



Cape Peninsula
University of Technology

**COMPUTER-SIMULATED ENVIRONMENTS IN THE COMMERCIAL SECTOR:
ENHANCING CUSTOMER EXPERIENCE THROUGH 3D SPHERICAL IMAGE
TECHNOLOGY**

by

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A handwritten signature in black ink, appearing to read 'M. Pestana', with a long horizontal stroke extending to the right.

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Date 30/1/2023

ABSTRACT

In today's rapidly evolving business landscape, organisations seek innovative ways to enhance customer experiences and gain deeper engagement. The global pandemic drove the demand for immersive technologies, leading to the emergence of computer-simulated virtual environments as a promising solution. This study aimed to investigate the utilisation of such virtual environments in the commercial sector, with a specific focus on leveraging 3D Spherical Image Technology to enhance the overall customer experience. The study thereby explored user engagement in virtual reality experiences, where integrated marketing communication (IMC) is seen as an additional advantage, enhancing customer experience. The exploration of the enhancement of user engagement in immersive settings was the primary impetus of this study. This investigation examined consumer participation in virtual reality experiences in commercially relevant computer-simulated virtual settings.

The research problem relates to a knowledge gap for immersive access to virtual spaces, in which customers can have a viewing experience that is nearly identical to that of real life, and businesses can seize an opportunity to embed integrated digital marketing material through computer-simulated and virtual/immersive spaces. Spherical photography technology, namely three-dimensional 360-degree cameras, has the potential to play a significant role. This knowledge gap relates to the potential role of immersive technology in enhancing customer engagement through the seamless integration of embedded digital communication.

After analysis of requirements, this interpretive research project designed, developed, implemented and evaluated a computer-simulated business environment through the implementation of a systematic and pragmatic approach that involves the generation of artifacts, utilisation of iterative techniques, and application of build and evaluate methodologies. Evaluation steps included semi-structured interviews conducted among a selection of experienced participants. To do this, a qualitative research approach was used to examine participants' experiences, perceptions, and views. This approach was the ideal way to comprehend user participation in virtual reality environments. Qualitative data analysis of interview transcript data yielded seven informative themes linked to four research questions. These themes offer valued recommendations to theoretical and practical stakeholders and decision-makers, suggesting projects worthy of future research. Four research questions and associated objectives addressed valuable insights and effective approaches for businesses to harness the captivating potential of

virtual reality. The findings of this study have the potential to contribute to transforming customer experiences, offering new opportunities for development and adaptability in an ever-changing business landscape. The study created and evaluated a computer-simulated business environment through iterative and pragmatic artifact generation. It simultaneously emphasised the significant demand for immersive technology and its potential in enhancing customer engagement through embedded digital communication. Moreover, the research explored the role of technology, particularly 3D Spherical Image Technology, in transforming marketing strategies and driving user engagement in virtual reality environments. While recognising the importance of marketing in business success, this study primarily concentrated on user engagement within virtual reality environments. Additionally, the study investigated the impact of 3D Spherical Image Technology on marketing strategies and user engagement during the COVID-19 pandemic.

Keywords Marketing, Integrated marketing communication, Customer engagement, Communication, Virtual reality, Augmented reality, Immersive experiences, Technology, Pandemic, Simulation system, Mixed reality, Build and evaluate, Build and evaluate research.

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1 CHAPTER ONE: INTRODUCTION

In the dynamic business landscape, organizations are constantly seeking novel approaches to enhance customer experiences and cultivate more profound levels of engagement. The previous global pandemic resulted in an increased need for immersive technologies, which has consequently given rise to computer-simulated virtual environments as a potentially effective solution. This thesis aims to conduct a thorough investigation into the utilisation of computer-simulated virtual environments within the commercial sector, specifically emphasising the potential of 3D Spherical Image Technology to enhance the overall customer experience. The main objective of this study is to investigate user engagement in virtual reality settings, with integrated marketing communication (IMC) being regarded as an additional advantage and characteristic that could potentially be embedded into the environment.

The objective of this project is to create and evaluate a computer-simulated business environment. This will be achieved through a systematic and practical process of generating artifacts, utilising iterative methods and build and evaluate methodologies. It is important to examine its considerable potential in enhancing customer engagement by seamlessly integrating embedded digital communication. Furthermore, the study seeks to provide a thorough examination of build and evaluate as a methodology for the development of frameworks and the empirical evaluation of design research theory. The study also seeks to identify effective strategies for addressing the challenges presented by virtual reality environments, while simultaneously highlighting the crucial role of technology in enhancing user engagement in virtual reality experiences.

In the upcoming chapters, we will undertake a comprehensive examination of the theoretical underpinnings of integrated marketing communication. Additionally, we will explore the extensive capabilities of computer-simulated virtual environments in enhancing customer experiences. Furthermore, this paper aims to elucidate the significant impact of technology on the transformation of marketing strategies in virtual reality environments, focusing specifically on enhancing user engagement. Through an analysis of these factors, our aim is to offer valuable observations and effective approaches for businesses to leverage the captivating potential of virtual reality. This will ultimately enhance customer experiences, gain brand loyalty, and strengthen market competitiveness by augmenting user engagement.

1.1 Introduction

Companies are looking for innovative methods to improve consumer experiences and engagement in today's fast-changing business climate. Because of the global epidemic, demand for immersive technology has surged, making computer-simulated virtual environments a viable choice. This thesis investigates the commercial usage of computer-simulated virtual worlds to improve customer experience utilising 3D Spherical Image Technology. The investigation will look into the commercial usage of computer-simulated virtual worlds in the real world. The research makes use of 3D Spherical Image Technology to evaluate how businesses may provide customers with more immersive and engaging experiences.

1.2 Research Context

This study relates to the impact of the COVID-19 pandemic of various sectors of the business world in general and to consumer behaviour in particular. Ali (2020) explores how the change in consumer behavior might be connected to the COVID-19 outbreak as well as the severe restrictions (Ali, 2020). Furthermore, Eger et al. (2021) examine how the pandemic significantly affects customer purchasing patterns at a time when the great majority of consumers are concerned about their health as well as the situation of the economy (Eger et al., 2021). These adjustments in consumer behaviour emanating from the advent of the COVID-19 pandemic suggest a technological gap worthy of research.

Marketing is recognised as a fundamental aspect of achieving success in business, involving a range of strategies including public relations, social media platforms, audience analysis, strategic frameworks, and promotional activities. The dynamic nature of digital media has provided businesses with unprecedented opportunities to increase the exposure of advertisements and products, actively involving customers through various media platforms (Bagaria, 2021). While the significance of integrated marketing communication persists, it is imperative to emphasise that this study primarily concentrates on user engagement within virtual reality environments, rather than exclusively on marketing communication strategies.

As virtual reality technology progresses, businesses must understand its implications and advantages. This thesis provides empirical facts and rigorous analysis to help readers better grasp how 3D Spherical Image Technology and virtual reality experiences will change the future of commercial customer engagement.

1.3 Problem Statement and Aim

This section outlines the problem statement and aim of the study.

1.3.1 Problem statement

A gap in the knowledge regarding strategy for the development and evaluation of a computer-simulated virtual environment within a commercial sector prompted this study. This lack of guidelines addressing the difficulties of granting customers access to physical stores became apparent during the COVID-19 pandemic. People displayed caution and were unwilling to physically approach businesses, commercial activities, or organisations because of the unexpected growth of the pandemic. Customers' purchasing habits were significantly affected by this shift in consumer behaviour brought on by the pandemic, with health and financial considerations taking precedence (Eger et al., 2021).

Four significant foci emerge, namely:

- An evaluation of the variations in user involvement within virtual reality experiences provided by commercially available computer-simulated virtual worlds.
- The development and analysis of a computer-simulated business environment through a methodical and useful process of producing artefacts, using iterative approaches, and using build and evaluate procedures.
- A focus on how integrated digital communication may improve consumer engagement in virtual environments that are fully immersive.
- The examination of how technology—in particular, 3D Spherical Image Technology—can change marketing tactics and raise user engagement in virtual reality settings. During a pandemic, it reviews how this technology might be used to modify marketing strategies in response to the difficulties provided by virtual reality surroundings.

The project provides useful observations on the possibilities of 3D spherical image technology and integrated digital communication in the business sector, in addition to advancing the understanding of user engagement in virtual reality settings.

A need for immersive access to virtual spaces developed around that time, giving customers an experience that closely mirrored real-life interactions and giving companies the chance to embed integrated digital content through computer-simulated and virtual/immersive settings. Technology

for spherical photography, particularly three-dimensional 360-degree cameras, has shown significant promise for producing immersive depictions of real-world environments and other views (Guan, 2011). To improve user engagement in virtual reality environments and address the main issue of giving consumers access to actual stores. The study focused heavily on user experience and immersive access as it explored the creation and assessment of commercially relevant computer-simulated virtual worlds.

To promote consumer engagement and create better experiences, it was important to find out how organisations may successfully incorporate information in immersive virtual worlds. This study aimed to provide beneficial solutions to businesses, enabling them to contact clients even in trying times by bridging the gap between physical and virtual locations. Businesses might provide clients with an experience that closely mimicked real-life interactions by integrating immersive technology, encouraging greater engagement and expanding accessibility. Consequently, the research aimed to transform how companies approach customer experiences, offering fresh chances for development and adaptability in a constantly shifting business environment.

1.3.2 Aim

This study explores the potential enhancement of customer experiences using 3D spherical image technology within computer-simulated virtual environments in a commercial sector.

