the same process as for performance expectancy.

The result of a principal factor analysis on the eight items is presented in Table 21 below, which shows that two factors were extracted with six and four items respectively, with factors loadings of .308 to .912 and .502 to .755 respectively. This shows a convergence between the scree plot and Kaiser normalisation of eigenvalue that is greater than one.

Table 21: Rotated component matrix (EE)

Rotated Component Matrix[a]		
	Component	
	EEFA1	EEFA2
EE01	.912	
EE02	.883	
EE03	.869	
EE04	.868	
EE05	.521	.502
EE06		.771
EE07	.308	.755
EE08		.637
Extraction Method: PCA. Rotation Method: Varimax with Kaiser Normalisation.[a] a. Rotation converged in 3 iterations.		

As reflected in Table 22, the two factors extracted explain 67.81% of the variance (with EEFA1 = 50.02%; EEFA2 = 17.78%). This indicates an acceptable level that is representative of the items.

The Kaiser-Meyer-Olkin measure of sampling adequacy (overall KMO=0.809), as shown in Table 23, is above the 0.5 cut-off and considered ideal, thus indicating that the sample size and variables are adequate for factor analysis.

Table 22: Total variance explained (EE)

Total Variance Explained (EE)									
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.002	50.023	50.023	4.002	50.023	50.023	3.502	43.780	43.780
2	1.423	17.783	67.806	1.423	17.783	67.806	1.922	24.026	67.806
3	.882	11.025	78.831						
4	.689	8.609	87.440						
5	.398	4.972	92.413						
6	.275	3.440	95.853						
7	.198	2.481	98.334						
8	.133	1.666	100.000						
Extraction Method: PCA.									

The Bartlett's Test of Sphericity result indicates that the correlation between the items is large enough and significant, which allowed a factor analysis to be conducted. In addition to the above, the determinant of 0.010>0.00001 is indicative that there is no issue of multicollinearity that requires attention. To prevent the potential for multicollinearity, the variables were centred by subtracting the means from each of the independent and moderating variables, then multiplying the residuals together to create a centred product term, which was used for regression analysis.

Table 23: KMO and Bartlett's test (EE)

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.809
Bartlett's Test of Sphericity	Approx. Chi-Square	338.350
	df	28
	Sig.	<,001

4.3.3 *Social influence (independent variable)*

The initial measurement for social influence was performed on eight items, and, after the EFA, one item was retained. This process followed the same process as for performance expectancy and effort expectancy above. The result is presented in Table 24 below, which reflects that one factor was extracted, with loadings from .455 to .802, thus showing a convergence between the scree plot and Kaiser normalisation of eigenvalue that is greater than one. No rotation was required as only one factor was extracted.

Table 24: Component matrix (SI)

Component Matrix[a]	
	Component
	SIFA1
SI01	.802
SI02	.793
SI03	.783
SI04	.713
SI05	.686
SI06	.655
SI07	.597
SI08	.455
Extraction Method: PCA.	
a. 1 component extracted.	

Table 25 reflects that the one factor extracted explains 48.22% of the variance, which is not ideal but acceptable as it is close to 50% (cf. Tabachnick & Fidell, 2019).

Table 25: Total variance explained (SI)

Total Variance Explained (SI)						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.858	48.219	48.219	3.858	48.219	48.219
2	.995	12.438	60.657			
3	.902	11.271	71.928			
4	.632	7.903	79.831			
5	.574	7.176	87.007			
6	.463	5.791	92.798			
7	.350	4.377	97.174			
8	.226	2.826	100.000			
Extraction Method: PCA.						

The Kaiser-Meyer-Olkin measure of sampling adequacy (overall KMO=0.821), as shown in Table 26, is above the 0.5 cut-off and considered ideal, thus indicating that the sample size and variables are adequate for factor analysis. The Bartlett's Test of Sphericity result indicates that the correlation between the items is significant and large enough to conduct a factor analysis. In addition to the above, the determinant of 0.046>0.00001 is indicative that there is no issue of multicollinearity that requires attention. To counteract this potential, the variables were centred by subtracting the means from each of the independent and moderating variables, then multiplying the residuals together to create a centred product term, which was used for regression analysis.

Table 26: KMO and Bartlett's test (SI)

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.821
Bartlett's Test of Sphericity	Approx. Chi-Square	226.222
	df	28
	Sig.	<,001

4.3.4 *Facilitating conditions (independent variable)*

The facilitating conditions variable was measured with an initial total of ten items, three of which were retained. This process followed a similar approach to that discussed in the previous sub-sections. The result is reflected in Table 27 below, which shows that, for the three component factors extracted, factor loadings were .291 to .863, .284 to .882 and .277 to .747 respectively, thus showing a convergence between the scree plot and Kaiser normalisation of eigenvalue that is greater than one.

Table 27: Rotated component matrix (FC)

Rotated Component Matrix[a]			
	Component		
	FCFA1	FCFA2	FCFA3
FC1	.863	.295	
FC2	.863		
FC3	.817	.286	
FC4	.708	.344	.277
FC5	.529		.507
FC6		.882	
FC7		.852	
FC8	.346	.775	
FC9		.284	.747
FC10	.291		.744
Extraction Method: PCA. Rotation Method: Varimax with Kaiser Normalisation.[a]			
a. Rotation converged in 5 iterations.			

Table 28 reflects that the three factors extracted account for 73.40% of the total variance, with component FCFA1 = 50.64%, FCFA2 = 12.50% and FCFA3 = 10.25%, which indicates an acceptable level of representation.

Table 28: Total variance explained (FC)

Total Variance Explained (FC)									
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.064	50.643	50.643	5.064	50.643	50.643	3.252	32.516	32.516
2	1.250	12.497	63.140	1.250	12.497	63.140	2.529	25.290	57.806
3	1.025	10.254	73.393	1.025	10.254	73.393	1.559	15.588	73.393
4	.764	7.642	81.036						
5	.608	6.082	87.118						
6	.501	5.013	92.132						
7	.263	2.626	94.758						
8	.211	2.112	96.870						
9	.171	1.713	98.583						
10	.142	1.417	100.000						
Extraction Method: PCA.									

The Kaiser-Meyer-Olkin measure of sampling adequacy (overall KMO=0.834), as shown in Table 29, is above the 0.5 cut-off and considered ideal, thus indicating that the sample size and variables are adequate for factor analysis. The Bartlett's Test of Sphericity result indicates that the correlation between the items is large and significant enough to conduct a factor analysis. In addition to the above, the determinant of 0.002>0.00001 is indicative that there is no issue of multicollinearity that requires attention. To counteract this potential, the variables were centred by subtracting the means from each of the independent and moderating variables, then multiplying the residuals together to create a centred product term, which was used for regression analysis.

Table 29: KMO and Bartlett's test (FC)

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.834
Bartlett's Test of Sphericity	Approx. Chi-Square	420.343
	df	45
	Sig.	<,001

4.3.5 *Behavioural intention (dependent variable)*

The initial measurement for BI was performed on five items and, after the EFA, one item was retained. The result is presented in Table 30 below, which reflects the factor loadings from .747 to .930, thus showing a convergence between the scree plot and Kaiser normalisation of eigenvalue that is greater than one. No rotation was required as only one factor was extracted.

Table 30: Component matrix (BI)

Component Matrix[a]	
	Component
	BIFA1
BI01	.930
BI02	.921
BI03	.856
BI04	.761
BI05	.747

Extraction Method: PCA.

a. 1 component extracted.

Table 31 reflects that this single extracted factor explains 71.63% of the total variance, with a total eigenvalue of 3.58, which indicates an acceptable level.

Table 31: Total variance explained (BI)

Total Variance Explained (BI)						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.581	71.627	71.627	3.581	71.627	71.627
2	.582	11.639	83.266			
3	.492	9.847	93.113			
4	.202	4.044	97.156			
5	.142	2.844	100.000			
Extraction Method: PCA.						

The Kaiser-Meyer-Olkin measure of sampling adequacy (overall KMO=0.855), as shown in Table 32, is above the 0.5 cut-off and considered ideal, thus indicating that the sample size and variables are adequate for factor analysis. The Bartlett's Test of Sphericity result indicates that the correlation between the items is large and significant enough to conduct a factor analysis. In addition to the above, the determinant of 0.0291>0.00001 is indicative that there is no issue of multicollinearity that requires attention. To counteract this potential, the variables were centred by subtracting the means from each of the independent and moderating variables, then multiplying the residuals together to create a centred product term, which was used for regression analysis.

Table 32: KMO and Bartlett's test (BI)

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.855
Bartlett's Test of Sphericity	Approx. Chi-Square	248.406
	df	10
	Sig.	<,001

4.3.6 *Use behaviour (dependent variable)*

The initial measurement for UB was performed on three items and, after the EFA, one item was retained. The result is presented in Table 33 below, which shows the loadings for the extracted factor from .899 to .957, thus showing a convergence between the scree plot and Kaiser normalisation of eigenvalue that is greater than one. No rotation was required as only one factor was extracted.

Table 33: Component matrix (UB)

Component Matrix[a]	
	Component
	UBFA1
UB001	.957
UB002	.957
UB003	.899
Extraction Method: PCA.	
a. 1 component extracted.	

The extracted factor explains 88% of the total variance, as reflected in Table 34, with a total eigenvalue of 2.6, which is an acceptable level.

Table 34: Total variance explained (UB)

Total Variance Explained (UB)						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.640	87.991	87.991	2.640	87.991	87.991
2	.277	9.223	97.214			
3	.084	2.786	100.000			
Extraction Method: PCA.						

The Kaiser-Meyer-Olkin measure of sampling adequacy (overall KMO=0.728), as shown in Table 35, is above the 0.5 cut-off and

considered ideal, thus indicating that the sample size and variables are adequate for factor analysis. The Bartlett's Test of Sphericity result indicates that the correlation between the items is large and significant enough to conduct a factor analysis. In addition to the above, the determinant of 0.061>0.00001 is indicative that there is no issue of multicollinearity that requires attention. To counteract this potential, the variables were centred by subtracting the means from each of the independent and moderating variables, then multiplying the residuals together to create a centred product term, which was used for regression analysis.

Table 35: KMO and Bartlett's test (UB)

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.728
Bartlett's Test of Sphericity	Approx. Chi-Square	204.584
	df	3
	Sig.	<,001

4.3.7 *Summary of exploratory factor analysis results*

The analysis initially started with 44 factors and post the EFA, which was conducted to reduce the dimension of the variables, 10 factors remained. These factors are deemed reliable and consistent when tested for convergence and validity through the EFA.

The below pattern matrix is the SPSS generated output for exploratory factor analysis and provides a view of the items that load to the factor.

Table: Summary of the EFA results

Pattern Matrix			
	Factor		
	1	2	3
PE Factor Analysis Component 1	.815	-.221	.035
PE Factor Analysis Component 2	-.226	.349	.520
EE Factor Analysis Component 1	.012	.481	.121
EE Factor Analysis Component 2	.763	-.035	-.074
SI Factor Analysis Component 1	.757	.108	.079
FC Factor Analysis Component 1	-.264	.969	-.089
FC Factor Analysis Component 2	.022	-.179	.967
FC Factor Analysis Component 3	.674	-.154	-.142
BI Factor Analysis Component 1	.578	.505	-.014
UB Factor Analysis Component 1	.469	.507	.076
Extraction Method: Principal Axis Factoring. Rotation Method: Promax with Kaiser Normalization.			
a. Rotation converged in 5 iterations.			

The following section extends the analysis and focuses on the testing of the study's hypotheses.

4.4 Hypotheses testing

The research followed a multiple regression method as the statistical technique used to test the hypotheses, as presented in the earlier discussion. The hypotheses are outlined below for reference.

Research Objective 1: The first research objective is to explore consumer acceptance behaviour in relation to virtual world environments and, in particular, the influence of access to virtual world environments as a motivator of acceptance. This is assessed against Hypotheses 1 to 3.

> **H1:** Access to virtual world environments through enabling technology has a positive effect on user acceptance of the metaverse.
>
> **H2:** A secure, portable and user-controlled digital identity has a positive effect on user acceptance and adoption of the metaverse.
>
> **H3:** The influence of an individual's social circle has a positive effect on user acceptance and adoption of the metaverse.

Research Objective 2: The second research objective is to examine consumer purchasing patterns in virtual environments and, in particular, the desire to purchase items in virtual world environments as a motivator of acceptance. This is assessed by Hypothesis 4.

> **H4:** Access to virtual world currencies has a positive effect on an individual's desire to purchase virtual world items as a motivator of acceptance.

Research Objective 3: The third research objective is aimed at assessing user adoption of alternative digital payment strategies in virtual world environments and, particularly, which payment capabilities aid transacting potential for users. This is assessed by Hypothesis 5.

> **H5:** Access to alternative payment capabilities has a positive effect on user desire to purchase virtual world items as a motivator of acceptance and adoption.

The process initially focuses on correlation analysis to gain an understanding of the strength, size, direction and significance of the relationships between the variables in the model. This was extended to the regression analysis, focusing on the moderation of the moderating variables of UTAUT (Age, Gender and Experience) on the relationships between the variables.

Table 36 presents a consolidated view of the correlation matrix with factored components prior to regression analysis, including both independent (PE, EE, SI, FC) and dependent (BI, UB) variables. The strength, size, direction and significance of the relationships between the variables are presented and interpreted in the individual sections.

Table 36: Consolidated correlation matrix

Correlations

	PEFA1	PEFA2	EEFA1	EEFA2	SIFA1	FCFA1	FCFA2	FCFA3	BIFA1	UBFA1
PEFA1	1									
PEFA2	.000	1								
EEFA1	.204	.282*	1							
EEFA2	.467**	.132	.000	1						
SIFA1	.548**	.318**	.282*	.678**	1					
FCFA1	.089	.201	.311**	.349**	.420**	1				
FCFA2	.237	.409**	.043	.261*	.317**	.000	1			
FCFA3	.302*	.016	.250*	.307**	.460**	.000	.000	1		
BIFA1	.577**	.300*	.551**	.570**	.771**	.563**	.162	.501**	1	
UBFA1	.507**	.298*	.390**	.673**	.719**	.549**	.323**	.344**	.901**	1

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

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

The list below summarises the significant relationships as outlined in Table 36:

- PEFA1 has a positive association with EEFA2, SIFA1, FCFA3, BIFA1 and UBFA1.
- PEFA2 has a positive association with EEFA1, SIFA1, FCFA2, BIFA1 and UBFA1.

- EEFA1 has a positive association with SIFA1, FCFA1, FCFA3, BIFA1 and UBFA1.
- EEFA2 has a positive association with SIFA1, FCFA1, FCFA2, FCFA3, BIFA1 and UBFA1.
- SIFA1 has a positive association with FCFA1, FCFA2, FCFA3, BIFA1 and UBFA1.
- FCFA1 has a positive association with BIFA1 and UBFA1.
- FCFA2 has a positive association with UBFA1.
- FCFA3 has a positive association with BIFA1 and UBFA1.
- BIFA1 has a positive association with UBFA1.

For the purposes of this analysis and to aid in the interpretation of the results, the centring technique was conducted, which involves the subtraction of the means from each observation and represents the average value of the variables, resulting in a new variable with a mean of zero (Aiken & West, 1991).

4.5 Results pertaining to Hypothesis 1

To test Hypothesis 1, the correlation between the independent performance expectancy variables (PEFA1 and PEFA2) and the dependent variable (BIFA1) was assessed. Further, the interaction effect of moderating variables of UTAUT (Age and Gender) and their influence on the relationships were assessed and these are discussed below.

Table 37 shows the initial correlation between PEFA1 and BIFA1 as a significantly positive association ($r = 0.577$, $p<0.01$). With centring, the correlation significance is validated at the 0.01 level.

Table 37: PEFA1 and BIFA1 with Age

Correlations								
		PEFA 1	Age group	BIFA1	PEFA1_ Age	PEFA1 Centred	Age Centred	PEFA1_Age_ Centred
PEFA1	Pearson Correlation	1						
	Sig. (2-tailed)							
Age group	Pearson Correlation	.067	1					
	Sig. (2-tailed)	.559						
BIFA1	Pearson Correlation	.577**	-.168	1				
	Sig. (2-tailed)	<,001	.152					
PEFA1_Age	Pearson Correlation	.943**	.068	.583**	1			
	Sig. (2-tailed)	<,001	.556	<,001				
PEFA1 Centred	Pearson Correlation	1.000**	.067	.577**	.943**	1		
	Sig. (2-tailed)	.000	.559	<,001	<,001			
Age Centred	Pearson Correlation	.067	1.000**	-.168	.068	.067	1	
	Sig. (2-tailed)	.559	.000	.152	.556	.559		
PEFA1_Age _Centred	Pearson Correlation	.089	.019	.178	.416**	.089	.019	1
	Sig. (2-tailed)	.437	.868	.137	<,001	.437	.868	
**. Correlation is significant at the 0.01 level (2-tailed).								

Expanding the analysis to PEFA2 and BIFA1, the initial correlation as outlined in Table 38 shows that there is a significant positive association between the variables ($r = 0.300$, $p<0.05$), which is lower than PEFA1. However, this is considered acceptable and consistent as the PEFA1 extracted variable was shown in the EFA to account for 49.46% of the total variance, whereas PEFA2 accounts for 12.99%.

Centring with the PEFA2 variable has the same small negative correlation ($r = -0.168$), while both PEFA2 and centred variables result in a small positive correlation with behavioural intention and is consistent with the result outlined above in PEFA1.

Table 38: PEFA2 and BIFA1 with Age

Correlations								
		PEFA 2	Age group	BIFA1	PEFA2_ Age	PEFA2 Centred	Age Centred	PEFA2_Age _Centred
PEFA2	Pearson Correlation	1						
	Sig. (2-tailed)							
Age group	Pearson Correlation	-.109	1					
	Sig. (2-tailed)	.344						
BIFA1	Pearson Correlation	.300*	-.168	1				
	Sig. (2-tailed)	.011	.152					
PEFA2_Age	Pearson Correlation	.971**	-.101	.274*	1			
	Sig. (2-tailed)	<,001	.380	.021				
PEFA2 Centred	Pearson Correlation	1.000**	-.109	.300*	.971**	1		
	Sig. (2-tailed)	.000	.344	.011	<,001			
Age Centred	Pearson Correlation	-.109	1.000**	-.168	-.101	-.109	1	
	Sig. (2-tailed)	.344	.000	.152	.380	.344		
PEFA2_Age	Pearson Correlation	.255*	-.008	.057	.478**	.255*	-.008	1
_Centred	Sig. (2-tailed)	.024	.942	.637	<,001	.024	.942	
*. Correlation is significant at the 0.05 level (2-tailed).								
**. Correlation is significant at the 0.01 level (2-tailed).								

The same analysis was performed to assess PEFA1 and PEFA2. Table 39 outlines the result for PEFA1. The initial correlation between PEFA1 and BIFA1 shows a significantly positive association ($r = 0.577$, $p<0.05$). When centred, the correlation significance is validated at the 0.01 level.

Table 39: PEFA1 and BIFA1 with Gender

		PEFA1	Gender	BIFA1	PEFA1x Gender	PEFA1 _centred	Gender _centred	PEFA1x Gender_ centred
PEFA1	Pearson Correlation	1						
	Sig. (2-tailed)							
Gender	Pearson Correlation	.065	1					
	Sig. (2-tailed)	.571						
BIFA1	Pearson Correlation	.577**	-.020	1				
	Sig. (2-tailed)	<,001	.866					
PEFA1x Gender	Pearson Correlation	.945**	.047	.530**	1			
	Sig. (2-tailed)	<,001	.680	<,001				
PEFA1_ centred	Pearson Correlation	1.000**	.065	.577**	.945**	1		
	Sig. (2-tailed)	.000	.571	<,001	<,001			
Gender_ centred	Pearson Correlation	.065	1.000**	-.020	.047	.065	1	
	Sig. (2-tailed)	.571	.000	.866	.680	.571		
PEFA1x Gender _centred	Pearson Correlation	-.028	-.045	-.082	.301**	-.028	-.045	1
	Sig. (2-tailed)	.807	.698	.495	.007	.807	.698	
*. Correlation is significant at the 0.05 level (2-tailed).								
**. Correlation is significant at the 0.01 level (2-tailed).								

Following the same pattern, and assessing PEFA2 and BIFA, Table 40 shows that there is a positive association between the variables (r = 0.300), which is lower than PEFA1 but is acceptable and consistent, as the PEFA1 extracted variable was shown in the EFA to account for 49.46% of the total variance, whereas PEFA2 accounts for 12.99%.

Centring with the PEFA2 variable has a small negative correlation (r = -0.020), while both PEFA2 and the variable centred result in a small positive correlation with behavioural intention and is consistent with the result outlined above in PEFA1.

Table 40: PEFA2 and BIFA1 with Gender

Correlations								
		PEFA2	Gender	BIFA1	PEFA2_ Gender	PEFA2 Centred	Gender Centred	PAFA2x Gender_ Centred
PEFA 2	Pearson Correlation	1						
	Sig. (2-tailed)							
Gender	Pearson Correlation	.050	1					
	Sig. (2-tailed)	.664						
BIFA1	Pearson Correlation	.300*	-.020	1				
	Sig. (2-tailed)	.011	.866					
PEFA2_G ender	Pearson Correlation	.961**	.065	.292*	1			
	Sig. (2-tailed)	<,001	.571	.013				
PEFA2 Centred	Pearson Correlation	1.000**	.050	.300*	.961**	1		
	Sig. (2-tailed)	.000	.664	.011	<,001			
Gender Centred	Pearson Correlation	.050	1.000**	-.020	.065	.050	1	
	Sig. (2-tailed)	.664	.000	.866	.571	.664		
PEFA2x Gender _Centred	Pearson Correlation	.410**	.077	.100	.645**	.410**	.077	1
	Sig. (2-tailed)	<,001	.501	.409	<,001	<,001	.501	
*. Correlation is significant at the 0.05 level (2-tailed).								
**. Correlation is significant at the 0.01 level (2-tailed).								

The correlation between the independent effort expectancy variables (EEFA1 and EEFA2) and the dependent variable (BIFA1) was assessed.

Table 41 shows the initial correlation between EEFA1 and BIFA1 as a significantly positive association ($r = 0.551$, $p<0.01$). With centring, the correlation significance is validated at the 0.01 level.

The same analysis was conducted on EEFA2 and BIFA1. As shown in Table 42, this analysis revealed similar results as above, except that when EEFA2 and Age are centred (EEFA2_Age_Centred), there is a reduced positive correlation. This result can be explained and is consistent with the EFA analysis finding that EEFA1 accounts for 50.02% of the total variance, whereas EEFA2 accounts for 17.78%.

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Table 41: EEFA1 and BIFA1 with Age

Correlations								
		EEFA1	Age group	BIFA1	EEFA1_Age	EEFA1 Centred	Age Centred	EEFA1_Age_Centred
EEFA1	Pearson Correlation	1						
	Sig. (2-tailed)							
Age group	Pearson Correlation	-.312**	1					
	Sig. (2-tailed)	.005						
BIFA1	Pearson Correlation	.551**	-.168	1				
	Sig. (2-tailed)	<,001	.152					
EEFA1_Age	Pearson Correlation	.970**	-.312**	.564**	1			
	Sig. (2-tailed)	<,001	.005	<,001				
EEFA1 Centred	Pearson Correlation	1.000**	-.312**	.551**	.970**	1		
	Sig. (2-tailed)	.000	.005	<,001	<,001			
Age Centred	Pearson Correlation	-.312**	1.000**	-.168	-.312**	-.312**	1	
	Sig. (2-tailed)	.005	.000	.152	.005	.005		
EEFA1_Age_Centred	Pearson Correlation	.313**	-.133	.315**	.535**	.313**	-.133	1
	Sig. (2-tailed)	.005	.245	.007	<,001	.005	.245	
**. Correlation is significant at the 0.01 level (2-tailed).								

Table 42: EEFA2 and BIFA1 with Age

Correlations								
		EEFA2	Age group	BIFA1	EEFA2_Age	EEFA2 Centred	Age Centred	EEFA2_Age_Centred
EEFA2	Pearson Correlation	1						
	Sig. (2-tailed)							
Age group	Pearson Correlation	.065	1					
	Sig. (2-tailed)	.570						
BIFA1	Pearson Correlation	.570**	-.168	1				
	Sig. (2-tailed)	<,001	.152					
EEFA2_Age	Pearson Correlation	.970**	.109	.573**	1			
	Sig. (2-tailed)	<,001	.344	<,001				
EEFA2 Centred	Pearson Correlation	1.000**	.065	.570**	.970**	1		
	Sig. (2-tailed)	.000	.570	<,001	<,001			
Age Centred	Pearson Correlation	.065	1.000**	-.168	.109	.065	1	
	Sig. (2-tailed)	.570	.000	.152	.344	.570		
EEFA2_Age_Centred	Pearson Correlation	.063	.190	.183	.304**	.063	.190	1
	Sig. (2-tailed)	.582	.096	.123	.007	.582	.096	
**. Correlation is significant at the 0.01 level (2-tailed).								

Table 43: EEFA1 and BIFA1 with Gender

Correlations								
		EEFA1	Gender	BIFA1	EEFA1 _Gender	EEFA1 Centred	Gender Centred	EEFA1_ Gender_ Centred
EEFA1	Pearson Correlation	1						
	Sig. (2-tailed)							
Gender	Pearson Correlation	-.246*	1					
	Sig. (2-tailed)	.030						
BIFA1	Pearson Correlation	.551**	-.020	1				
	Sig. (2-tailed)	<,001	.866					
EEFA1_ Gender	Pearson Correlation	.958**	-.233*	.576**	1			
	Sig. (2-tailed)	<,001	.040	<,001				
EEFA1 Centred	Pearson Correlation	1.000**	-.246*	.551**	.958**	1		
	Sig. (2-tailed)	.000	.030	<,001	<,001			
Gender Centred	Pearson Correlation	-.246*	1.000**	-.020	-.233*	-.246*	1	
	Sig. (2-tailed)	.030	.000	.866	.040	.030		
EEFA1_ Gender _Centred	Pearson Correlation	.248*	-.053	.291*	.517**	.248*	-.053	1
	Sig. (2-tailed)	.029	.645	.013	<,001	.029	.645	
*. Correlation is significant at the 0.05 level (2-tailed).								
**. Correlation is significant at the 0.01 level (2-tailed).								