1.4 Research Questions and Objectives

The study poses four research questions which demarcate a research map, identifying research gaps. These research questions establish a focus for the study. In parallel, four research objectives specifically guide and action the answering of the research questions.

Table 1-1 below tabulates research questions (RQ1 – RQ4) and associated objectives (O1 – Q4) set out in the first and second columns respectively. The final column maps research questions and objectives to chapter sections, providing links to supportive content. Links associate the research questions to both theoretical sources (Chapter Two) and empirical findings (Chapter Four).

Table 1-1 Research Question, Objectives and Chapter Sections

Research Questions	Objectives	Chapter Sections
RQ1 How does user engagement vary within virtual reality experiences offered through computer-simulated virtual environments in the commercial sector?	O1 To determine how user engagement varies within virtual reality experiences	2.2, 4.2, 5.2.1
RQ2 What design challenges are faced by users of immersive virtual spaces?	O2 To establish the design challenges experienced by users of an immersive virtual space	2.4, 4.3, 5.2.2
RQ3 How does embedded digital communication contribute to enhancing customer engagement within immersive virtual spaces?	O3 To explore the contribution of digital communication to the enhancement of customer engagement	2.3, 4.4, 5.2.3
RQ4 What is the impact of technology, especially 3D Spherical Image Technology, on the transformation of marketing strategies and user engagement within virtual reality environments during a pandemic?	O4 To investigate the impact of technology on the transformation of marketing strategies	2.5, 4.5, 5.2.4

1.5 Research Strategy: Design and Methods

The qualitative study adopted an interpretivist strategy. It comprised the design, development, implementation and evaluation of a customer-oriented, 3D spherical image technology within computer-simulated virtual environments in a commercial sector by applying the processes outlined by the ADDIE model. It thereafter explored participant responses to and perception of the built artifact during semi-structured interviews. Data collection sought thick and rich data aimed at eliciting meaningful themes and recommendations during qualitative data analysis.

1.6 Summary of Chapters

Table 1-2 summarises dissertation chapters.

Table 1-2 Summary of Chapters

CHAPTER	SUMMARY
ONE INTRODUCTION	<p>Contextualises the study.</p> <p>Sets out the problem statement and aim.</p> <p>Poses research questions and associated research objectives.</p> <p>Defines the research strategy: design and methods.</p> <p>Outlines emergent themes and recommendations.</p> <p>Addresses limitations and delimitations.</p>
TWO LITERATURE REVIEW	<p>Discusses leveraging of integrated marketing communication.</p> <p>Reviews the enhancement of end-user engagement.</p> <p>Assesses the shaping of modern world via computer simulation.</p> <p>Explores the impact of transforming marketing strategy.</p>
THREE RESEARCH DESIGN AND METHODOLOGY	<p>Defines purpose, research questions and objectives.</p> <p>Presents research design and methodology.</p> <p>Describes the application of ADDIE model - synthesis of the artifact.</p>
FOUR FINDINGS	<p>Presents seven themes linked to four research questions, namely:</p> <ul style="list-style-type: none"> • Pandemic challenge. • Design challenges. • Design improvement. • Safety reasons during the pandemic. • Ease of access. • Business growth. • Efficacy.
FIVE CONCLUSIONS, RECOMMENDATIONS AND CONTRIBUTIONS	<p>Revisits the research questions.</p> <p>Makes recommendations.</p> <p>Considers theoretical, methodological and practical contributions.</p> <p>Details limitations and delimitations.</p> <p>Poses possible future research for consideration.</p>

2 CHAPTER TWO: LITERATURE REVIEW

An initial introduction to the literature review section is followed by four themed outlines, set out as:

- Leveraging integrated marketing communication for user engagement in immersive virtual reality spaces.
- Enhancing end-user engagement and experience in immersive settings.
- Shaping the modern world via computer simulation systems and digital touch points and design considerations.
- Impacting and transforming marketing strategies and user engagement using technology within virtual reality environments amid a pandemic.

2.1 Introduction

This qualitative project aimed to develop and evaluate a computer-simulated business environment by using an iterative and pragmatic approach to artifact generation, grounded in build and evaluate approaches. The purpose of this project is to investigate the need for immersive technology during a pandemic and to increase customer engagement through embedded digital content, further, to provide a comprehensive study of build and evaluate as a methodology for framework development and empirical evaluation of design research theory,

Marketing is critical to the success of any business, and the phrase "marketing communications" was initially envisaged as a managerial role. The bulk of marketing communication tactics include public relations, direct marketing, sales promotion, and advertising. The most current technological advancements provide unprecedented opportunity to increase the visibility of adverts and merchandise. Furthermore, they aggressively engage clients via a variety of media (Bagaria, 2021). Because of ongoing improvements in digital media, the original integrated marketing communication framework idea has either lost all or a large portion of its usefulness. The study is significant because it helps the reader understand integrated marketing communication as well as the impact that technologies such as virtual reality have on modern marketing. Integrated marketing communication (IMC) is a strategy that may combine public relations, social networks, audience analytics, the strategic principles of the business, and advertising to create a consistent brand identity across a variety of media platforms.

2.2 Leveraging integrated marketing communication for user engagement in immersive virtual reality spaces

Integrated marketing communication (IMC), also known as integrated marketing, plays an essential part in today's marketing strategy, since it ensures communication with stakeholders that is open, trustworthy, and ongoing. IMC becomes a critical tool in the process of building consistent brand identities and seamless product experiences across a variety of media platforms as businesses work towards their goal of engaging people in immersive virtual reality (VR) locations. This literature study investigates the role of IMC in enhancing the total consumer experience in virtual reality settings by boosting user interaction, establishing immersive places, and using digital marketing methods.

IMC is a unified communication medium that is formed by combining a variety of different promotional strategies (Bagaria, 2021). According to Camilleri (2018), it is a key component of the marketing strategy of a company, with the goals of increasing consumer awareness and improving sales by educating people about the unique benefits offered by the business's products. Businesses may improve their image and the quality of their connections with stakeholders by establishing a consistent brand identity across a variety of media platforms (Yeshin, 2008). This can be accomplished by incorporating public relations, social networks, audience analytics, and advertising into their marketing strategies.

IMC is known for its consistent use of the practice of combining traditional and contemporary forms of media into a single marketing effort. According to Yeshin (2008), integrated marketing communications (IMC) plays an essential part in the development and execution of multi-channel advertising and public relations campaigns in the context of immersive virtual reality (VR) worlds. Virtual reality (VR) is a strong tool for user interaction, making it possible for customers to engage with a company's products and services on a more profound level. According to Yoon et al. (2010), companies may use virtual reality to blur the barriers between physical and digital worlds by creating interactive experiences and virtual tours with a 360-degree field of view.

IMC in immersive VR settings benefits from the addition of digital marketing, which enables business to more effectively connect and interact with their target audience. According to Camilleri (2018), direct marketing tactics allow for personalised and direct engagement with clients, which increases the possibility of conversions. Examples of direct marketing techniques include electronic direct mail and email marketing. In addition, internet marketing, which includes search

engine optimisation (SEO) and display advertising, makes it possible to precisely target customers depending on the interests and actions of those customers (Anderson, 1996). According to Bastug et al. (2017), the application of data-driven marketing strategies in virtual reality (VR) environments enables businesses to develop persuasive advertising and brand messages.

IMC is the foundation for increasing user involvement in immersive VR areas and acts as its cornerstone. IMC helps customers make purchasing decisions by merging many communication specialisations into engaging commercial communications (Direction, 2006). This allows IMC to influence customers' purchasing decisions. According to McGrath (2005), this guarantees that consumers understand and properly absorb information, which gains favourable interactions with the brand as well as long-term customer connections. IMC is an invaluable tool for businesses that want to cultivate long-term brand loyalty because of its low cost, capacity to give a greater return on investment, and other advantageous characteristics (Keller, 2000).

According to Lee and Yoon (2020), the effectiveness of IMC in the creation of immersive and empowering experiences can be shown in the #LikeAGirl campaign that was run by Always. Always used social media, print media, and television as part of its integrated marketing communications (IMC)-driven campaign to appeal to the next generation of potential customers as they went through the transition from childhood to early adulthood. The primary video of the #LikeAGirl campaign, which was directed by Lauren Greenfield and attracted the attention of people all over the world, was able to drastically alter the target audience's opinions of the phrase "like a girl" (Lee and Yoon, 2020).

When it comes to increasing user engagement in immersive virtual reality worlds, integrated marketing communication is a valuable instrument that may be utilised. Businesses can build consistent brand identities as well as engaging brand experiences that appeal with customers even when they are operating in virtual reality settings if they use a variety of promotional approaches and digital marketing strategies. As virtual reality (VR) continues to define the future of marketing, understanding in-game marketing communications (IMC) will be essential for organisations that want to establish long-term client loyalty and remain competitive in this ever-changing field.

Relevance of the literature to this study

The literature review is in accordance with the thesis objectives, which involve examining user engagement in virtual reality experiences. Specifically, the focus is on the role of integrated marketing communication and 3D Spherical Image Technology in this context. This paper examines the role of integrated marketing communications (IMC) in fostering user engagement through the creation of immersive environments and the utilisation of digital marketing strategies. The review underscores the significance of integrated marketing communications (IMC) in establishing coherent brand identities and brand experiences, aligning with the central theme of the thesis, which aims to enhance customer experiences and engagement. Moreover, the discussion of in-game marketing communication and its implications for the future of marketing is closely linked to the examination of technology's impact, specifically the utilisation of 3D Spherical Image Technology, in revolutionising marketing tactics and enhancing user involvement within virtual reality environments amidst a pandemic.

2.3 Enhancing end-user engagement and experience in Immersive Settings

Ferreira and Pereira (2020) examine the impact of virtual reality (VR) and artificial intelligence (AI) on consumer interest and purchase intentions. Virtual reality (VR) and artificial intelligence (AI) have garnered considerable attention in the field of business marketing owing to their immense potential in engaging and captivating customers. The utilisation of innovative marketing techniques has been observed to attract customers to the market, leading to inquiries regarding their influence on marketing strategy, particularly during the pre-purchase, purchase (intention), and post-purchase phases of the consumer journey (Ferreira and Pereira, 2020).

In the contemporary competitive business environment, the utilisation of virtual reality (VR) technology has emerged as a noteworthy enhancer of marketing strategies, enabling organisations to effectively captivate and involve customers. The interactive and immersive tools of virtual reality (VR) possess significant potential in influencing consumer experiences and behaviour (Ysik and Opaciski, 2019). This technological advancement enables enterprises to conduct an analysis of contemporary consumer behaviour and their interactions within the market and with various products, utilising content analysis techniques.

The increasing trend of digitalising communication channels has a significant influence on the strategic development and implementation of marketing communications (Mazurek, 2011a). To

achieve optimal utilisation of marketing communications, it is imperative to possess a thorough comprehension of social phenomena, business operations, and information communication tools and technology. The integration of all available communication channels is of utmost importance to achieve successful marketing communications, as it guarantees dependable and punctual coordination. According to Hajduk (2016), the implementation of modern marketing communication strategies by businesses enables effective dissemination of messages to their clientele.

Virtual reality (VR), being a nascent medium, presents distinct prospects for the dissemination of content. According to Biocca (1992), the interactive nature and capacity to alter perceptions of time and space of this technology empower users to effectively regulate their experiences. The implications of virtual reality (VR) on communications encompass a wide range of areas, such as the dissemination of VR technology, the impact on communication design and cognition, and the influence on interpersonal communication and collaborative work (Mazurek, 2011b). The creation of interfaces with superior quality on platforms that involve objects or entire realities results in an experience that is difficult to differentiate between the physical and virtual realms (Barnes, 2016).

The advent of novel technological advancements and virtualisation methodologies, specifically the rapid growth and widespread adoption of the internet, has brought about a transformative impact on the field of marketing communication (Mazurek, 2012). Virtual reality (VR) has emerged as a captivating technological innovation that is garnering significant interest as a novel approach to promoting goods and brands. This is primarily attributed to the growing affordability of VR for consumers (Adams, 2016). Several industries, such as travel and tourism, experience marketing, and product testing, utilise virtual reality (VR) technology to augment customer experiences and interactions with their respective offerings (Scott, 2016; Mandelbaum, 2015). Further research is needed to fully understand the potential of virtual reality (VR) in the realm of real estate marketing. However, existing studies indicate that augmenting property visibility through various media platforms, including open houses and virtual tours, has a positive impact on trading prices (Benefield et al., 2012).

The integration of real and virtual environments in augmented reality (AR) facilitates immediate user engagement and the seamless alignment of three-dimensional objects, resulting in a captivating user experience (Bonetti, Warnaby, & Quinn, 2018). Augmented reality (AR) and virtual reality (VR) are integral components of marketing strategies employed by businesses

across diverse industries such as business, entertainment, education, healthcare, and defense (Bonetti, Warnaby, and Quinn, 2018). These technologies are utilised to enhance sales and attract clients, highlighting their significance in the marketing landscape.

The incorporation of virtual reality (VR) software development within marketing communications enables businesses to enhance the efficacy of their promotional efforts for products and services. According to Bonetti, Warnaby, and Quinn (2018), businesses have the opportunity to engage customers through the utilisation of virtual reality (VR) and augmented reality (AR) technologies. These technologies enable businesses to offer unique and immersive experiences that captivate customers, whether it be through interactions with products, companies, or the physical environment. The advent of personalised advertising has enabled the creation of tailored experiences for individual consumers, leading to increased efficiency in capturing the attention of potential clients (Bonetti, Warnaby, & Quinn, 2018).

The appeal of augmented reality (AR) and virtual reality (VR) stems from the significant interest among individuals in technology, rendering it a potent instrument for customer engagement (Bonetti, Warnaby, and Quinn, 2018). According to Bonetti, Warnaby, and Quinn (2018), the integration of augmented reality (AR), virtual reality (VR), and artificial intelligence (AI) technologies enables businesses to enhance the quality of shopping experiences, strengthen the connection between the digital and physical realms, and gain valuable insights for enhancing user interactions. The incorporation of artificial intelligence (AI) into virtual reality environments facilitates the process of decision-making and reduces the need for physical interaction, thereby providing support for a range of technologies such as computer vision, simultaneous positioning, mapping, and machine learning (Bonetti, Warnaby, and Quinn, 2018).

Relevance of the literature to this study

The literature review correlates with the objectives of the thesis, which are to enhance end-user engagement and experience in immersive environments. It elaborates on the influence of VR and AI on consumer engagement and behaviour, which is directly related to the thesis's emphasis on examining user engagement in immersive virtual reality spaces. The evaluation examines the ability of innovative marketing techniques, such as VR and AI, to captivate consumers and strengthen digital-to-physical connections. It emphasises the significance of personalised experiences and the use of VR and AR for enhancing consumer engagement and interactions,

which is closely aligned with the objective of the thesis to enhance end-user engagement and experience.

2.4 Shaping the modern world via computer simulation systems, digital touch points and design considerations

Virtual reality, when used for customer engagement, may cover a gap of having to guess consumer intent. In-store merchandisers may reliably assess customer perception and intent utilising headsets that detect user's eye movements and utilise this data to establish optimum product placement in-store. Marketers may also easily change test case variables and try out other situations owing to the versatility of virtual reality design (Koptelov, 2022).

A study on the use of immersive technology in customer experience management was undertaken by Dieck and Han (2021). Their main contention is that immersive technologies redefine and revolutionise the co-creation of value in relation to associating the control of client experiences. In this context, taking into account the importance of business and market research, Dieck and Han create a customer experience management approach that investigates the efficacy of new immersive technologies (augmented and virtual reality). However, the study's results show that when it comes to creating customer experiences, the CMX framework serves as a guide for academics and business professionals (Dieck and Han, 2021). Like this, Scholz and Smith did a study on augmented reality experiences that are immersive. They assert that augmented reality is currently exerting a noteworthy influence on the design of immersive brand experiences, interactive advertising, and consumer engagement in marketing communication. The authors used secondary data analysis to perform their investigation and presented a strategy for locating the current augmented reality practice gap. They concluded that user-brand, user-user, and user-bystander engagement strategies can all assist marketers increase consumer involvement in the marketing communication process (Scholz and Smith, 2016).

According to Schmitt (1999:12), successfully produced customer experiences provide "sensory, emotional, cognitive, behavioral, and relational qualities that replace functional values". The CMX process, according to Schmitt's paradigm (1999), consists of five steps: assessing the customer's conceptual universe, building an experiential platform, creating a brand experience, organising the customer's experience, and engaging in continuous improvement. Edelman and Singer (2015) urge companies to analyse consumer experience and interactions from a customer journey perspective in order to improve the entire customer experience. According to Ratcliff (2015, p. 1),

"customer experience is the sum of all interactions that a customer has with a company over the course of their lifetime relationship, taking into account not only the key touchpoints (product consciousness, social contact, the transaction itself, and post-purchase feedback), but also how individualised and memorable these experiences are". Furthermore, Verhoef et al. (2009) hypothesised that depending on how the technology is implemented, technological developments like self-service counters would muddy the lines between influencing elements and have an impact on how customers perceive their experiences. Extreme customer loyalty and the management of comprehensive customer experiences that integrate functional and emotional factors make them tough for competitors to duplicate. It is clear from past studies that a temporal perspective was used to evaluate a specific occasion while broadly examining client experiences. However, managing customer experiences necessitates ongoing review and assessment of stakeholders' existing and new interventions. The goal is to address the emotional and functional cues that efficiently create ongoing total customer experiences to elicit from consumers certain emotional reactions that may gain long-term customer loyalty. Homburg et al. (2017) proposed that CMX be a corporate-wide strategy that unifies the organisation's competencies, strategic directions, and cultural attitudes into a single framework to provide value for the client.

While giving customers an immersive and interactive experience, Virtual Showroom provides the appearance and feel of a physical showroom. From the comfort of their homes, customers can examine and research each item at their own pace. For product owners, a virtual showroom setting provides a variety of alternatives. It comprises simple product integration with videos and brochures, product placement on podiums in eye-catching places, and placement of advertisements and posters in desirable locations. Since virtual showrooms provide 24 hour shopping, traditional store hours are a thing of the past (Yoon et al., 2010). The virtual showroom delivers experiences for customers and store managers with choices for performing many trials, real-time product alteration, real-time product transformation, and real-time placement. Even shop owners benefit from virtual showrooms because there are no large rent rates or loan-driven showroom upkeep costs. For many personnel across numerous industries and locations, AR/VR has enabled a smooth transition from on-site training to a clear depiction of step-by-step instructions. Technology has had a significant impact on how customers conduct their research, engage with companies, and make their final purchases. Potential customers are more selective about brand authenticity now that they have access to more information; many claim that reality determines the potential relationship between themselves and the brands they are most inclined

to support. AR/VR enables businesses to reach a wider audience and deliver important and occasionally defining messages. For instance, huge businesses have used AR and VR technologies to enable transparency and demonstrate their commitment to sustainability, which is what many consumers are buying into (Yoon et al., 2010).