Table 44: EEFA1 and BIFA1 with Experience

Correlations					
		EEFA2	EEFA1	Experience Level Rating	BIFA1
EEFA2	Pearson Correlation	1			
	Sig. (2-tailed)				
EEFA1	Pearson Correlation	.000	1		
	Sig. (2-tailed)	1.000			
Experience Level Rating	Pearson Correlation	-.282*	.428**	1	
	Sig. (2-tailed)	.012	<,001		

BIFA1	Pearson Correlation	.570**	.551**	.067	1
	Sig. (2-tailed)	<,001	<,001	.573	
*. Correlation is significant at the 0.05 level (2-tailed).					
**. Correlation is significant at the 0.01 level (2-tailed).					

H0: There is no positive relationship between performance expectancy, effort expectancy and behavioural intention.

H1: Access to virtual world environments through enabling technology has a positive effect on user acceptance of the metaverse.

In testing Hypothesis 1, which postulates that there is a positive relationship between performance expectancy (PEFA1 and PEFA2), effort expectancy (EEFA1 and EEFA2) and behavioural intention (BIFA1), the results indicate a significantly positive relationship between all the variables. This suggests that a user's expectation that accessing and using a virtual world through enabling technology would enable them to adopt the metaverse as an interactive environment in which they can socialise, transact and work is supported and significant.

Consequently, the null hypothesis (H0) is rejected.

4.6 Results pertaining to Hypothesis 2

To test Hypothesis 2, the correlation between the independent variables and the dependent usage behaviour variable was assessed

The initial correlations were conducted for the unfactored variables (FC1, FC2, FC3, EE04, SI07) as they were positioned to probe respondents specifically for digital identity as an enabler and motivator of acceptance of virtual world environments. The results, which are presented in Table 45, reflect that there is a significant positive correlation between FC1, FC2 and FC3 and UBFA1 ($r = 0.455$, $r = 0.430$ and $r = 0.479$ respectively, $p<0.01$). EE04 is similarly significantly and positively correlated, with $r = 0.387$, and SI07 is significantly positively correlated, with $r = 0.283$, $p<0.05$. The effect of Age and Experience moderation shows that there is a negative correlation ($r = -0.119$ and $r = -0.073$ respectively).

Table 45: FC (1-3), EE04, SI07 and UBFA1 with Age and Experience

Correlations								
		UBFA1	FC1	FC2	FC3	EE04	SI07	Age Centred
FC1	Pearson Correlation	.455**						
	Sig. (2-tailed)	<,001						
FC2	Pearson Correlation	.430**	.752**					
	Sig. (2-tailed)	<,001	<,001					
FC3	Pearson Correlation	.479**	.750**	.658**				
	Sig. (2-tailed)	<,001	<,001	<,001				
EE04	Pearson Correlation	.387**	.184	.200	.202			
	Sig. (2-tailed)	<,001	.121	.092	.089			
SI07	Pearson Correlation	.283*	.275*	.378**	.308**	.214		
	Sig. (2-tailed)	.016	.019	.001	.009	.071		
Age Centred	Pearson Correlation	-.119	.087	.031	-.088	-.308**	-.062	
	Sig. (2-tailed)	.318	.468	.796	.462	.008	.602	
Experience Level Rating	Pearson Correlation	-.073	-.211	-.050	-.167	.433**	.124	-.333**
	Sig. (2-tailed)	.541	.075	.679	.161	<,001	.299	.004
**. Correlation is significant at the 0.01 level (2-tailed).								
*. Correlation is significant at the 0.05 level (2-tailed).								

When the analysis is conducted with factored variables from the EFA, as presented in Table 46, the results show some similarity with those presented in Table 45. There is a strong positive significant correlation between FCFA1, FCFA2, FCFA3 and UBFA1 (r = 0.544, r = 0.324 and r = 0.346). The reason for the difference in strength of the correlations between these factors can be related to the effect that EFA concluded that FCFA1 accounts for a larger percentage of the total variance of the extracted FC variables (FCFA1 = 50.64%). For this reason, FCFA1 has a higher correlation at a significant level than FCFA2 and FCFA3. EE04 and SI07 show similarity to the unfactored result (r = 0.380 and r = 0.278).

Table 46: FCFA (1-3), EE04, SI07 and UBFA1 with Age and Experience

Correlations								
		UBFA1	FCFA1	FCFA2	FCFA3	EE04	SI07	Age Centred
FCFA1	Pearson Correlation	.544**						
	Sig. (2-tailed)	<,001						
FCFA2	Pearson Correlation	.324**	-.001					
	Sig. (2-tailed)	.006	.997					
FCFA3	Pearson Correlation	.346**	-.002	.011				
	Sig. (2-tailed)	.003	.988	.927				
EE04	Pearson Correlation	.380**	.290*	.083	.290*			
	Sig. (2-tailed)	.001	.014	.492	.014			
SI07	Pearson Correlation	.278*	.339**	.201	.346**	.207		
	Sig. (2-tailed)	.019	.004	.093	.003	.084		
Age Centred	Pearson Correlation	-.130	-.122	.091	-.288*	-.325**	-.070	
	Sig. (2-tailed)	.280	.310	.453	.015	.006	.561	
Experience Level Rating	Pearson Correlation	-.062	.080	-.173	.049	.458**	.135	-.324**
	Sig. (2-tailed)	.610	.510	.149	.683	<,001	.261	.006
**. Correlation is significant at the 0.01 level (2-tailed).								
*. Correlation is significant at the 0.05 level (2-tailed).								

H0: There is no positive relationship between facilitating conditions and usage behaviour.

H2: A secure, portable and user-controlled digital identity has a positive effect on user acceptance and adoption of the metaverse.

In testing Hypothesis 2, which postulates that there is a positive relationship between facilitating conditions (FC) and usage behaviour (UBFA), the results reveal a significantly positive relationship between the variables. It can therefore be concluded that the idea that a user's expectation that a secure, portable and user-controlled digital identity has a positive effect on user acceptance and adoption of the metaverse is supported and significant.

Consequently, the null hypothesis (H0) is rejected.

4.7 Results pertaining to Hypothesis 3

To test Hypothesis 3, the correlation between the independent social influence variable and the dependent behavioural intention variable was assessed.

Table 47: SIFA1 and BIFA1 with Gender, Age and Experience

Correlations					
		BIFA1	SIFA1	Gender Centred	Age Centred
SIFA1	Pearson Correlation	.771**			
	Sig. (2-tailed)	<,001			
Gender Centred	Pearson Correlation	-.020	.129		
	Sig. (2-tailed)	.866	.274		
Age Centred	Pearson Correlation	-.168	.023	.005	
	Sig. (2-tailed)	.152	.843	.969	
Experience Level Rating	Pearson Correlation	.067	-.053	-.378**	-.358**
	Sig. (2-tailed)	.573	.656	<,001	.002
**. Correlation is significant at the 0.01 level (2-tailed).					

The results show that there is a significant positive correlation between social influence and behavioural intention ($r = 0.771$, $p<0.01$). This suggests that as social influence on the individual increases from family, friends, colleagues and influential people around them regarding the technology, the probability that the individual will intend to engage favourably with the technology will increase. The significance of the positive correlation also suggests that individual behaviour is shaped by social influence in a persuasive manner. When applying this result to participation in virtual worlds, it further indicates that the social aspect of participation increasingly becomes a significant driver of engagement and adoption. This can also imply that individuals attach a great deal of value to shared experiences.

H0: There is no positive relationship between social influence and behavioural intention.

H3: The influence of an individual's social circle has a positive effect on user acceptance and adoption of the metaverse.

In testing Hypothesis 3, which postulates that there is a positive relationship between social influence (SI) and behavioural intention (BI), the results indicate a positive significant relationship between the variables. Therefore, it can be accepted that the influence of an individual's social circle has a positive effect on user acceptance and adoption of the metaverse.

Consequently, the null hypothesis (H0) is rejected.

4.8 Results pertaining to Hypothesis 4

To test Hypothesis 4, the correlation between the individual variables pertaining to virtual currencies and their use for transacting in virtual worlds (BI03, PE010, FC6 and FC9) and the dependent use behaviour variable (UB) was assessed.

Table 48: Correlation between PE010, FC6, FC9, BI03 and UBFA1 with Gender, Age and Experience

Correlations								
		UBFA1	BI03	PE010	FC6	FC9	Gender Centred	Age Centred
BI03	Pearson Correlation	.754**						
	Sig. (2-tailed)	<,001						
PE010	Pearson Correlation	.388**	.228*					
	Sig. (2-tailed)	<,001	.049					
FC6	Pearson Correlation	.532**	.575**	.324**				
	Sig. (2-tailed)	<,001	<,001	.005				
FC9	Pearson Correlation	.581**	.573**	.276*	.730**			
	Sig. (2-tailed)	<,001	<,001	.016	<,001			
Gender Centred	Pearson Correlation	.002	-.004	-.110	.027	.118		
	Sig. (2-tailed)	.984	.970	.349	.816	.313		
Age Centred	Pearson Correlation	-.117	-.196	.062	-.175	-.087	.004	
	Sig. (2-tailed)	.316	.091	.595	.133	.457	.973	
Experience Level Rating	Pearson Correlation	-.061	.037	.071	.085	.059	-.362**	-.342**
	Sig. (2-tailed)	.603	.751	.543	.471	.615	.001	.003
**. Correlation is significant at the 0.01 level (2-tailed).								
*. Correlation is significant at the 0.05 level (2-tailed).								

The results show that there is a significant positive correlation between all the selected variables ($r = 0.754$, $r = 0.388$, $r = 0.532$, $r = 0.581$, $p<0.01$). With respect

to the relationship between the variables and UBFA1 (actual use behaviour), the strong and positive significant relationship found supports the UTAUT model that an individual's behavioural intention is an important predictor of actual use of technology (in this case, adoption of virtual currencies to purchase goods in the virtual world).

H0: There is no positive relationship between access to virtual currencies and the individual's desire to purchase virtual world items.

H4: Access to virtual currencies has a positive effect on an individual's desire to purchase virtual world items as a motivator of acceptance.

In testing Hypothesis 4, which postulates that there is a positive relationship between virtual currency access and an an individual's desire to purchase virtual world items, the results show a significantly positive relationship between the variables. Therefore, it can be accepted that the ability of an individual to access virtual world currencies has a positive effect on user intention to purchase virtual world items and, by extension, their acceptance and adoption of the metaverse.

Consequently, the null hypothesis (H0) is rejected.

4.9 Results pertaining to Hypothesis 5

To test Hypothesis 5, the correlations between the individual variables pertaining to alternative payment capabilities (FC6, FC7, FC8 and FC9) and the dependent use behaviour variable (UBFA1) were assessed.

Table 49: FC6, FC7, FC8, FC9 and UBFA1 with Age and Experience

Correlations							
		UBFA1	FC6	FC7	FC8	FC9	Age Centred
FC6	Pearson Correlation	.532**					
	Sig. (2-tailed)	<,001					
FC7	Pearson Correlation	.581**	.730**				
	Sig. (2-tailed)	<,001	<,001				
FC8	Pearson Correlation	.608**	.783**	.777**			
	Sig. (2-tailed)	<,001	<,001	<,001			

Correlations							
		UBFA1	FC6	FC7	FC8	FC9	Age Centred
FC9	Pearson Correlation	.386**	.359**	.439**	.432**		
	Sig. (2-tailed)	<,001	.002	<,001	<,001		
Age Centred	Pearson Correlation	-.117	-.175	-.087	-.166	-.183	
	Sig. (2-tailed)	.316	.133	.457	.153	.116	
Experience Level Rating	Pearson Correlation	-.061	.085	.059	.125	-.099	-.342**
	Sig. (2-tailed)	.603	.471	.615	.287	.398	.003
**. Correlation is significant at the 0.01 level (2-tailed).							

The results show a strong positive significant correlation between the variables FC6, FC7 and FC8 (r = 0.532, r = 0.581 and r = 0.608 respectively) and UBFA1. The FC6 correlation predominantly assesses the relationship between an individual's belief that virtual world currencies are useful and the person's actual use behaviour. This suggests that if virtual world currencies proliferate, individuals are likely to consider them useful for making virtual world purchases. The significant strong FC7 and FC8 correlations, which measure the effect of digital payment capabilities and currencies on an individual's perception that virtual world experiences become enjoyable through their availability, support the hypothesis.

FC9 probes the individual's view of their financial services provider's (FSP) capacity to convert fiat currency into virtual world currency. This correlation is a moderately positive r = 0.386, which indicates that there may be areas where FSPs in the country may be facing challenges with assisting users to transact safely to participate in virtual worlds.

H0: There is no positive relationship between alternative payment capabilities and the individual's desire to purchase virtual world items.