One of the key areas of development right now is the interaction of numerous users in a single computer-generated environment in VR or a single piece of content in AR or MR. In order to co-create content and ultimately generate value, it provides the opportunity for meeting and fluid collaboration with the virtual environment. To ensure efficient and successful technology integration and use, however, and prevent potential customers from becoming alienated by usability concerns, a great deal of study is still required in the area of multi-user interactivity employing immersive technologies. Potential users' unresolved technical problems are a common challenge for early prototypes of developing technology. This reduces the likelihood of emergent technology being accepted and used (Yoon et al., 2010).

Customers can participate in the co-creation of organisational/business services by using immersive technologies. As demonstrated by examples from the convention and entertainment industries, consumers can co-create, post, and share interactive material to create unique, enhanced, and personalised experiences. Because they lack critical components of immersive technology, 360-degree virtual reality tours and other applications used solely for marketing are likely to fall short and deliver subpar experiences. All stakeholders should be associated with the management of projects in order to co-create value, add meaningful experiences (rather than PR possibilities), and deliver stakeholder benefits. By integrating brand information into clients' social and physical environments, augmented reality provides marketers with a unique opportunity to communicate with customers and incorporate it into their interactions. Therefore, the key question is: by maximising the interplay between proactive and reactive AR elements, customer engagement, user experience, and user feedback are three types of customer engagement that can be promoted. Marketers may regularly increase engagement by adopting little changes to how users interact with augmented reality content, other users, or onlookers. As a result, increasing an AR campaign's chances for engagement and its investment return may be easier than previously believed (Bastug et al., 2017).

The unique contribution augmented reality could provide to integrated marketing initiatives is significant. But in order to realise its complete capacity, advertisers must look past cutting-edge

tools and think about how to design customer experiences that combine digital data with the real and virtual worlds. They must consider both the active and passive elements of augmented reality. They must also create consumer experiences that consider their marketing objective, the traits of their intended audience, content management strategies, the motivations of the users, and the social and physical context of their lives. Customer involvement and all of its elements, such as affordance, sociability, and artifacts, must be their primary focus. Customers will be delighted by marketers who develop clever tactics that take advantage of these components and deliver ground-breaking AR activities. VR advertising is among the first ideas that spring to mind when considering immersive advertising. A campaign takes less time and money to develop, and multiple viewings by various viewers do not detract from the appeal of the experience (Bastug et al., 2017). With little more than headgear, VR may let users enjoy games, go on private tours, or test out products. In addition, AR can display products even when they are not actually there. Customers can utilise augmented reality (AR) with IKEA's catalog application, for instance, to visualise certain goods in their homes using a phone or tablet.

Retailers must find new ways to draw customers back into their stores by including them in the co-creation of dynamic, creative, personalised experiences that combine and synthesise potential available in mobile platforms with physical retail settings (Pantano et al., 2017). Given the population's digitalisation, retailers must look to emerging technologies to draw customers into their stores. AR and VR are the latest technologies that are being accepted by retailers. AR overlays real-time virtual annotations such as data, images, and audio on top of the physical environment, whereas VR entirely submerges viewers in a virtual environment (McKone et al., 2016). IKEA and Wayfair have incorporated AR because of its ability to measure the external conditions and adapt the visual overlay accurately (Young 2016). Improving the ability of customers to picture how furniture fits together has a significant impact on their overall shopping experience and decision-making (Oh et al., 2008). Customers are happier and more likely to make a purchase when they have an AR-enhanced experience (Poushneh and Vasquez-Parraga, 2017). An example of this kind of augmented reality (AR) is the "Magic Mirror", which uses motion capture to place virtual annotations like make-up and accessories on top of the user's actual image in order to produce a more realistic impression than an interlaced digital picture (Javornik et al., 2016).

Relevance of the literature to this study

The literature review corresponds with the objectives of the thesis by discussing at length the function of immersive technologies, such as VR and AR, in enhancing consumer engagement and experiences. It investigates the ability of these technologies to transform marketing strategies, facilitate personalised interactions, and co-create value with consumers. The assessment also highlights the significance of AI and stakeholder participation in the development of immersive experiences. In addition, it emphasises the impact of augmented reality on visualising products and boosting customer satisfaction, which is directly related to the objective of the thesis, which is to enhance end-user engagement and experience in immersive settings.

2.5 Impacting and transforming marketing strategies and user engagement using technology within virtual reality environments amid a pandemic

A study of technological and entrepreneurial marketing choices made during the COVID-19 period was presented by Polas and Raju (2021). Their consideration of the opportunities, problems, and recognition arising from the pandemic served as the main example of how technology influences marketing choices. The use of artificial intelligence (AI) in making marketing decisions was investigated by the writers. The study's conclusions showed a strong correlation between the recognition of entrepreneurial opportunities, their expansion, and their exploitation in marketing decisions, which would be helpful to practitioners, academics, and other connected parties (Polas and Raju, 2021). Nah and Siau (2020) studied how information technology helped businesses adapt to the pandemic and adjust to the unprecedented situation. Particularly noteworthy is their description of how information technology greatly enhanced the durability and continuity of corporate processes. They emphasised a number of technical trends, including the Internet of Things, robots, artificial intelligence, machine learning, robotic supply chains, and data analytics. They found that such technologies had a considerably favourable impact on modern company activities (Nah and Siau, 2020). In accordance with this, Patma et al. (2020) presented research on the use of social media marketing to change corporate operations during the COVID-19 epidemic. They examined the impact of internet and e-business technology (IEBT) on corporate operations in the midst of pandemics by examining funding, benefits perceived, and outside pressure. In this respect, the study found that adoption of IEBT and social media marketing was impacted favorably by perceived benefits and outside environment (Patma et al., 2020).

In order for businesses in a pandemic to be successful, entrepreneurship innovation is essential since the outcomes ensure that goods and services are ready for market before they deteriorate (Sharma et al., 2020). At the exposure stage, the economic demand may be the least essential, depending on the company's size and level of innovation, as well as the duration of the growth timeline. The numerous finance sources needed to build an entrepreneurial venture should be supported in various ways (Mogaji et al., 2020).

In the context of the COVID-19 travel restrictions, technology aids entrepreneurial marketing options by analysing the likelihood of recognition (Bartlett and Burton, 2020). AI could be a useful tool in this circumstance, when people work from home, because it allows business leaders to make decisions from afar (Ploum et al., 2018). It is not uncommon for entrepreneurs to be recognised for their achievements in light of a combination of societal norms, external factors, and the investor's own subjective viewpoints. Product, process, business model and marketing methods can be developed that allow business owners to profit from the difference in production expenditure and profits (Jahanshahi et al., 2020). New technology, inadequacies of skill, demand for products, business model development, industry upheaval and evolving consumer attitudes, innovation and knowledge recombination are only few of the sources of opportunities. COVID-19 was able to produce breakthrough AI-based products and services because of the new emergence of AI that can be considered as an evolutionary development of industries and a generator of entrepreneurial opportunities.

Mostly in the case of AI-based product validation conducted through prototyping, development of an appropriate product with acceptable capability, and market and input research, the outcome would be market-ready at COVID-19. Marketing decisions are clearly linked to the creation of entrepreneurial prospects. Better opportunity generation via market research influences marketing decisions, notably during COVID-19 (Morrish and Jones, 2020). Technology, like a human brain, tends to solve the problem of decision-making in this case. When it comes to business proprietors making a strategic decision under COVID-19-related movement restrictions, it is evident that artificial intelligence plays an important role.

With the use of technology, businesses can manage their customers digitally over the phone and online. Customer service must be a crucial capability of a business to draw in and keep clients (Javaid et al., 2020). However, this calls for a sizable staff of customer service representatives to handle inquiries and offer advice via client chatbots. All client inquiries should be handled quickly

and sensibly while taking the needs of the user into account. In this instance, technology enables business owners to concentrate on their marketing choices as they prepare for the effects of COVID-19. Customers were afraid to visit businesses because of COVID-19 due to concerns about virus infection (McCall, 2020). In this scenario, customers could use the corresponding services from their homes by telephone, which could be provided by an online robot powered by AI. Technology enables business owners to make marketing choices that are pertinent to the COVID-19 epidemic or other worldwide pandemics.

Opportunities to influence marketing decisions are influenced in the order of their identification, development, and exploitation (Boone et al., 2019). However, in the course of COVID-19, these responsibilities could not be fulfilled without the assistance of technology, which has the potential to be more reliable than the performance of humans. As a consequence of this, proprietors of businesses could reduce their operational expenses and safeguard themselves against COVID-19. As was mentioned before, a context-related company start-up would identify, cultivate, and capitalise on opportunities that emerged as a direct result of a passion for engaging in entrepreneurial activity inside a certain area. An operation that is placed in an entrepreneurial spirit that supports any marketing choices made during COVID-19 is likely to be the consequence of an effective general state of entrepreneurial orientation that was implanted in a specific context. This is because virtual reality was designed to encourage and support innovative and creative problem-solving and decision-making. Because of this, it is reasonable to assume that a person's excitement for starting their own business may play a role in their decision-making (Murnieks et al., 2020). In this particular example, it is quite evident how technological advancement can bolster entrepreneurial strength, which then goes on to affect marketing choices.