H5: Access to alternative payment capabilities has a positive effect on user desire to purchase virtual world items as a motivator of acceptance and adoption.

In testing Hypothesis 5, which postulates that there is a positive relationship between alternative digital payment capabilities and an individual's desire to

purchase virtual world items, the results indicate a significantly positive relationship between the variables. Therefore, it can be accepted that the availability of alternative payment capabilities has a positive effect on user acceptance and adoption of metaverse transactions.

Consequently, the null hypothesis (H0) is rejected.

4.10 Moderation Variable Effects

Hypothesis 1 – Performance and Effort Expectancy

The interaction effect of moderating variables of UTAUT (Age, Gender and Experience) and their influence on the relationships were assessed and discussed below.

When the moderation effect of Age is accounted for as an individual variable, its moderating effect initially shows a small negative correlation (r = -0.168) and is validated when centred individually. This suggests that when age increases, the likelihood of a user's behavioural intention and belief that virtual worlds will improve their overall performance is decreased. However, when both PEFA1 and Age are centred and the computed variable (PEFA1_Age_Centred) is assessed against BIFA1, there is a small positive correlation (r = 0.178). This correlation is not significant but shows that users may have a positive association between the performance expectancy and their behavioural intention as age increases. This, however, is not significant enough for the researcher to believe that Age has a significant effect on the adoption of enabling technology to access virtual world environments.

When both EEFA1 and Age are centred and the computed variable (EEFA1_Age_Centred) is assessed against BIFA1, there is a medium positive correlation (r = 0.315), which is significant. This shows that users may have a positive association between the effort expectancy and their behavioural intention towards the metaverse as age increases.

Centring with the EEFA2 variable has a small negative correlation (r = -0.168), while both EEFA2 and the moderating Age variable centred

(EEFA2_Age_Centred) result in a small positive correlation with behavioural intention, which is consistent with the result outlined above for EEFA1.

Conducting a similar analysis with Gender moderation, the EEFA1 correlation with BIFA1 initially reflects a significant positive association ($r = 0.551$, $p<0.01$), and a small negative correlation when interacting with gender, as shown in Table 43. The same results are shown even with centred variables, particularly with the computed EEFA1_Gender_Centred variable.

The results reflect a similar pattern when EEFA2 is correlated with Gender, which can be explained and is consistent with the EFA analysis finding that EEFA1 accounts for 50.02% of the total variance, while EEFA2 accounts for 17.78%.

When the moderation effect of Experience is factored into the analysis of the relationship between EEFA1/EEFA2 and BIFA1, as reflected in Table 44, there is a significant positive association with EEFA1 ($r = 0.428$, $p<0.01$), suggesting that a user's experience level rating has a positive effect on their behavioural intention to adopt the virtual world. This effect of Experience is a strong indicator that as experience increases, users are likely to be more positive toward adopting virtual world environments, with the belief that the correct enabling technology and ease of use will increase their performance in virtual worlds. In this way, the likelihood that they would adopt the metaverse is increased.

Hypothesis 2 – Facilitating conditions

The effect of the moderating variables Age and Experience on this relationship between the independent and dependent variables is negative, which suggests that the relationship is altered in a manner that weakens the influence of FC on UB. Factors that make up FC, such as resources and technical support, tend to have a positive influence on the ability of individuals to use a technology. Thus, a negative moderation of these variables may suggest a reduced overall impact of the positive relationship for individuals who are older and are more experienced. The presence of this negative moderation also suggests that older people may have vastly different experiences with their comfort levels as they relate to technological adoption compared to younger people. In addition, people

with more experience may have pre-established preferences that may negatively influence the actual use of the technology.

Hypothesis 3 – Social Influence

The interaction effect of moderating variables of UTAUT (Gender, Age and Experience) and their influence on the relationship were assessed and these are discussed below. Table 47 examines the correlation with factored variables from the EFA as there are no other factored variables apart from BIFA1 and SIFA1 for those constructs. Further, the centred Age and Gender variables were used to cater for any potential issues of multicollinearity. Experience was also analysed as the additional moderator of the relationship.

When the moderating effect of Gender is factored in, there is a small positive correlation of the variable with respect to social influence (r = 0.129). There is also a small negative correlation (r = -0.020) of Gender in relation to behavioural intention. Such correlations can be interpreted to represent complex gender dynamics pertaining to the relationships between the variables, as discussed below.

First, the positive effect of gender with social influence reflects that the effect of external factors such as the opinions and recommendations of others is different, depending on the gender of the individual. This influence, however, is consistent and positive, suggesting that the relationship between social influence and the individual's behavioural intention towards adopting the metaverse is likely to be stronger for one gender in relation to the other.

Second, the negative correlation of gender with the individual's behavioural intention to participate in the metaverse signifies a difference between males and females and suggests varying levels of intention between the genders.

Although a significant positive correlation exists between social influence and behavioural intention, the complexity of the effect of gender on the results and the contrast in the correlations can be interpreted to mean that an individual's motivation to adopt the metaverse technology is likely to depend on specific gender-related expectations regarding the technology. The same analysis can be

expanded to the Age of the individual, owing to the similarities of the various correlations shown in Table 47.

When the individual's Experience is considered, there is a small negative correlation of the moderating variable with social influence (r = -0.053), while there is a small positive correlation of the variable with behavioural intention (r = 0.067). The negative correlation suggests that the effect of social factors such as the opinions or recommendations of other people on the individual's intention to adopt the metaverse technology is weaker for people with more experience. Further, the positive correlation suggests that individuals with more experience are likely to have a higher intention to adopt the metaverse technology than those who have less experience. This may indicate that individuals who have more experience may already have formulated their own opinions regarding the technology and will actively engage in metaverse-adoption activities based on their prior, lived experience.

Hypothesis 4 – Virtual Currencies

The interaction effect of moderating variables of UTAUT (Gender, Age and Experience) and their influence on the relationship were assessed and these are discussed below. Table 48 presents the correlation for these constructs. Further, the centred Age and Gender variables were used to cater for any potential issues of multicollinearity. Experience, which did not need to be factored, was also analysed as an additional moderator of the relationship.

When the moderating effect of Gender is factored in, is the result is a weak and negligible positive correlation of the variable with respect to use behaviour (r = 0.002). This suggests that it is unlikely that gender will influence the individual's intention to purchase virtual goods as a motivator of virtual world acceptance. A negligible negative correlation (r = -0.004) is shown between gender and behavioural intention. This correlation suggests that gender will also not significantly impact the relationship between an individual's intention to adopt virtual currencies for the express purpose of purchasing virtual goods.

When Age is considered, Table 48 shows a negative correlation with both BI03 and UBFA1 (r = -0.117, r = -0.196 respectively). This suggests that there is a

weak negative relationship between the variables, and specifically that there may be a slight inclination for older individuals to display lower levels of intention or desire to purchase virtual goods using virtual currencies compared to younger individuals, albeit a very minor inclination. This may be the result of metaverse technology and, by extension, virtual currencies being too unfamiliar to older individuals, who may have less exposure to, or differing attitudes about, the usefulness of the technology.

The moderating effect of Experience displays both a small negative (r = -0.061) and a small positive (r = 0.037) correlation of the variable with UBFA1 and BI03 respectively. As with the previous analysis, this suggests a subtle relationship between the variables, specifically that the moderating effect of experience on the individual's intention to acquire virtual world goods using virtual currencies is minimal. The weaker negative correlation of experience with use behaviour suggests that as experience in the metaverse increases, the desire to purchase virtual world items using virtual currencies may decrease.

Hypothesis 5 – Alternative Payment Capabilities

Further, the interaction effect of moderating variables of UTAUT (Age and Experience) and their influence on the relationship were assessed and these are discussed below. Table 49 presents the correlations for these constructs.

The moderation of Age on the relationship between digital currencies and use behaviour measures r = -0.117, which indicates a weak negative correlation. As with the previous analysis, this may suggest that older individuals display lower levels of intention or desire to purchase virtual goods using virtual currencies compared to younger individuals, albeit a very minor difference. This may be because metaverse technology and, by extension, virtual currencies are too unfamiliar to older individuals, who may have less exposure to, or differing attitudes about, the usefulness of the technology.

The moderating effect of Experience displays a small negative (r = -0.061) correlation of the variable with UBFA1. As with the previous analysis, the weaker negative correlation of experience with use behaviour suggests that as

experience in the metaverse increases, the desire to purchase virtual world items using virtual currencies may decrease.

Table 51: Regression model summary

Correlation between IVs and DVs		Behavioural Intention (BIFA)			Use Behaviour		
Factors	**Hypothesis**	**Coefficient**	**Supported**	**Significant**	**Coefficient**	**Supported**	**Significant**
Performance Expectancy (PEFA)	H1	0.584	Yes	Yes	-	-	-
Effort Expectancy (EEFA)	H2	0.591	Yes	Yes	-	-	-
Social Influence (SIFA)	H3	0.606	Yes	Yes	-	-	-
FCFA_Virtual Currencies	H4	-	-	-	0.745	Yes	Yes
FCFA_Alternative Payment Methods	H5	-	-	-	0.676	Yes	Yes

The above results show the output for the relationship between the independent and dependent variables of UTAUT. Specifically, the hypothesis (H1 – H3) and coefficients of the factors that influence Behavioural Intention (Performance Expectancy, Effort Expectancy and Social Influence) are supported and significant. This means that these independent variables have a high predictive influence on BI. When applied to the metaverse, it is noted that the degree to which individuals believe that their performance would be improved by participating in virtual worlds, the ease with which they consider access to and the ability to learn virtual worlds to be, as well as the perception of adoption based on participation by members of their social circles as motivators of acceptance, show a significantly positive relationship for PEFA, EEFA and SIFA.

When expanding the results to facilitating conditions, in particular the influence of access to and transacting capabilities offered by virtual currencies as well as alternative payment methods on actual use behaviour for virtual worlds, the hypothesis (H4 – H5) are supported and significant.

4.11 Regression models

Proceeding from the correlation results, as presented above, a multiple regression analysis was performed on all the relationships assessed, with the results discussed below and outlined in the model summary presented in Table 50. For the benefit of the analysis, only the highlighted models were assessed as they reflected the variables that were most representative from the factor analysis (PEFA1, EEFA1, SIFA1, FCFA1, FCFA1_Digital identity and FCFA1_Alternative Payment Methods).

Table 50: Regression model summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.584[a1]	.341	.311	.84269522
2	.305[a2]	.093	.052	.98852162
3	.623[b1]	.388	.361	.81192638
4	.335[b2]	.112	.073	.97796181
5	.591[c1]	.349	.320	.82505653
6	.580[c2]	.336	.307	.83309843
7	.566[d1]	.320	.290	.84316347
8	.606[d2]	.367	.339	.81371891
9	.761[e1]	.580	.561	.66288124
10	.803[f1]	.644	.624	.61346313
11	.725[g1]	.526	.490	.72443542
12	.745[h1]	.556	.506	.71172432
13	.844[i1]	.713	.678	.56900116
14	.676[j1]	.457	.409	.77103139

a1. Predictors: (Constant), PEFA1xGender_centred, Gender_centred, PEFA1_centred
a2. Predictors: (Constant), PEFA2_Gender_Centred, Gender Centred, PEFA2 Centred
Dependent Variable: BI Factor Analysis Component 1

b1. Predictors: (Constant), PEFA1_Age_Centred, Age Centred, PEFA1 Centred
b2. Predictors: (Constant), PEFA2_Age_Centred, Age Centred, PEFA2 Centred
Dependent Variable: BI Factor Analysis Component 1

c1. Predictors: (Constant), EEFA1_Gender_Centred, Gender Centred, EEFA1 Centred
c2. Predictors: (Constant), EEFA2_Gender_Centred, EEFA2 Centred, Gender Centred
Dependent Variable: BI Factor Analysis Component 1

d1. Predictors: (Constant), EEFA1_Age_Centred, Age Centred, EEFA1 Centred d2. Predictors: (Constant), EEFA2_Age_Centred, EEFA2 Centred, Age Centred Dependent Variable: BI Factor Analysis Component 1
e1. Predictors: (Constant), EEFA2 Centred, EEFA1 Centred, Experience Level Rating Dependent Variable: BI Factor Analysis Component 1
f1. Predictors: (Constant), Experience Level Rating, SI Factor Analysis Component 1, Age Centred, Gender Centred Dependent Variable: BI Factor Analysis Component 1
g1. Predictors: (Constant), Experience Level Rating, FC Factor Analysis Component 3, FC Factor Analysis Component 1, FC Factor Analysis Component 2, Age Centred Dependent Variable: UB Factor Analysis Component 1
h1. Predictors: (Constant), Experience Level Rating, FC Factor Analysis Component 3, FC Factor Analysis Component 1, FC Factor Analysis Component 2, Age Centred, SI New Identity Different to Everyday Self, EE Avatar Roleplay Dependent Variable: UB Factor Analysis Component 1
i1. Predictors: (Constant), Experience Level Rating, BI Interested to Purchase Virtual Good/Services, PE Transact and Purchase, Gender Centred, Age Centred, FC FSP Convert Real Money into Virtual Currency, FC Virtual Currencies to Purchase, FC Upgrade Devices to be Compatible Dependent Variable: UB Factor Analysis Component 1
j1. Predictors: (Constant), Age Centred, PE Transact and Purchase, FC FSP Convert Real Money into Virtual Currency, FC Virtual Currencies to Purchase, FC Digital Payments Make Virtual World Enjoyable, FC Digital Currencies for Wholesome Experience Dependent Variable: UB Factor Analysis Component 1

- **Model 1:** the correlation coefficient (R = 0.584) indicates a moderately positive relationship between the independent variable, performance expectancy (PEFA1), and behavioural intention (BIFA1), and that PEFA1 explains approximately 34.1% of the variance in BIFA1. The adjusted R Square value suggests that around 31.1% of the variance is explained when considering the complexity of the model (i.e., the moderation effect of Gender). The standard error of the estimate provides an estimate of the average distance between the observed values of BIFA1 and the predicted values from the regression model.

- **Model 3**: the correlation coefficient (R = 0.623) indicates a moderately positive relationship between the independent variable, performance expectancy (PEFA1), and behavioural intention (BIFA1), and that PEFA1 explains

approximately 38.8% of the variance in BIFA1. The adjusted R Square value suggests that around 36.1% of the variance is explained when considering the complexity of the model (i.e., the moderation effect of Age). The standard error of the estimate provides an estimate of the average distance between the observed values of BIFA1 and the predicted values from the regression model.

- **Model 5**: the correlation coefficient (R = 0.591) indicates a moderately positive relationship between the independent variable, effort expectancy (EEFA1), and behavioural intention (BIFA1), and that EEFA1 explains approximately 34.9% of the variance in BIFA1. The adjusted R Square value suggests that around 32% of the variance is explained while considering the complexity of the model (i.e., the moderation effect of Gender). The standard error of the estimate provides an estimate of the average distance between the observed values of BIFA1 and the predicted values from the regression model.
- **Model 7:** the correlation coefficient (R = 0.566) indicates a moderately positive relationship between the independent variable, effort expectancy (EEFA1), and behavioural intention (BIFA1), and that EEFA1 explains approximately 32% of the variance in BIFA1. The adjusted R Square value suggests that 29% of the variance is explained when considering the complexity of the model (i.e., the moderation effect of Age). The standard error of the estimate provides an estimate of the average distance between the observed values of BIFA1 and the predicted values from the regression model.
- **Model 9:** the correlation coefficient (R = 0.761) indicates a strong positive relationship between the independent variable, effort expectancy (EEFA1), and behavioural intention (BIFA1), and that EEFA1 explains approximately 58% of the variance in BIFA1. The adjusted R Square value suggests that around 56% of the variance is explained when considering the complexity of the model (i.e., the moderation effect of Experience). The standard error of the estimate provides an estimate of the average distance between the observed values of BIFA1 and the predicted values from the regression model.
- **Model 10:** the correlation coefficient (R = 0.803) indicates a strong positive relationship between the independent variable, social influence (SIFA1), and behavioural intention (BIFA1), and that SIFA1 explains approximately 64% of the variance in BIFA1. The adjusted R Square value suggests that around 62% of

the variance is explained when considering the complexity of the model (i.e., the moderation effect of Gender, Age and Experience). The standard error of the estimate provides an estimate of the average distance between the observed values of BIFA1 and the predicted values from the regression model.

- **Model 11:** the correlation coefficient (R = 0.725) indicates a strong positive relationship between the independent variable, facilitating conditions (FCFA1), and use behaviour (UBFA1), and that FCFA1 explains approximately 53% of the variance in UBFA1. The adjusted R Square value suggests that around 49% of the variance is explained when considering the complexity of the model (i.e., the moderation effect of Age and Experience). The standard error of the estimate provides an estimate of the average distance between the observed values of UBFA1 and the predicted values from the regression model.
- **Model 12:** the correlation coefficient (R = 0.745) indicates a strong positive relationship between the independent variable, facilitating conditions (FCFA1_digital identity), and use behaviour (UBFA1), and that FCFA1_digital identity explains approximately 56% of the variance in UBFA1. The adjusted R Square value suggests that around 51% of the variance is explained when considering the complexity of the model (i.e., the moderation effect of Age and Experience). The standard error of the estimate provides an estimate of the average distance between the observed values of UBFA1 and the predicted values from the regression model.
- **Model 13:** the correlation coefficient (R = 0.844) indicates a strong positive relationship between the independent variable, facilitating conditions (FCFA1_virtual currencies), and use behaviour (UBFA1), and that FCFA1_virtual currencies explains approximately 71% of the variance in UBFA1. The adjusted R Square value suggests that around 68% of the variance is explained when considering the complexity of the model (i.e., the moderation effect of Age and Experience). The standard error of the estimate provides an estimate of the average distance between the observed values of UBFA1 and the predicted values from the regression model.
- **Model 14:** the correlation coefficient (R = 0.676) indicates a strong positive relationship between the independent variable, facilitating conditions (FCFA1_alternative payment methods), and use behaviour (UBFA1), and that

FCFA1_alternative payment methods explains approximately 46% of the variance in UBFA1. The adjusted R Square value suggests that around 41% of the variance is explained when considering the complexity of the model (i.e., the moderation effect of Age and Experience). The standard error of the estimate provides an estimate of the average distance between the observed values of UBFA1 and the predicted values from the regression model.

4.12 Summary of the results

This chapter presented and discussed the results of the study. The methodology adopted for this quantitative study was positivist and used the descriptive and exploratory capabilities of the SPSS v28 platform. The data was collected using an online questionnaire administered on the Qualtrics platform. The population of interest was adults (18 years and older) residing in South Africa and a sample of 93 was achieved, with 90 usable responses.

Data screening was conducted to ensure integrity before the analysis took place. The internal consistency, reliability and validity of the measurement scale were also tested. The scale was found to be reliable, valid and internally consistent, therefore no items were excluded from the analysis.

EFA was performed on the dataset, along with bivariate correlation and multiple regression, with the moderation effects of the UTAUT moderator variables considered. This sought to determine the relationships between the independent and dependent variables of the model and to test the study's five hypotheses, which were found to be positive and significant.

CHAPTER 5. DISCUSSION OF THE RESULTS

5.1 Introduction

This study aimed to examine consumer acceptance drivers and digital payment strategies that facilitate the adoption of virtual worlds (metaverse) in South Africa. The study investigated these constructs primarily through the lens of the Universal Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2003), as the unifying construct through which user acceptance of information systems can be explained.

Following the UTAUT theory, the independent variables considered in the study were performance expectancy (PE), effort expectancy (EE), social influence (SI) and facilitating conditions (FC). These were believed to influence the dependent variables, which took the form of behavioural intention (BI) and use behaviour (UB). The theoretical construct further accommodated the effect of the moderating variables of age, gender and experience, which were thought to have the potential to influence the strength of the relationships between the independent and dependent variables.

This chapter discusses the findings presented in Chapter 4 in the context of the literature presented in Chapter 2. Furthermore, it seeks to provide possible explanations and logical arguments related to the findings.

5.2 Discussion pertaining to Hypothesis 1

H1: There is a positive relationship between performance expectancy (PEFA1 and PEFA2), effort expectancy (EEFA1 and EEFA2) and behavioural intention BIFA1.

This hypothesis posits that an individual’s accessing and using a virtual world through enabling technology would enable them to adopt the metaverse as an interactive environment in which to socialise, transact and work. The study thus tested the direct relationship between these UTAUT variables, the result of which is confirmed and significant.

The relationship between performance expectancy (PEFA1/PEFA2) and behavioural intention (BIFA1) indicated a significant positive association in the findings, which is consistent with several research outputs. Venkatesh et al. (2003) found the performance expectancy construct to be the strongest predictor of intention, with age and gender as moderators. This finding was empirically supported by Chong and Chan (2012). These authors extended the UTAUT model with Expectation-Confirmation theory for end-user satisfaction, particularly with information systems, which is similar to the underlying assumption of the current study, which assesses the adoption of the metaverse at the user level. While this study's primary concern is the metaverse's ability to support a user's socialisation, transaction and productivity expectations, Esmaeilikia et al. (2020) focused on assessing customer intention to use chatbots through the UTAUT theoretical lens, and also found that performance expectancy has a significant effect on user's behavioural intention towards the chatbot technology.

It is worth noting that the metaverse concept and technology are nascent and undergoing rapid development, and this means that no substantial empirical research has been conducted around the topic. However, recent studies in the adoption of virtual worlds have provided meaningful insights. Karlsson and Shamoun (2022) investigated the effect of VR in the context of remote working and found the complexities that underpin remote working to be centred on freedom and control. They suggest that users are more inclined to operate within the metaverse if provided with freedom and control over their work. They caution, however, that this has the effect of a loss of comradery amongst colleagues, while also creating a sense of social exclusion within the organisation. So, although the current study identifies a strong belief by individuals that virtual worlds can increase their effectiveness through the ability to allocate their time efficiently to both their work and private lives, there are other factors that may negatively impact their sense of belonging, especially in the working environment.

Performance expectancy in the context of this study also relates to the learning or academic applications of the metaverse, which is based on UTAUT and Kolb's learning style theory (McLeod, 2023). This theory classifies the learning process into four consecutive stages (concrete experience, reflective observation,

abstract conception and active experimentation). Their study hypothesised that all four independent variables of UTAUT and Kolb's construct of concrete experience would have a positive association with behavioural intention. They concluded that the UTAUT variables, and concrete experience, which is associated with the improvement of students' meta-thinking and self-directed learning through experimental education, have a significantly positive association with an individual's behavioural intention to use virtual reality headsets (VRHs) for learning.

Exploring the discussion further, the findings of the current study show a consistent and positive significant correlation between effort expectancy (EEFA1/EEFA2) and behavioural intention (BIFA1). Venkatesh et al. (2003) accepted that the effort expectancy variable was sufficient to define the degree of ease of use associated with the use of the system, and that this definition was similar to those initially proposed by the TAM, MPCU and DOI theories. Following on from this, the hypothesised relationship and moderation of the relationship by age, gender and experience is important to note, as Venkatesh et al. (2003) found that the moderation is stronger for women than men owing to gender roles. They also found that increases in age also create difficulty for individuals, especially in processing complex stimuli. In the current study, it is noted that individuals' perceived ease of use of virtual world systems is consistent with the initial findings from these authors.

Hsu and Lin (2016) examined a recent technological innovation, the Internet of Things (IoT) and associated smart objects (e.g., smartwatches and smart cars), which are presumed to increase convenience and efficiency for individuals. The authors found that a vast increase in the number of connected devices (to each other and to the internet) created network externalities that motivated users significantly to adopt these devices, primarily for identifying themselves and others, sharing information, recording health-related statuses and making payments. This analysis mirrors the perceived ease of use that was a motivator for adoption in the current study. Users of IoT devices thus prove to be encouraging for virtual world implements. Of course, the proliferation of VR, AR

and XR (extended reality) devices will be the decisive element that ultimately leads to wider adoption of the metaverse.

The results presented and the discussion related to performance expectancy conclude and support the view taken by this research that access to enabling technology such as VR, AR and XR tools has a positive impact on individuals' motivation to adopt a new technology. It further concludes and supports the view that perceived ease of use of the virtual world and metaverse technology has a positive impact on individuals' motivation to adopt a new technology.

5.3 Discussion pertaining to Hypothesis 2

H2: There is a positive relationship between facilitating conditions (FCFA1. FCFA2, FCFA3) and use behaviour (UBFA1).

This hypothesis puts forward the idea that individuals perceive and expect a secure, portable and user-controlled digital identity to have a positive effect on their acceptance and adoption of the metaverse. The study tested this hypothesis and found the relationship to be significant and supported. The seminal study by Venkatesh et al. (2003) found that facilitating conditions positively influence the use behaviour of information technology (IT).

The relationship correlation that is evidenced in the results can be assessed in the context of previous technology-adoption research. Ambarwati et al. (2020) examined the role of facilitating conditions and user habits of online learning platforms (OLPs) and found that the effect of the facilitating conditions variable was significant, which is aligned to the results presented in this report.

In relation to digital identity specifically, Beduschi et al. (2017) expanded the discussion around the importance of digital identifiers alongside existing identity systems to provide new lines of data that can be used for verification. In relation to the findings of this study, it is clear that individuals consider a metaverse digital identity to be different from "their everyday self". They also see the application of such a digital identity to be usable, with particular attributes chosen by the user

to manoeuvre between different virtual worlds. It is important to note that the current forms of digital identity within virtual worlds (i.e., avatars) may be restrictive for individuals who may want to disassociate their physical, real-world identity from their virtual identity. Furthermore, Beduschi et al. (2017) suggest that existing identity systems have failed the 1.5 billion people who exist without a legal identity. They suggest that as part of the UN Sustainable Development Goals (#16), digital identity frameworks should be developed with the undocumented to enable autonomy and self-determination in conjunction with the legal frameworks at the international and regional level.