Technology provides assistance with data processing, and it also contributes to the marketing decisions that may be made for products or services (Polas et al., 2020a). When it comes to making important decisions about marketing, every business must rely on the information, goods, or services provided by its customers. The information is first obtained, then stored, and finally transmitted to the appropriate business department in order to be utilised further. As a result of the COVID-19 outbreak, various administrative tasks, such as filling out forms, updating files, and cross-referencing paperwork, might become necessary under this circumstance. As a result of this advantage, numerous organisations could implement data management systems that were enabled with AI in order to detect extortion, maintain their online safety, and improve their overall operations throughout the epidemic (Di Vaio et al., 2020).

Technology, and specifically artificial intelligence, plays a crucial role in predicting the behaviour of customers and generating product recommendations. During the pandemic (Ting et al., 2020), in domains that were quickly increasing with the support of technology, the potential of the technology cannot be described through words alone. During COVID-19, Lucas et al. found that even while businesses frequently need to market and advertise their products or services, investing a considerable amount of money does not always result in new prospects and return transactions. As a direct consequence of COVID-19, the next significant technological advance in the business world would be artificial intelligence (AI), which will enhance corporate procedures and increase levels of competitiveness. AI should make it feasible for businesses to recognise, think about, and understand their ideal consumers, as well as understand the kind of goods and services that these customers may demand at any given time. Marketers are now in a position to anticipate purchaser behavior and monitor data-based initiatives during any catastrophic event, with exceptional results that would increase their marketing plans thanks to the support of big data and numerous technologies (Ienca and Vayena, 2020). An ever-increasing variety of businesses are finally coming to the realisation that artificial intelligence and machine learning offer many benefits that have been anticipated for a long time. AI is becoming more utilised in business intelligence operations daily, particularly in light of the COVID-19 outbreak. Recent years have seen a proliferation of applications for AI in the business world, ranging from pattern recognition to process automation (Haider Syed et al., 2020). It boosts growth. Businesses may make quicker, real-time marketing decisions using computer algorithms to find trends. AI supports a well-defined corporate strategy with centralised culture and values across multiple industries (Donthu and Gustafsson, 2020).

Relevance of the literature to this study

The literature review corresponds well with the aims of the thesis, which are to comprehend the significance of technology, particularly immersive technologies, in promoting digital communication activities during the COVID-19 pandemic. The evaluation provides in-depth insights into how businesses have utilised VR, AR, and AI to adjust to challenges, improve customer experiences, and make data-driven marketing decisions. It also highlights the significance of these technologies in predicting consumer behaviour, enhancing customer engagement, and maintaining competitiveness. Overall, the literature review supports the objectives of the thesis by emphasising the importance of technology in reconfiguring digital communication strategies in response to pandemic-induced changes and uncertainties.

2.6 Conclusion

The literature research reveals significant findings pertaining to user engagement and user experience in the context of virtual reality (VR) settings and integrated marketing communications (IMC) within virtual environments. The concept of Integrated Marketing Communications (IMC) assumes a prominent role as it serves as the basis for developing coherent brand identities and facilitating seamless product encounters within immersive virtual reality (VR) environments. The integration of several promotional approaches within a singular medium gives rise to Integrated Marketing Communications (IMC) as a potent strategy for teaching consumers about product attributes, augmenting brand perception, and exerting influence on purchasing choices. Nevertheless, the inherent potential of IMC is in its capacity to generate immersive environments that cultivate profound user engagement and interaction, hence enhancing the user experience.

The literature emphasises the significant significance of developing technologies, including virtual reality (VR) and artificial intelligence (AI), in the endeavour to improve user engagement and enjoyment in immersive environments. Virtual reality (VR) offers an exceptional medium for effectively involving clients in meaningful and interactive experiences, facilitating comprehensive examinations of various items and services. Artificial intelligence (AI) enhances this process by facilitating the examination of consumer behaviour and customising experiences based on individual preferences, leading to exceptionally personalised and captivating engagements. In addition, Augmented Reality (AR) and Virtual Reality (VR) present dynamic mechanisms for augmenting user experiences by effectively erasing the distinctions between the physical and digital realms, granting users agency over their encounters and interpretations.

The research also emphasises the significance of modifying marketing strategies in times of disruption, such as a pandemic. In the realm of data-driven marketing, the use of technology, namely artificial intelligence (AI), assumes a crucial position. This technology facilitates the process of making informed decisions based on data, accurately forecasting customer behaviour, and effectively delivering captivating and pertinent content. Amidst the COVID-19 pandemic, technology emerged as a crucial resource for numerous enterprises, facilitating the uninterrupted continuation of their activities and facilitating distant interactions with clientele.

The scholarly literature emphasises the crucial significance of integrated marketing communication (IMC) and immersive technologies such as virtual reality (VR) and artificial

intelligence (AI) in relation to their impact on user engagement, interaction, and the improvement of user experiences within immersive settings. These observations underscore the flexibility and significance of these approaches in addressing the changing requirements and obstacles of marketing, especially in the presence of unforeseen upheavals. In essence, the significance of prioritising user-centric strategies in marketing within immersive settings is emphasised, with a particular focus on the utmost relevance of engagement and experience.

The incorporation of virtual reality (VR), augmented reality (AR), and artificial intelligence (AI) technologies offers businesses the opportunity to augment customer engagement, provide tailored experiences, and make informed marketing choices based on data. Throughout the COVID-19 pandemic, technology assumed a pivotal role in facilitating the adaptation of businesses to the novel challenges, enabling digital customer management, and facilitating the anticipation of consumer behaviour. Nevertheless, the review also acknowledges the existence of areas that necessitate additional research and development. A significant domain of interest pertains to the utilisation of immersive technologies for multi-user interactivity, wherein the collaborative development of content and the generation of value can be investigated. Furthermore, further investigation is warranted in order to comprehensively understand the potential implications of immersive technologies within particular sectors, such as the realm of real estate and retail.

In summary, the literature review underscores the significant impact of immersive technologies on marketing and underscores the imperative for businesses to adopt these technologies to enhance customer experiences, effectively engage with their intended audience, and maintain competitiveness within the ever-evolving business landscape. The ongoing evolution of technology will have a lasting influence on marketing strategies and consumer behaviour, thereby exerting a significant impact on the future of businesses.

3 CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter briefly tabulates research questions and objectives (Section 3.2). Thereafter, Sections 3.3 and 3.4 respectively set out the research design and methodology underpinning the study. Section 3.5 details the design, development, implementation and evaluation considerations of the 3D artifact.

3.2 Research questions and objectives of the study

The study was demarcated by four research questions (RQ1-RQ4) and related objectives (O1-O4) , set out earlier as Table 1-1.

3.3 Research Design

The study incorporated the analysis, design, development, evaluation, and implementation of a computer simulated virtual environment specifically utilising 3D Spherical Image Technology in a commercial context. An interpretivist philosophy, informed by the research onion (Saunders *et al*, 2019), was employed to explore in-depth participants' experiences, perceptions, and opinions, aligning with the objective of understanding user engagement in virtual reality environments. An inductive research approach incorporated a cross sectional survey strategy where qualitative data was collected during semi-structured interviews. Data analysis included thematic analysis of encoded participant responses.

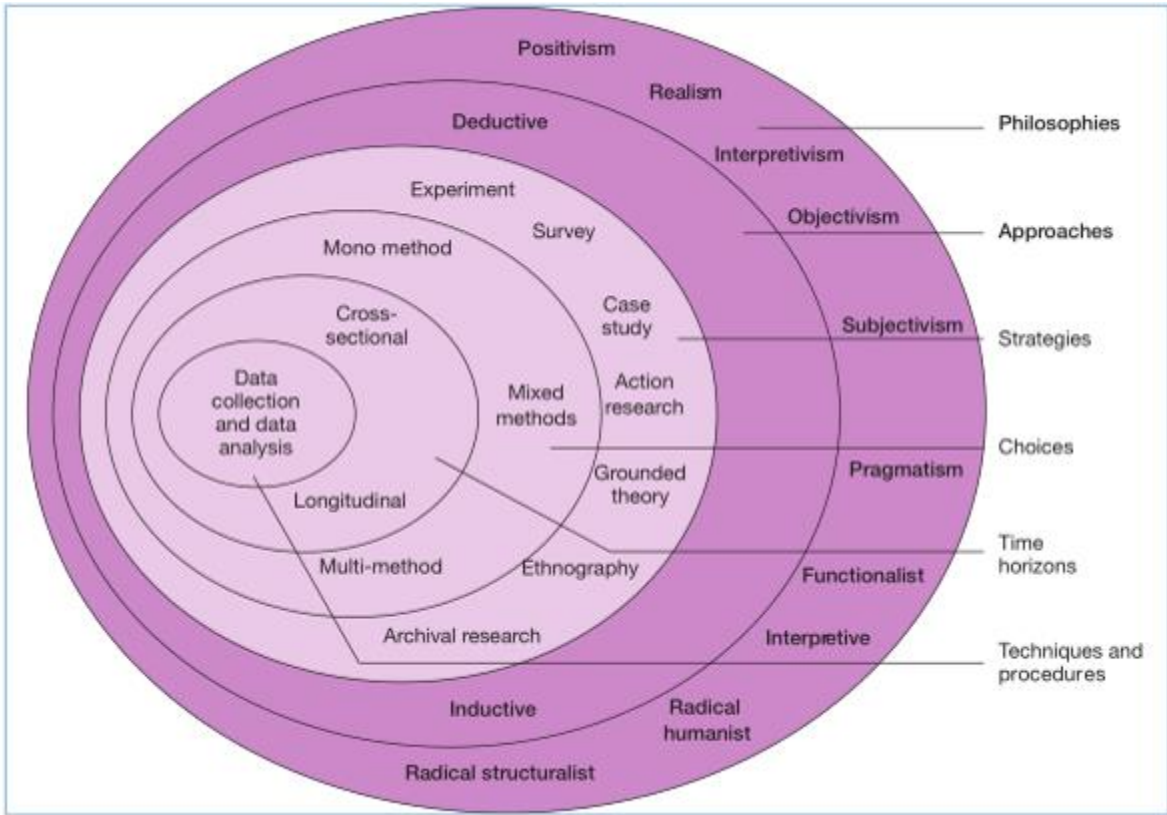


Figure 3-1 Research Onion (Saunders et al 2019 p.109)

3.4 Methodology

Section 3.4 addresses methodological considerations of the study as follows:

- Participant selection.
- Instruments for feedback analysis.
- Data collection.
- Data analysis.
- Ethical considerations.

3.4.1 Participant selection

Seven participants labelled P1 to P7 constituted a purposive sample of convenience (Creswell, 2014), selected from a population of experienced stakeholders in the retail, marketing, or IT environment. The participants demonstrated an academic background in these areas. This ensured that the participants had relevant knowledge and expertise to provide valuable insights into the research topic. The final sample outlined below as Table 3-2 consisted of two male and five female participants, recruited through targeted invitations sent to professionals in the specified fields.

Table 3-1 Sample Details

Participants	Age	Gender	Field Role	Years of Experience
P1	29	Female	Clothing Designer	5
P2	32	Male	Retail Store Manager	4
P3	31	Female	Public Relations Officer	8
P4	34	Female	Copywriter and Content Creator	10
P5	32	Female	Marketing Manager	10
P6	36	Female	Brand Manager	15
P7	35	Male	Marketing Manager	12

3.4.2 Instruments for feedback analysis

To collect feedback from the participants, survey instruments (Appendix E) comprised a semi-structured interview format. An interview protocol consisted of a set of five categories totalling 16 open-ended questions aimed at exploring different aspects of user engagement (A=3 questions), presence/immersion (B=4 questions), engagement/flow (C=3 questions), clarity/experience implications (D=3 questions), and utilisation of available technology within the virtual environment (E=3 questions). These questions enabled participants to express their thoughts, preferences, and suggestions regarding the 3D virtual store in detail providing rich and detailed data for analysis.

3.4.3 Data collection

Semi-structured interviews served as the primary data collection method. Participants were given the opportunity to interact with a virtual tour of a shop using 3D Spherical Image Technology. Following the interaction, participants signed ethical consent documents (Appendix F). Thereafter, the series of open-ended interview questions gauged participant feedback.

3.4.4 Data analysis

Upon conducting the interviews, the recorded responses were transcribed and then subjected to processing and analysis using the NVivo data analysis program (Lumivvero, 2023). NVivo proved to be a powerful tool for qualitative data analysis, facilitating the identification of patterns, themes, and commonalities within the participants' responses. The data was meticulously organised based on the research questions posed, ensuring alignment with the research objectives and facilitating a clear interpretation of the results.

Platform for Organisation and Management: NVivo, a software for qualitative data analysis, to analyse the collected data in depth, served as a centralised platform for effectively organising, managing, and interpreting the research data I collected.

Data Importation and Categorization: NVivo enabled the import of diverse forms of data, including interview transcripts and audio recordings in a seamless manner. Once imported, this tool supported meticulous encoding of transcript snippets thus assuring organising and categorisation of data. Nodes served as virtual folders, allowing the combination of comparable content, laying the foundation for subsequent thematic analysis.

Effective Data Storage and Access: Using NVivo, I was able to store and retrieve information from a central location. This was notably beneficial when dealing with a large quantity of data. The search and navigation capabilities of the software allowed me to rapidly access pertinent data based on keywords, dates, or specific nodes.

Coding and Identification of Themes: Coding support was an essential feature of NVivo. I employed coding to assign descriptive identifiers or codes to particular data segments. This enabled me to systematically analyse and classify the dataset, thereby revealing patterns and recurring ideas.

System of Nodes for Organisation: The node system in NVivo was instrumental in organising my analysis. I designed a hierarchical network of nodes to represent diverse themes, concepts, and categories. This allowed me to investigate the data in depth, from broad themes to specific aspects.

Enhanced Search and Query Functionality: The advanced search and query capabilities of NVivo enabled me to delve deeply into the data. I could search the coded data for particular keywords, code combinations, or attributes. This enabled me to discover relationships and connections that would have been missed by manual analysis.

Identifying Fundamental Trends: Manual analysis of qualitative data can occasionally overlook subtle trends or nuances. Using the systematic approach of NVivo, I was able to reveal these concealed insights. By identifying patterns and associations across the dataset, I acquired a deeper comprehension of my research topic.

Enhanced Validity and Rigour: The structured approach of NVivo enhanced the validity and rigour of my qualitative analysis. The software assisted me with maintaining a decision audit trail and documenting the analysis procedure. Thus, the quality and reliability of my research findings were ensured.

3.4.5 Ethical considerations

Throughout the research process, participants were informed of their rights, emphasising that they could leave the interview or decline to answer any question that made them uncomfortable. This approach underscored the commitment to ethical considerations, ensuring voluntary

participation, informed consent, and the safeguarding of privacy, anonymity, confidentiality and well-being for all participants involved in the study.

3.5 The 3D Spherical Image Technology artifact – application of the ADDIE model

The research methodology is supported by the systematic and structured instructional design model referred to as ADDIE (Analysis, Design, Development, Implementation, and Evaluation). The ADDIE framework is a well-established model that has been integrated into the research process to facilitate the investigation of virtual reality experiences within computer-simulated commercial environments (Yu et al., 2021). This model was specifically applied in the study to explore 3D Spherical Image Technology.

The integration of each phase of the ADDIE framework into the research methodology was carefully considered, enabling an iterative approach to the investigation. The first step in the build and evaluate methodology involved identifying the problem domain and gathering requirements for the artifact (Section 3.5.1).

3.5.1 Analysis of problem and requirements gathering

The focus was on understanding the challenges and needs of the target users or stakeholders. The problem identified for this research was to enhance customer experiences and engagement in the commercial sector through computer-simulated virtual environments, particularly using 3D Spherical Image Technology.

3.5.2 Design and development

After defining the problem and requirements, the next stage was to design and develop the artifact. In this case, the artifact was a computer-simulated business environment with integrated 3D Spherical Image Technology. The design process followed established principles and best practices to create a functional and innovative virtual reality experience, aiming to improve customer engagement and user experiences. This stage included the following ten steps:

Step 1 Selecting the optimal location

Carefully chose an appropriate location within the CIOVITA retail store. Opted for an area with abundant natural light that could highlight the store's products effectively. Ensured the selected space represented the store's ambiance and aesthetics accurately.

Step 2 Ensuring camera battery level

Before starting, confirmed that the Insta360 3D camera had a sufficient charge. Plugged the provided charging cable into the camera and connected it to a power source. Let the camera charge until the battery indicator showed a full charge.

Step 3 Preparing the memory card:

Inserted a compatible memory card with ample storage capacity into the designated slot on the camera. Ensured that the memory card was properly seated and ready to accommodate the upcoming 3D scans.

Step 4 Powering on the camera:

Pressed and held the power button on the Insta360 camera until the LED indicators illuminated. Waited for the camera's startup sequence to complete, indicating that it was ready for operation.

Step 5 Connecting to the Insta360 app:

Opened the Insta360 app on a mobile device and used it to establish a Wi-Fi connection with the camera. This wireless connection enabled remote control of the camera's settings and provided a live preview of the captured scans.

Step 6 Fine-tuning the camera settings:

Within the Insta360 app, adjusted camera settings to suit the specific lighting conditions and layout of the CIOVITA store. Tweaked settings such as exposure, white balance, and resolution to achieve optimal scan quality.

Step 7 Securing the camera on a tripod:

Placed the Insta360 camera securely on a stable tripod at a vantage point within the CIOVITA store. Ensured that the tripod was positioned strategically to capture the store's key features while maintaining stability throughout the scanning process.

Step 8 Calibrating the camera:

Followed the manufacturer's calibration instructions to ensure accurate depth perception and alignment of the camera. This step was crucial to ensure that the 3D scans would be precise and well-aligned.

Step 9 Conducting test shots:

Captured a series of test shots to evaluate the camera's settings and positioning. Reviewed the test shots on the mobile device to ensure that lighting, focus, and overall quality met the desired standards.

Step 10 Preparing the scanning area:

Cleared the scanning area of any unnecessary objects or clutter that could obstruct the scans. Ensured that the area was clean and well-organised to present CIOVITA's products in the best possible light.

(Anon, n.d.)

Creating the interactive virtual tour via the Matterport cloud

Using an Insta360 3D camera and a Matterport platform (Matterport, Inc, 2023), there are various phases involved in generating interactive and immersive 3D virtual tours. Panoramic photos and videos can be taken using the Insta360 3D camera. A full perspective of the space is produced by taking pictures of it from various angles using its 360-degree capability.

The Matterport platform on a computer is where the images from the Insta360 camera are uploaded to begin the editing process. The software of the platform effortlessly stitches the 360-degree photographs together to provide a 3D virtual tour after users log into their Matterport accounts and begin a new project. The user-friendly design makes it simple to organise the photos, making it straightforward for visitors to navigate.