Technologically, the digital identity landscape may be limited in its current reach, particularly with concepts such as the metaverse. However, the rapid development and adoption of these technologies can aid digital infrastructure potentially to close gaps in identity systems with social and economic benefits.

Li and Bernoff (2021) examined the construct of digital identity in the context of contact tracing during the Covid-19 pandemic and found that individual perceptions around privacy and digital identity significantly impact the adoption of these applications. They found that individuals with a stronger sense of digital identity have a higher propensity to adopt contact-tracing applications, as a means of contributing to public health and the societal benefits that may accrue through their adoption.

The moderating effects of age and experience were also tested in the study and were found to have a negative moderation effect on the relationship between facilitating conditions and use behaviour. Where the facilitating condition is digital identity, individuals who are older and have more experience may face potential challenges regarding their digital identity, which may weaken the actual use of metaverse technology.

To counter these limitations, methodologies have been established that aim to support older users who may have an inherent interest in technology adoption. In the design sphere, User-Centred Design (UCD) prioritises the need to accommodate user preferences when new technology is being developed, which may favourably impact the adoption of metaverse technology. Recently, Ozgun

and Alacam (2023) explored AR UI within the design process and found that users who interacted with AR-based UI during the development of an application responded positively towards technology. They further suggest that the earlier in the design process users are involved, the more likely they are to interact with the technology within its physical and digital environments.

Gerontechnology is another intervening discipline that is aimed at supporting the design of technology for older individuals (Chen, 2020). This multidisciplinary effort seeks to support successful ageing to respond to the challenge of an increasingly ageing society in the advent of rapid technological development, thus finding meaningful ways to enable older adults to embrace technology. Applications within this domain that are closely aligned with digital identity include design principles such as digital inclusion and access and online social engagement to maintain connections with their family and social circles. Applications are also designing for privacy and security that enable the management of potential risks for a vulnerable group of society and developing digital skills to empower the elderly to maintain competence and confidence when interacting with newer forms of technology.

Another noteworthy consideration within the scope of digital identity is the empirical study by Bailenson et al. (2018), which investigated the impact of avatars and self-representation in VR. This study sought to compare the experiences of people in the real and virtual worlds through their avatars. The authors found that people who experienced contrasts between their real and virtual world selves had a heightened sense of presence in the virtual world. This sense of presence translated as participants showing behaviours that closely mirrored those of their avatars in the real world, including increased physical activity for tasks that required actual physical effort. This outcome is positive for a variety of applications, including the gaming industry, as well as training and simulation environments. These applications can aid faster adoption of technology as users react positively in the real world to the stimuli and capabilities experienced in the virtual world.

The results presented and the above discussion highlight the significant impact of digital identity as a key component of virtual world and metaverse technology, and the literature findings that this research supports.

5.4 Discussion pertaining to Hypothesis 3

H3: There is a positive relationship between social influence (SIFA1) and behavioural intention (BIFA1).

This hypothesis holds that social influence has a positive effect on individuals' behavioural intention to accept and adopt the metaverse. The study tested this hypothesis and found the relationship to be very strong and significant, and the hypothesis was thus supported. Venkatesh et al. (2003) also found that social influence positively influences the behavioural intention of individuals regarding the use of IT. In the context of previous theoretical and empirical studies, Taylor and Todd (1995) assessed the factors that influence IT usage and found that social influence in the form of subjective norms (whether important groups of people believe that a person should adopt a particular technology) is a strong motivator. In that study, the authors suggested that expectations and opinions from family, friends and colleagues form the basis of subjective norms as they shape individual beliefs about technological use.

The application of this theory was extended by Hsu and Lu (2004), who investigated the reasons why people play online games. Recently, others such as You et al. (2017) found that social influence, represented by reputation and the perceived expertise of others, strongly influenced an individual's intention not only to adopt technology but also to contribute knowledge to online communities. The strength of the correlation in the current study further supports the view that individuals formulate their opinions on the basis of their social interactions. The implication of this statement is that social cues such as reviews and recommendations are dominant influencers of user behaviour in technological adoption, as identified by Wang and Benbasat (2019).

Although Venkatesh et al. (2003) determined age to be a moderator of the relationship between social influence and behavioural intention, its strength and

direction were found to be uncertain. This the authors attributed to the variable having a dependency on the type of technology being studied. In a later study, Chang et al. (2005) came to a different conclusion when examining the adoption of online shopping, finding that age has a weak positive moderation effect. Bock et al. (2005) and more recently Zhang et al. (2014) found similar results, showing that the influence of age on the relationship between behavioural intention and social influence may vary according to the age of the individual. This view of a weak positive moderation effect is evident in the results of the current study.

Similar to the results of the current study, the moderation effect of gender was found by Venkatesh et al. (2003) to be positive yet weak. A study by Moon et al. (2001), using an expanded TAM theoretical perspective, explored this effect on the adoption of the World Wide Web and concluded that gender indeed has a weak positive moderation effect. This is similar to the findings of the current study that the impact of gender may vary depending on the gender of the individual.

Lastly, the effect of experience was found to be both negative (for social influence) and positive (for behavioural intention). This dual effect may be unique to the context of this metaverse study and indicates that, depending on the nature of the technology being analysed, an individual's previous experience may positively or negatively influence the relationship between the variables. In this case, the positive effect may suggest a strengthening of the relationship. Alternatively, a negative effect may suggest that where individuals have gained expertise in a technology, the opinions, reviews or recommendations of others may not be sufficient to persuade the individual to adopt or reject the technology. This means that they are more likely to rely on their own judgement when deciding on their behavioural intention. The studies on this topic by Venkatesh and Davis (2000) and Cheung and Lee (2010) both found a weak positive correlation, while Straub et al. (1997) and Bhattacherjee (2001) found the negative scenario also to be evident.

In conclusion, the third hypothesis is supported by the findings presented as well as the above discussion led by the literature interrogated.

5.5 Discussion pertaining to Hypothesis 4

H4: There is a positive relationship between the variables BI03, PE010, FC6 and FC9 in relation to use behaviour (UBFA1).

This hypothesis postulates that there is a positive relationship between virtual currency access and an individual's desire to purchase virtual world items. The study tested this hypothesis and found the relationship to be very strong and significant, and the hypothesis was thus supported.

Virtual currencies have taken root as a key enabler within the Web 3.0 landscape, primarily as a result of different virtual worlds having innovated around unique digital currencies that enable a user or player to navigate and enjoy the full experience on offer. In relation to game design, studies by Hamari and Lehdonvirta (2010) and Yao and Leong (2018) recognise that these currencies are influential in creating demand for virtual goods. They thus incentivise players to adopt a specific technology through enabling them to access features that may not be standard in the initial offering, or only become available as players progress in the gameplay. The role of virtual currencies in these virtual economies includes providing the means for users to conduct transactions and participate in virtual communities, thus increasing motivation and engagement, which ultimately increase adoption of the technology. Kankanhalli et al. (2005) further examined the factors that lead individuals to make contributions within online communities and concluded that rewarding users with virtual currencies can be an added motivator of adoption.

When investigating metaverse experiences, Antonioli and Ardolino (2021) recently found that virtual currencies can assist users to navigate the metaverse. Further, a Decentraland study by Liu and Purnawirawan (2021) supports the view that users are most likely to adopt the virtual world if they have the requisite digital asset (MANA). Other virtual world currencies such as Linden Dollars (Second Life), Robux (Roblox), V-Bucks (Fortnite), WoW Gold (World of Warcraft), IMVU Credits (IMVU) and Project Entropia Dollar (Entropia Universe) have reached saturation and widespread adoption within these worlds. These currencies enable users to create avatars, customise their virtual experiences and purchase goods, services, land, accessories, equipment and battle passes among the wide

array of available functionality (Castronova & Jakobsson, 2004; Lehdonvirta & Lehdonvirta, 2010, Yurekli & Scott, 2020; Gruber et al., 2020).

On the African context, several studies have sought to explore the adoption of cryptocurrencies as natural predecessors of virtual world currencies. Johnson and Urumieh (2020) associate the proliferation of cryptocurrency with economic development within sub-Saharan Africa, while Ruiz et al. (2019) provide an analysis of individual motivations for Bitcoin usage within the continent.

In South Africa, Walton and Johnston (2018) identified key drivers of Bitcoin adoption in the country and explore how its diffusion into the wider economy has been influenced by perceived benefits, usefulness, ease of use and risk. The authors found that adoption (intention to use) was indirectly affected by perceived ease of use, usefulness and perceived benefits, while risk negatively influenced people's intention to use the currency. Users also found that the decentralised nature of the currency and low influence of government provided an increased benefit in that they were able to process cross-border transactions without being under scrutiny. Furthermore, Jankeeparsad and Tewari (2018) found varying perceptions regarding the underlying technology between users and non-users of the cryptocurrency, although the available technology within the country was compatible with the requirements of the currency and user expectations. This indicated that a larger percentage of users were comfortable with day-to-day transacting capabilities, even though the currency was unregulated. This, of course, has subsequently changed with the SARB and commercial bank collaboration in the creation of a CBDC.

The recent launch of the Ubuntuland metaverse marketplace and its $Ubuntu token has resulted in partners around the continent seeking to collaborate, with the aim of unlocking employment opportunities and boosting economic growth through the commercialisation of the 3D VR experience. This is being driven through virtual land sales, and initiatives such as a Data Science Metaversity as well as community hubs that enable landowners to develop custom value propositions for work, play and social experiences with Ubuntuland (GlobeNewswire, 2022).

The results presented and the discussion above support the view that the ability of an individual to access virtual world currencies has a positive effect on user intention to purchase virtual world items, and, by extension, on their acceptance and adoption of the metaverse.

5.6 Discussion pertaining to Hypothesis 5

H5: There is a positive relationship between the variables FC6, FC7, FC8 and FC9 in relation to use behaviour (UBFA1).

This hypothesis posits that there is a positive relationship between access to alternative digital payment methods and an individual's desire to purchase virtual world items. The study tested this hypothesis and found the relationship to be very strong and significant, and the hypothesis was thus supported.

This hypothesis is closely related to H4, in that those elements of the facilitating conditions construct that particularly deal with digital payment methods were examined to measure their influence on use behaviour. Alternative digital payment methods such as mobile wallets and QR code payments (contactless) offer a variety of benefits to users over cash-based payment methods. Users generally prefer speed of execution when making payments, and the convenience offered by these payment capabilities provides this ease of use. At the same time, these payment methods provide security through the enhanced measures implemented to cater specifically for their usage. Beldad et al. (2010) explored this assertion by investigating the trust lens through which electronic commerce is undertaken and found that users view online transactions as faceless and intangible, which often leads to mistrust and a reluctance to conduct electronic transactions. Where alternative methods are available, these authors assert that users become more amenable to selecting whichever method is most trusted.

Wang and Rau (2014) and Roumani et al. (2015) examined the effect of alternative digital payment methods on use behaviour. They found that these methods often offer incentives such as cashback, loyalty points and discounts to

promote continued intention and use behaviour that favours transacting within online communities, thus increasing the potential for acceptance.

In the context of emerging market economies within the African continent, with vast numbers of underbanked and unbanked people, alternative methods of payment can provide access to financial services for individuals. This ultimately has the potential to lead to inclusion and access to the economy, as recognised by Mas and Radcliffe (2010). These authors specifically focused their analysis on the adoption of the M-PESA mobile payment capability, which enabled individuals to participate in digital transactions. Other successful digital payment methods within the continent, such as MTN Mobile Money, EcoCash, Orange money, Tigo Pesa and Airtel Money, have been found to support this inclusion agenda. These payment methods facilitate financial transactions, including remittance payments, bill payments, merchant payments and the purchase of goods and services (Jack & Suri, 2011; Kimaro & Nhampossa, 2012; Dlodlo & Tauringana, 2019).

The above discussion indicates that seamless transaction capabilities provided by alternative payment methods are recognised as being strong influencers of adoption, specifically where they relate to e-commerce. Therefore, the availability of alternative payment capabilities can be considered to have a positive effect on user acceptance and adoption of metaverse transactions.

5.7 Conclusion

This chapter focused on the essential aspects of the various hypotheses, and how the results of the study support the research objectives of this research. The metaverse, as with any new technology that has not reached maturity, depends on user adoption to gain momentum and gain investment in infrastructure development to progress its value offering.

The factors (PE, EE, SI and FC) that influence user behavioural intention and actual use, along with the moderating effects of age, gender and experience as per the UTAUT theoretical model, were explored throughout the chapter with the aim of supporting the study findings. The study findings were compared to the findings of other studies on related topics. The findings support the view that

technology and financial stakeholders who seek to gain advantage with this technology must aim their efforts at incentivising existing users and potential individuals to participate in this ecosystem.