It is possible to add interactive elements, such as links, notes, and multimedia data, to spots within the virtual tour using Matterport. These improvements can improve user engagement and the entire experience by adding more context, calling attention to certain features, or offering helpful

web resources. The visual appeal and realism of the virtual tour can be further enhanced by changing Matterport's lighting, color, and other parameters.

Once all the 360-degree images and interactive elements have been edited, the virtual tour is shared on Matterport's cloud-based platform. The photographs are assembled into a continuous, clickable, and seamless 3D virtual tour using the cloud, allowing a seamless transition between various locations. The virtual tour can be readily shared and accessed globally after it has been published. The tour can be seen on computers, tablets, or smartphones, giving users the opportunity to experience the physical area from a distance.

High-quality and interesting 3D virtual tours can be created using a Matterport camera and an Insta360 3D camera. The procedure entails uploading pictures, classifying them according to location, including interactive elements, and releasing the tour on the cloud for distribution.

Design and implementation – a 10-step process

Step 1 Uploaded Photos: The process began by uploading the 360-degree photos captured with the Insta360 3D camera to the Matterport account. These photos served as the foundation for the virtual tour.

Step 2 Created a New Project: Once the photos were uploaded, a new project was created within the Matterport account. This project acted as the cornerstone for the virtual tour.

Step 3 Stitched Photos: Matterport's software automatically stitched the uploaded photos together, resulting in a seamless 3D environment. This stitching process ensured smooth transitions between different photos.

Step 4 Organised Spaces: Within the project, the uploaded photos were organised into distinct "spaces" or rooms. This organisational step facilitated easy navigation for users exploring the virtual tour.

Step 5 Added Interactive Elements: Enhancements were made to the virtual tour by incorporating interactive components such as links, notes, and multimedia information. These elements provided additional context, highlighted features, and guided users to external resources.

Step 6 Adjusted Lighting and Colors: Matterport's editing tools were utilised to fine-tune lighting, colors, and other settings, enhancing the visual appeal and authenticity of the virtual tour.

Step 7 Integrated Multimedia: Multimedia elements, including videos and audio guides, were integrated into the virtual tour to offer users a more comprehensive and immersive experience.

Step 8 Previewed and Tested: Before finalisation, the virtual tour underwent thorough previewing and testing to ensure the proper functioning of interactive elements and the overall navigation experience.

Step 9 Finalised Edits: Based on the preview and testing, necessary adjustments were made to ensure a captivating and informative virtual tour experience.

Step 10 Published: Once satisfied with the edits, the virtual tour was published on Matterport's cloud-based platform, making it accessible to users around the world.

Editing Process

The editing process on Matterport encompassed seven key aspects, namely:

Stitching: Matterport's software seamlessly combined the uploaded 360-degree photos during the stitching process, creating a continuous and cohesive environment.

Interactive Elements: Interactive elements, like links, notes, and multimedia components, were integrated to enhance user engagement and offer additional information.

Aesthetic Enhancement: Adjustments to lighting, colors, and other visual settings were made to create a visually appealing and realistic virtual environment.

Multimedia Integration: Videos, audio guides, and other multimedia elements were integrated to provide users with a more enriched and immersive experience.

Quality Control: Thorough previewing and testing ensured the absence of technical issues and guaranteed a smooth user experience.

User-Focused Refinements: Based on user experience testing, refinements were implemented to improve navigation and interactivity.

Finalisation and Publishing: Once all edits were complete, the virtual tour was finalised and published on the Matterport platform for users to access and explore.

Picture Story Using Screenshots

A series of screenshots established a picture story using the following processes:

Upload: Screenshots displayed the process of uploading the 360-degree photos to Matterport.

Stitching: Screenshots showcased how Matterport stitched the photos together, creating a seamless environment.

Interactive Elements: Visuals demonstrated the addition of links, notes, and multimedia elements within the virtual tour.

Aesthetic Enhancement: Screenshots captured the adjustment of lighting and color settings for a more appealing visual experience.

Multimedia Integration: Illustrations depicted the integration of videos and audio guides for enhanced engagement.

Quality Control: Screenshots reflected the process of previewing and testing the virtual tour for functionality.

User-Focused Refinements: Visuals indicated adjustments made based on user experience testing.

Finalisation and Publishing: The final steps of preparing and publishing the virtual tour were illustrated in the thesis through screenshots.

The outcome of these processes culminated in six scenes described below as Scenes 1 to 6:

- Scene 1 The Environment.
- Scene 2 The Ciovita Store.
- Scene 3 Aspects of the Virtual Tour.
- Scene 4 Floor plans.
- Scene 5 Add-Ons.
- Scene 6 Bird's Eye and Dollhouse Views.

Scene 1 The Environment

As you start a Matterport virtual tour, the entry view welcomes you with a captivating scene. This scene is carefully chosen to show a striking aspect of the environment you're about to explore. It's like the doorway into a new world. Users can view the entire scene in a 360-degree panorama. This means you can look around in all directions, just like turning your head. If you see something interesting or want to explore a specific area, keep an eye out for interactive spots. These could be links or icons that you can click on to navigate to different places within the tour. Figure 3-2 below depicts a first look at the Ciovita store environment that is experienced during the launch of the virtual tour. A play button activates scrolling and/or viewing

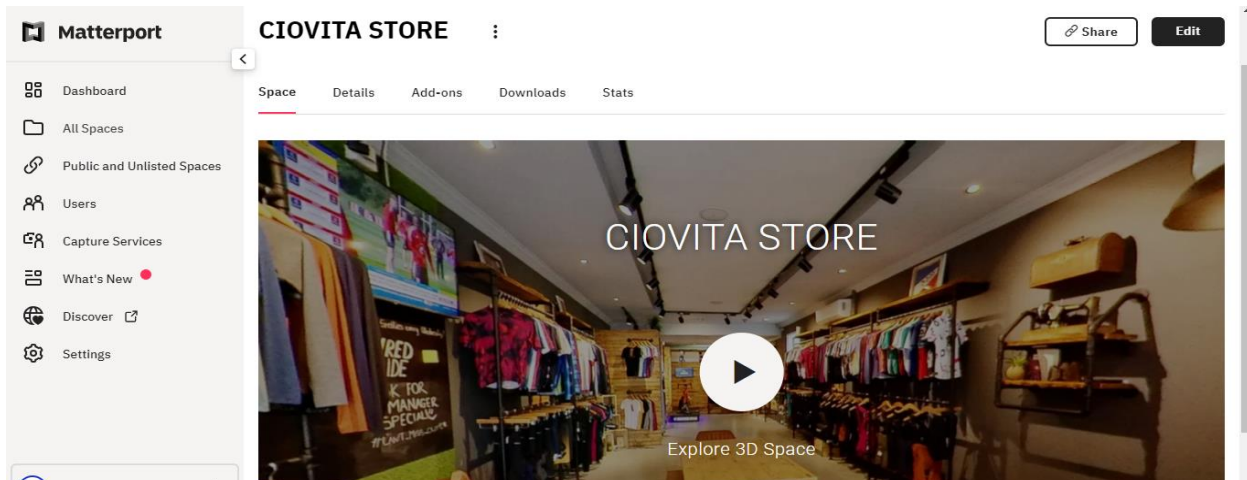


Figure 3-2 Ciovita Store

Scene 2 The Ciovita Store

Link Placement: Embedded YouTube links are strategically placed within the virtual tour at specific points of interest, like an exhibit in a museum or a room in a real estate tour.

Clickable Hotspots: These links are typically presented as clickable hotspots. Users can identify them visually and interact with them using clicks or taps.

Video Player: Clicking on an embedded YouTube link triggers the opening of a video player within the virtual tour. The video plays directly within the same tour interface.

Seamless Experience: Users can watch the video without leaving the virtual tour. This keeps them engaged within the same environment.

Figures 3-3 and 3-4 illustrate outcomes of clicking the highlight reel within the blue icon launches integrated video content within the virtual tour as displayed above, users are able to view it within the virtual tour or open the video content in the 3rd party application