5.8 Findings contribution to theory base and practice

The findings presented in this report on metaverse acceptance and adoption contribute to the Universal Theory of Acceptance and Use of Technology (UTAUT) theory and practice in several ways:

1. **Explores new contexts:** the combined technologies that can lead to Metaverse success introduce new, immersive environments that have the right attributes and potential to be studied within the UTAUT. Particularly, the research investigates user perceptions and intentions to use virtual world platforms, which are aligned to UTAUT constructs like performance expectancy, effort expectancy, social influence and facilitating conditions, as well as the influence of moderating variables on the constructs of the framework.
2. **Extending UTAUT constructs:** as seen in this report, facilitating conditions was extended to cater for the unique features of digital identity and currencies, as well as alternative digital payment methods, which are critical to the adoption of the metaverse. In the context of UTAUT, this extension can also be applied to presence and virtual social interaction in further research.
3. **Enhanced User Adoption and Experience:** research into metaverse technology, as outlined in this report, can further explore factors that influence user adoption and behaviour. The findings presented in this report further outline metaverse specific challenges and user motivations, which is relevant for UTAUT, and insights can be used to refine the design and marketing of metaverse environments to enable wider adoption and a heightened user experience.
4. **Policy and Regulation:** it is noted in the report that there is a significant gap in policy and regulation relating to Web 3.0 technologies. The report's contribution can inform and shape

guidelines and governance policy, particularly on the roles and responsibilities developers, content creators and organisations have in creating a safer version of the next, immersive iteration of the internet.

CHAPTER 6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter presents the conclusions derived from the research findings in relation to the acceptance and adoption of metaverse technology within the South African context and the recommendations made on the basis of these conclusions. In reaching the conclusions, the research objectives are revisited, and each is discussed within the framework of the hypotheses that were tested, as well as the results that were obtained.

The findings indicate that access to enabling technology, digital identity, economic resources in the form of virtual world currencies and alternative digital payment capabilities, together with a strong effect of social influence, are defining factors of individual acceptance and adoption of metaverse technology.

The study contributes to the broader understanding of virtual world environments within the developing country context. It provides empirical evidence of the various elements that impact individual intention and actual use behaviour regarding this technology using the UTAUT model. Furthermore, the moderating factors of UTAUT (gender, age and experience) are considered in terms of their effect on the overall relationships that exist between the model variables (performance expectancy, effort expectancy, social influence, facilitating conditions, behavioural intention and use behaviour).

In the subsequent sections of this chapter, the conclusions drawn from the findings are discussed and recommendations for key stakeholders are made to aid participating stakeholders in this technology. The chapter ends with suggestions for future research and a summary of the contribution made by this study.

6.2 Conclusions regarding Research objective 1

The first research objective sought to explore consumer acceptance behaviour in virtual environments and, in particular, the influence of access to virtual world environments as a motivator of acceptance and adoption. This entailed the testing and analysis of Hypotheses 1, 2 and 3. These hypotheses specifically probed the influence of enabling technology, digital identity and the influence of an individual's social circle as motivators of acceptance and adoption of the metaverse technology.

The findings pertaining to these hypotheses indicate a strong positive correlation in the relationship between enabling technology, digital identity, the influence of an individual's social circle and behavioural intention. The results of the UTAUT moderating variables also support the hypotheses in so far as their influence on the relationship between the independent and dependent variables is concerned.

6.2.1 *Enabling technology, digital identity and social influence*

Enabling technology in the context of this study refers to the technology and capabilities that facilitate the use and functionality of metaverse ecosystems. The strong positive correlation suggests that as users perceive the availability and effectiveness of enabling technologies, such as high-speed internet access, immersive VR experiences through VR/AR headsets, and seamless connectivity, their intention to adopt metaverse technology increases. This implies that a robust technological foundation is essential for promoting user acceptance and adoption of the metaverse.

Digital identity in the context of this study refers to the authentication element of individuals within the virtual world and comprises user profiles and avatar creation, including how users personalise their identity. The strong positive correlation suggests that when users perceive digital identity features as valuable, trustworthy and aligned with their self-expression, they are more likely to have a positive behavioural intention towards adopting metaverse technology. Digital identity acts as a bridge between the users' real-world identities and their virtual presence,

enhancing their engagement and willingness to participate in the metaverse.

Social influence refers to the impact of others' opinions, recommendations and behaviours on an individual's decision-making process. The strong positive correlation indicates that social influence significantly influences users' behavioural intention to accept and adopt metaverse technology. Users are more likely to adopt metaverse technology if they perceive positive social norms, receive recommendations from influential individuals or groups, or observe others actively engaging in and benefiting from the metaverse. Social influence acts as a persuasive force in shaping users' attitudes and intentions towards metaverse adoption.

Overall, the strong positive correlation among enabling technology, digital identity, social influence and behavioural intention to adopt metaverse technology suggests that a holistic approach is necessary for successful metaverse-adoption strategies. Attention should be given to providing robust technological infrastructure, developing user-friendly digital identity features and leveraging social influence to create a supportive environment that encourages users to embrace and engage with the metaverse.

6.3 Conclusions regarding Research objective 2

The second research objective sought to examine consumer purchasing patterns in virtual world environments, particularly the desire of individuals to purchase items in virtual world environments as a motivator of acceptance. This entailed the testing and analysis of Hypothesis 4, which hypothesised that the ability of an individual to access virtual world currencies has a positive effect on user intention and behaviour regarding purchasing virtual world items and, by extension, their acceptance and adoption of the metaverse technology.

The findings pertaining to this hypothesis indicated a strong positive correlation in the relationship between access to virtual world currencies and behavioural intention. The results of the UTAUT moderating variables also support the

hypothesis in so far as their influence on the relationship between the independent and dependent variables is concerned.

6.3.1 *Access to economic resources: Digital currency*

The strong positive correlation indicates that when individuals have easy and convenient access to virtual currencies within virtual worlds, they are more likely to demonstrate an intention and engage in use behaviour to make purchases of virtual items.

The positive correlation therefore suggests that virtual currencies play a significant role in influencing individuals' purchasing behaviour within virtual worlds. When users have access to virtual currencies, particularly through digital wallets or other virtual currency tools, they are more inclined to participate in these virtual world economies as they have the means to engage in virtual transactions and acquire virtual items. This correlation implies that the availability and accessibility of virtual currencies act as enablers for individuals to engage in desired use behaviour, which ultimately contributes to the growth and development of the metaverse.

From a practical standpoint, this finding has important implications for virtual world platforms and developers. It highlights the importance of providing users with a seamless and user-friendly experience when it comes to acquiring and using virtual currencies. By ensuring easy access to virtual currencies, platforms can enhance users' engagement and satisfaction, as well as encourage more frequent and meaningful transactions within the virtual world.

However, further research is necessary to explore the underlying mechanisms and factors that contribute to this correlation. Consideration also needs to be given to potential moderating or mediating variables that may influence the relationship between access to virtual currencies and behavioural intentions.

Overall, this finding emphasises the significance of virtual currencies as a key facilitator of virtual world economies and transactions. It underscores the importance of providing users with accessible and efficient means to acquire and utilise virtual currencies, ultimately promoting greater engagement and participation in virtual worlds.

6.4 Conclusions regarding Research objective 3

The third research objective sought to assess user adoption of alternative digital payment capabilities, particularly with the view of understanding which payment capabilities aid user transacting potential. This entailed the testing and analysis of Hypothesis 5, which hypothesised that there is a positive relationship between access to alternative digital payment methods and an individual's desire to purchase virtual world items and, by extension, their acceptance and adoption of the metaverse technology.

The findings pertaining to this hypothesis indicated a strong positive correlation in the relationship between access to alternative digital payment methods and individual use behaviour to purchase virtual world items. The results of the UTAUT moderating variables also support the hypothesis in so far as their influence on the relationship between the independent and dependent variables is concerned.

6.4.1 *Access to alternative payment methods*

The analysis reveals a strong positive correlation between access to alternative digital payment capabilities and the use behaviour of individuals to purchase virtual world items. This suggests that individuals who have greater access to alternative digital payment methods are more likely to engage in the use behaviour of purchasing virtual world items, indicating a higher level of acceptance and adoption of the metaverse.

The findings indicate that the availability and accessibility of alternative digital payment capabilities play a significant role in influencing user behaviour within the metaverse. When users have convenient and diverse

options for making digital payments, such as mobile wallets, contactless payments or other innovative payment solutions, they are more inclined to participate in virtual economies and engage in the purchase of virtual world items. This positive correlation suggests that alternative digital payment capabilities facilitate and streamline the transaction process, leading to increased use behaviour and the acceptance and adoption of the metaverse.

6.5 Research limitations

The study had the following limitations:

- **Generalisation:** The exclusive focus on adult participants limits the ability of the researcher to generalise the findings to other age groups, such as teenagers or children, who may have distinct attitudes and behaviours regarding technology adoption. Future research could include a more diverse sample to capture a broader range of perspectives.
- **Self-report bias:** The reliance on self-reported data may introduce response bias, as participants may provide socially desirable responses or may not accurately recall their behaviours. Combining self-reported data with objective measures or observational studies could enhance the validity of the findings.
- **Sample bias:** The exclusive use of an adult sample may introduce selection bias and limit the representativeness of the findings. The results may not accurately reflect the experiences and behaviours of the broader population in South Africa.

6.6 Recommendations

This section focuses on identifying insights for virtual world practitioners, financial institutions, regulators and researchers that may be interested in the development of metaverse technology within South Africa. To increase acceptance and adoption of metaverse technology in South Africa and facilitate its commercialisation, stakeholders can consider the following recommendations:

- **Improve infrastructure and connectivity:** Invest in robust digital infrastructure and reliable internet connectivity to support the seamless functioning of the metaverse. Accessible and high-speed internet connectivity is crucial for users to engage in metaverse activities without interruptions or delays.
- **Collaboration and research support:** Encourage collaboration between technology companies, content creators, businesses and government entities to create a thriving metaverse ecosystem. Facilitate partnerships that drive innovation, content creation and the development of metaverse applications across various sectors. Allocate resources for research and development initiatives focused on advancing metaverse technology. Encourage innovation in areas such as VR, AR, blockchain and AI, which are integral to the development of the metaverse. Collaborate with financial institutions and payment service providers to enable seamless integration of alternative digital payment methods within the metaverse. Ensure that users have convenient and secure options for transacting within the metaverse ecosystem.
- **Ensure regulatory clarity:** Establish clear and supportive regulatory frameworks that promote innovation, consumer protection and privacy within the metaverse. Collaborate with regulatory authorities to create guidelines and standards that address potential challenges and ensure a safe and trusted metaverse environment.
- **Foster user trust and security:** Prioritise user trust and security by implementing robust data-protection measures, secure payment systems and user authentication protocols. Building trust among users is essential for wider acceptance and adoption of metaverse technology.
- **Encourage local content creation:** Support the creation of local content, virtual experiences and virtual marketplaces within the metaverse that reflect the unique culture, history and identity of South Africa. This fosters a sense of ownership and encourages local businesses and creators to leverage the metaverse for economic opportunities. The Ubuntuland metaverse ecosystem is a first for the African continent, and other initiatives that reflect the diversity of the continent can lead to economic

growth and opportunities for technological development, reducing the reliance on more advanced economies.

- **User education and awareness:** The findings suggest that there is a need for educational initiatives that raise awareness of and provide training on metaverse technology, particularly targeting individuals who may be less familiar with digital platforms. This can help to bridge the knowledge gap and empower more individuals to participate in the metaverse.
- **Policy and infrastructure development**: The study highlights the importance of robust technological infrastructure for metaverse adoption. The findings can inform policymakers and technology providers in South Africa to invest in improving internet connectivity, affordability and access, particularly in underserved areas. This can create an enabling environment for widespread metaverse adoption. In particular, advancements are required in digital identity within South Africa, and a focus on the National Identification System (NIS) as a consolidated database for the existing systems of identification can assist to achieve this.
- **Targeted interventions**: The findings from the adult sample can be used to inform targeted interventions and strategies aimed at promoting virtual world adoption and usage among the adult population in South Africa. These interventions can focus on addressing barriers, improving access and enhancing the user experience within virtual worlds. An important initiative in this regard can be derived from an impactful application of the technology. EOH, a local technology company, has conceptualised and implemented an immersive virtual world digital experience that focuses on unconscious bias within the workplace. The In My Shoes program aims to create awareness of how micro-aggressive behaviours create social and structural exclusion through a VR interface.
- **Foster virtual currency accessibility**: The findings emphasise the importance of ensuring easy and convenient access to virtual currencies within the metaverse. Platforms, developers and stakeholders can work towards creating user-friendly interfaces, secure payment gateways and

transparent systems that enable individuals to obtain and utilise virtual currencies seamlessly.

- **Payment infrastructure development:** The findings highlight the importance of developing robust payment infrastructures within the metaverse that support a variety of alternative digital payment capabilities. Platforms and developers should invest in creating secure and seamless payment systems that cater to user preferences and enable frictionless transactions. Collaborating with established payment service providers can facilitate the integration of alternative digital payment capabilities into the metaverse. Partnering with trusted and widely used payment platforms can enhance user confidence and encourage wider adoption of these payment methods.

By implementing these recommendations, stakeholders can contribute to the increased acceptance, adoption and commercialisation of metaverse technology in South Africa, unlocking its full potential for economic growth, innovation and immersive digital experiences.

6.7 Suggestions for further research

Although not exhaustive, the following section identifies gaps and makes suggestions for future research to widen the scope of future analysis of this topic.

- **Longitudinal studies:** Conducting longitudinal studies can provide insights into the adoption and usage patterns of metaverse technology over time, allowing for a deeper understanding of the factors that influence sustained adoption and the evolution of user behaviours.
- **Inclusion of diverse populations:** Future research could include samples that represent a wider range of demographics, including different age groups, socioeconomic backgrounds and cultural groups. This would provide a more comprehensive understanding of virtual world adoption and usage patterns in South Africa.
- **Comparative studies:** Comparative research that compares South Africa’s metaverse adoption trends with other countries or regions can

provide valuable insights into the unique factors that influence adoption in the South African context. This can help identify specific challenges and opportunities for metaverse adoption in the country.

- **Mixed-methods approach:** Combining qualitative and quantitative methods can provide a more comprehensive understanding of metaverse adoption in South Africa. Qualitative research can facilitate an in-depth exploration of the motivations and experiences of users and the barriers that they face, complementing the quantitative findings and offering richer insights.
- **User experience research:** Investigating the user experience associated with virtual currency access and use behaviour can provide insights into the usability, trust and satisfaction levels of users. Exploring user perspectives through qualitative research methods can uncover valuable insights into the barriers, motivations and preferences that influence virtual currency adoption.
- **Inclusivity**: There is a need to explore the experiences and perspectives of diverse population segments in South Africa, such as expanding the scope of research to different socio-economic backgrounds and geographic regions to obtain a detailed analysis of how different people may respond to the metaverse. This can provide a more comprehensive understanding of the factors that influence metaverse adoption and ensure that adoption strategies cater to the needs and preferences of a broader range of individuals.
- **Digital divide**: The study's exclusive focus on adult participants highlights a research gap regarding the digital divide in South Africa. Future research could investigate the barriers and challenges faced by marginalised groups, such as individuals with limited digital literacy or access to technology, to understand how to address these gaps and ensure equitable participation in the metaverse.
- **Limited age representation**: The exclusive reliance on an adult sample limits the researcher's ability to generalise the findings to other age groups, such as children or teenagers. This is important to note because individuals in these age groups tend to be more active in games such as

Minecraft, Roblox, World of Warcraft and Fortnite. Future research could explore the perspectives and behaviours of younger age groups to gain a more comprehensive understanding of virtual world adoption in South Africa.

- **Factors influencing virtual currency access**: It may be valuable to investigate further the factors that contribute towards access to virtual currencies, such as technological infrastructure, user-friendly platforms or regulatory frameworks. Regulation of digital currencies in the context of South Africa is evolving with the SARB Project Khokha 1 and 2 initiatives in partnership with commercial banks and fintech startups to conduct a feasibility study that aims to investigate the potential and technological requirements of a CBDC.
- **User perceptions and attitudes**: The study highlights the association between virtual currency access and use behaviour, but it does not delve into the underlying motivations, perceptions and attitudes that drive individuals to adopt and use virtual currencies. Exploring these aspects could provide valuable insights into user behaviour and inform strategies for promoting the acceptance and adoption of virtual currencies in the metaverse.
- **User preferences and trust**: While the study establishes a positive correlation between access to alternative digital payment capabilities and use behaviour, further research could explore user preferences and the factors that contribute to their trust and confidence in using these payment methods within the metaverse. Understanding user perceptions and concerns regarding security, privacy and convenience could help shape the development and implementation of effective payment solutions.

6.8 Contribution of this research

Like any new technology, the metaverse is not precluded from unique challenges and critique. In attempting to conduct meaningful research into this topic, the study has utilised a well-adopted theoretical model of technological acceptance and tested it against the research findings. In this manner, the contribution of this research is largely empirical,

attempting to conduct this level of analysis on a fairly new technology within the South African context. Future research could benefit from the empirical findings and expand to the growing body of knowledge on Web 3.0 and immersive digital technologies.

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APPENDIX A

Introductory Letter

Good day

My name is Sekete Malebana-Metsing. I am a final year student at Wits Business School enrolled in the Master of Management in Digital Business programme under the academic guidance and supervision of Dr. Manessah Alagbaoso.

In fulfilment of the requirements of the academic programme, I have undertaken to study the “Factors that influence the acceptance and adoption of virtual world environments (metaverse) for South African consumers”. The study primarily focuses on the effects of constructs such as performance expectancy, effort expectancy, social influence and facilitating conditions in the form of enabling technology like Virtual and Augmented Reality, Digital Identity and Digital Payment Strategies as influencers to the adoption of the metaverse.

I would like to invite you to participate by responding anonymously to this survey, which takes approximately 5 minutes to complete. You are not required to provide your name, therefore participation in the survey is completely anonymous, and no personal identifying information will be collected. Additionally, you will not incur any personal costs for completing the survey.

The results of the study will be statistically analysed and presented in the final applied research project report. The survey comprises of statements that require you to capture your responses by rating each statement.

Please feel free to contact me at 0613165K@students.wits.ac.za if you have any questions relating to the survey.

Kind regards
Sekete Malebana-Metsing

APPENDIX B

Questionnaire

Construct	Variables	Instrument
Performance Expectancy (PE)	**PE001**	Accessing the virtual world would enable me to be more productive and involved in my work/social life
	PE002	The virtual world would enable me to express my personal opinions
	PE003	I expect the virtual world to be full of entertaining experiences
	PE004	The virtual world system would allow me to increase my effectiveness
	PE005	Being active in the virtual world would give me more social contact with others
	PE006	The virtual world would enable me to get information
	PE007	I expect the virtual world to provide me with a three-dimensional (3D) experience
	PE008	I expect to be able to perform my work in the virtual world
	PE009	I expect the virtual world to be no different to the physical world
	PE010	The virtual world would enable me to transact and purchase virtual goods/services
Effort Expectancy (EE)	**EE01**	I expect a virtual world environment to be similar to the physical world
	EE02	Learning to navigate a virtual world environment would be easy for me
	EE03	It would be easy for me to become skilled in virtual world tasks
	EE04	It would be easy to play the role of an avatar in the virtual world
	EE05	I would be encouraged to continue my participation in the metaverse if there is a step-by-step virtual tutorial

Construct	Variables	Instrument
	EE06	I would challenge myself to learn how to use the metaverse regardless of how difficult the learning is
	EE07	I would change my opinion of the metaverse if learning to use it proves difficult
	EE08	Overall, I believe the virtual world would be easy to navigate
Social influence (SI)	**SI01**	I would be influenced by important others to participate in virtual world environments
	SI02	I will access the virtual world if I get assistance on how to use the system
	SI03	People who are important to me think that I should participate in virtual world environments
	SI04	Connecting with my important others in the metaverse is the ideal experience
	SI05	I look forward to making new social connections in the metaverse
	SI06	I will try the metaverse only if my important others participate
	SI07	I want a new identity in the metaverse that is different to my everyday self
	SI08	The virtual world would enable me to socialize with other people
Facilitating Conditions (FC)	**FC1**	Having a secure digital identity would assist me in accessing a virtual world environment
	FC2	I would be comfortable with creating a virtual world identity (i.e., avatar)
	FC3	A digital identity would enable me to access different virtual worlds
	FC4	I have identified a virtual world ecosystem that would enable me to participate in the metaverse
	FC5	VR/AR headsets are a must-have for me to participate in virtual world environments

Construct	Variables	Instrument
	FC6	Access to virtual currencies would enable me to purchase virtual world items
	FC7	Alternative digital payment methods would make my experience in a virtual world enjoyable
	FC8	I believe digital currencies would be important in making my virtual world experience wholesome
	FC9	My financial service provider can enable me to convert my money into a virtual currency
	FC10	I would upgrade my devices/gadgets to be compatible with the metaverse minimum requirements
Behavioural Intention (BI)	**BI01**	I predict that I will use virtual reality headsets to access virtual worlds
	BI02	I intend on procuring a virtual reality headset in the next 18 - 24 months to explore the metaverse
	BI03	I would be interested in purchasing items in a virtual world (i.e., land, clothing, cars etc.)
	BI04	I plan to use the metaverse in the long term
	BI05	I plan to use the metaverse more often as I gain more experience
Use Behaviour (UB)	**UB001**	I intend to use the metaverse in the future
	UB002	I intend to increase my usage of the metaverse in the future
	UB003	I will access different virtual worlds if I enjoy my initial experience

APPENDIX C

Table A1. Consistency table: research questions, propositions, data collection and data analysis

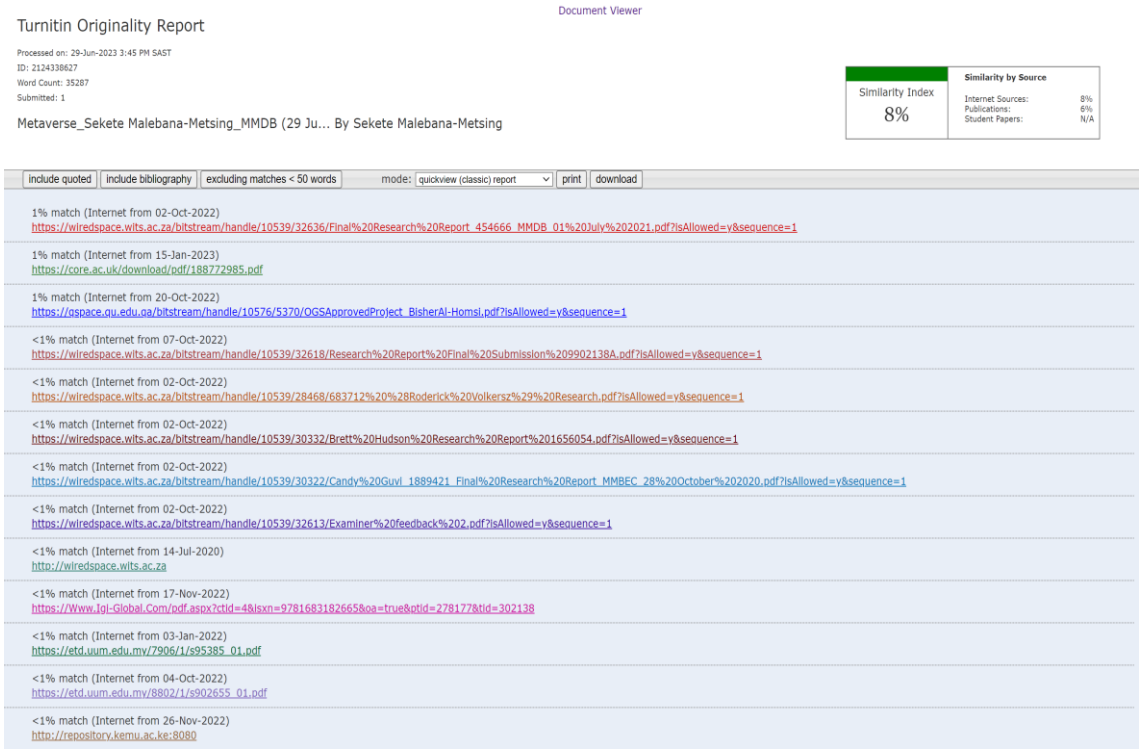
RO #	State Research Objective	Hyp #	State Hypothesis	Data collection detail	Data analysis method
1	Explore consumer acceptance behaviour in virtual environments and, in particular, the influence of access to virtual world environments as a motivator of acceptance	1	Access to virtual world environments through enabling technology like virtual (VR), augmented (AR) and extended reality (XR) has a positive effect on user acceptance of the metaverse.	PE001, PE001, PE003, PE004, PE005, PE006, PE007, PE008, PE009, PE010, EE01, EE02, EE03, EE04, EE05, EE06, EE07, EE08	Descriptive analysis
1	Explore consumer acceptance behaviour in virtual environments and, in particular, the influence of access to virtual world environments as a motivator of acceptance	2	A secure, portable and user - controlled digital identity has a positive effect on user acceptance and adoption of the metaverse.	FC1, FC2, FC3, EE04, SI07	Descriptive analysis

RO #	State Research Objective	Hyp #	State Hypothesis	Data collection detail	Data analysis method
1	Explore consumer acceptance behaviour in virtual environments and, in particular, the influence of access to virtual world environments as a motivator of acceptance	3	The virtual world experience has a positive effect on user acceptance and adoption of the metaverse.	BI01, BI02, BI03, BI04 BI05 SI01, SI02, SI03, SI04, SI05, SI06, SI08	Descriptive analysis
2	Examine consumer purchasing patterns in virtual environments and, in particular, the desire to purchase items in virtual world environments as a motivator of acceptance.	4	Access to virtual currencies has a positive effect on user desire to purchase virtual world items as a motivator of acceptance.	UB001, UB002, UB003 FC6, FC9, PE010, BI03	Descriptive analysis
3	Assess user adoption of alternative digital payment methods in virtual world environments and, particularly, which payment	5	Alternative payment capabilities have a positive effect on user acceptance and adoption of metaverse transactions.	FC6, FC7, FC8, FC9, FC10, BI01, BI02, BI03	Descriptive analysis

RO #	State Research Objective	Hyp #	State Hypothesis	Data collection detail	Data analysis method
	capabilities aid transacting potential for users?				

APPENDIX D

Turn It In Report



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