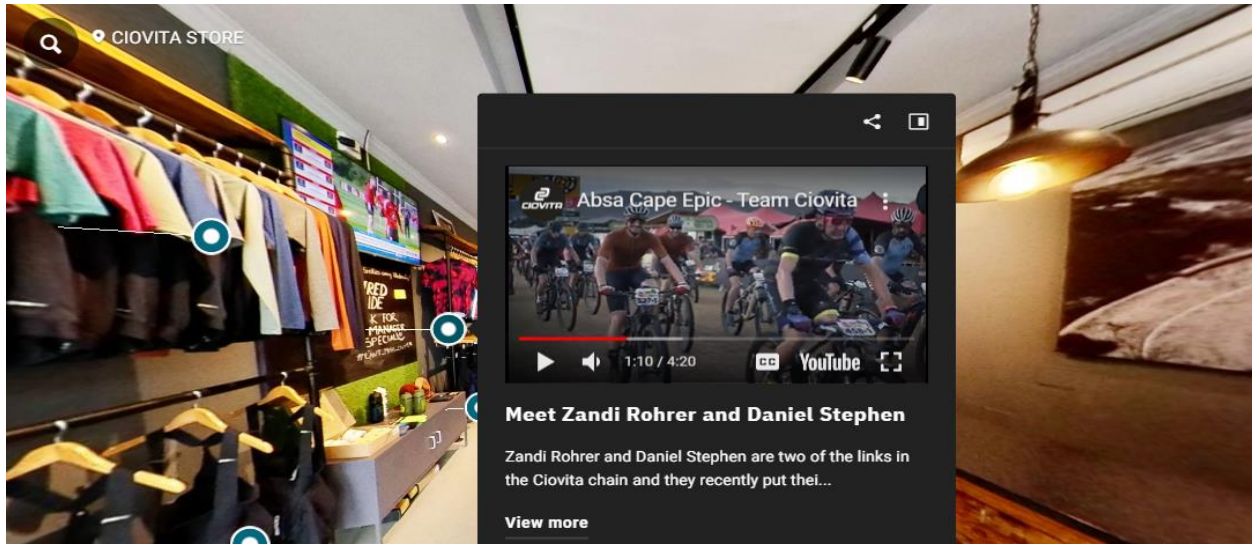


Figure 3-3 Team Ciovita

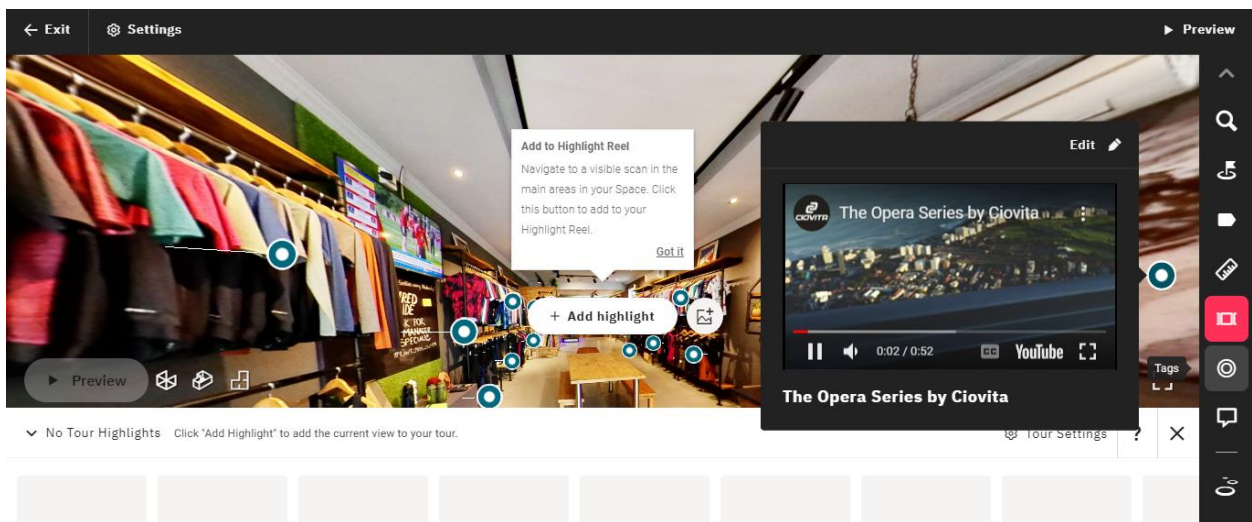


Figure 3-4 The Opera Series by Ciovita

Video Interaction: While watching the video, users can often control playback, adjust volume, and even view the video in full screen mode if desired.

Scene 3 Aspects of the Virtual Tour

Link Placement: Embedded website links are strategically positioned within the virtual tour at points associated with specific products or areas.

Clickable Hotspots: These links are often presented as clickable hotspots, distinguishable by visual cues such as icons or labels.

External Content: Clicking on an embedded website link opens a new browser window or tab, taking users directly to the linked website.

Product Context: The descriptions within the virtual tour provide relevant information about the products or spaces. Embedded website links enhance these descriptions. By clicking on the embedded link, users can access detailed product specifications, pricing, availability, or other relevant information hosted on an external website.

Visual Aids: These links can lead to image galleries, videos, or interactive content that visually demonstrates the product's features or benefits.

User Control: Users can choose to explore the linked content at their own pace, without leaving the virtual tour.

Figures 3-5 and 3-6 respectively present previews of women's and men's race fit cycling jerseys. The website link is associated with the circular blue icon which when clicked, displays a heading indicating the associated content type. Clicking the link redirects the user to the website itself for further reading and purchase.

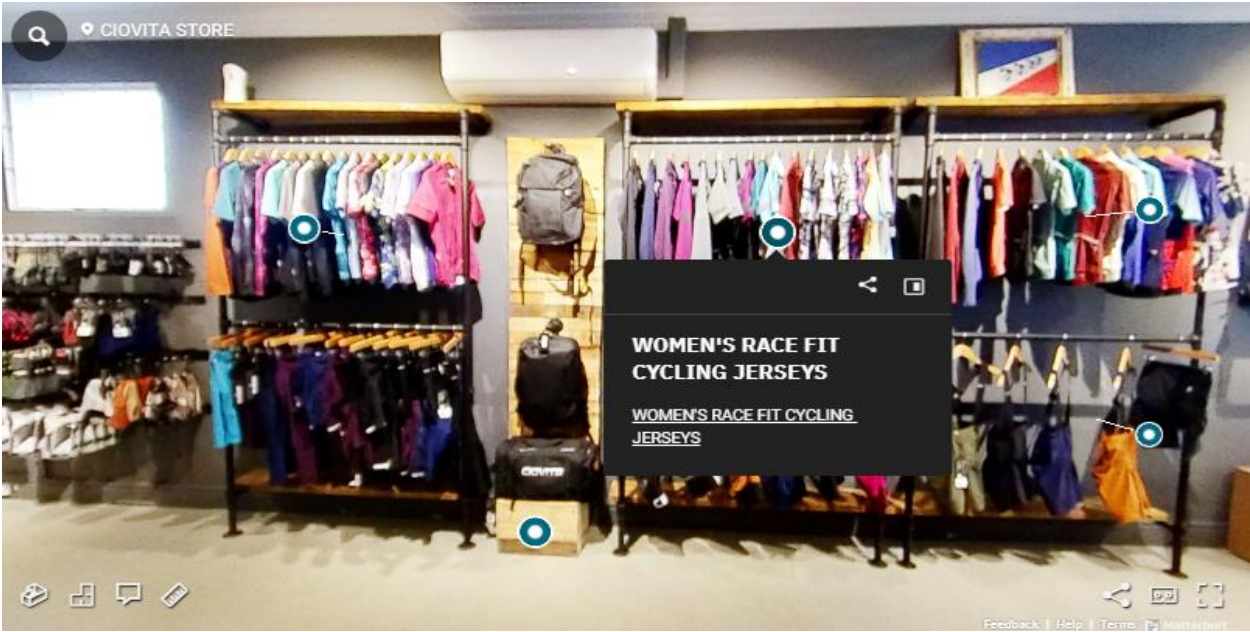


Figure 3-5 Women's Race Fit Cycling Jerseys

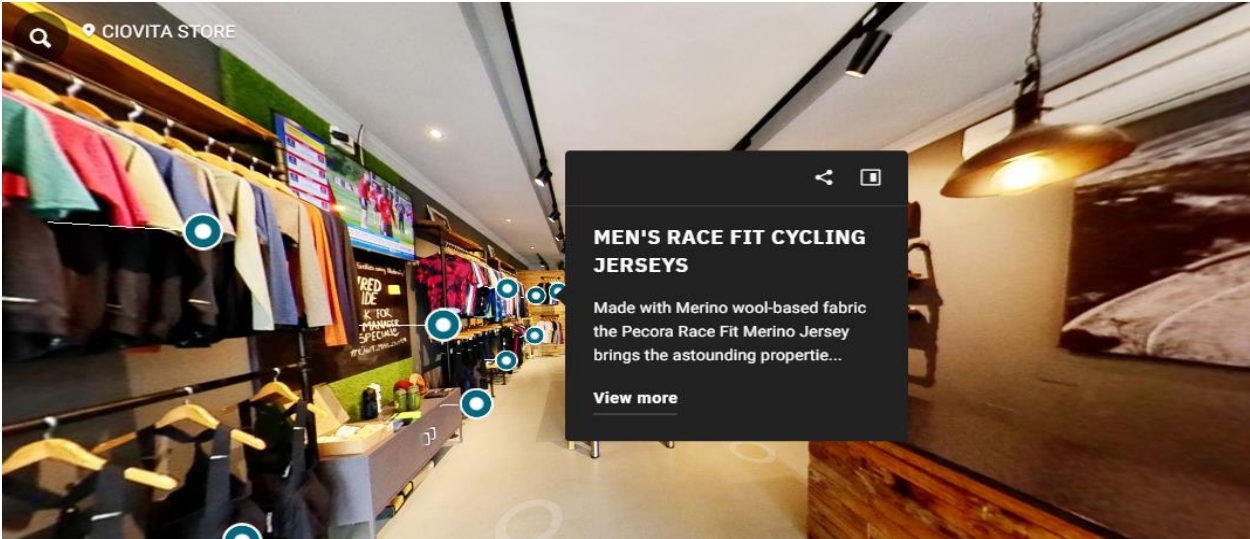


Figure 3-6 Men's Race Fit Cycling Jerseys

Scene 4 Floor plans

Visual Layout: Floor plans are 2D representations of the spatial layout of a location. They provide an overhead view of rooms, corridors, and the overall architecture.

Informational Context: Floor plans offer users a clear understanding of the physical structure and organisation of the space they're exploring.

Navigation Aid: Users can reference floor plans to navigate through the virtual tour, aiding in understanding the relationships between different areas.

Figures 3-7 and 3-8 allow the developer to scroll between the various 360-degree camera scans and navigate between views, allowing the developer to hide or display the scan.

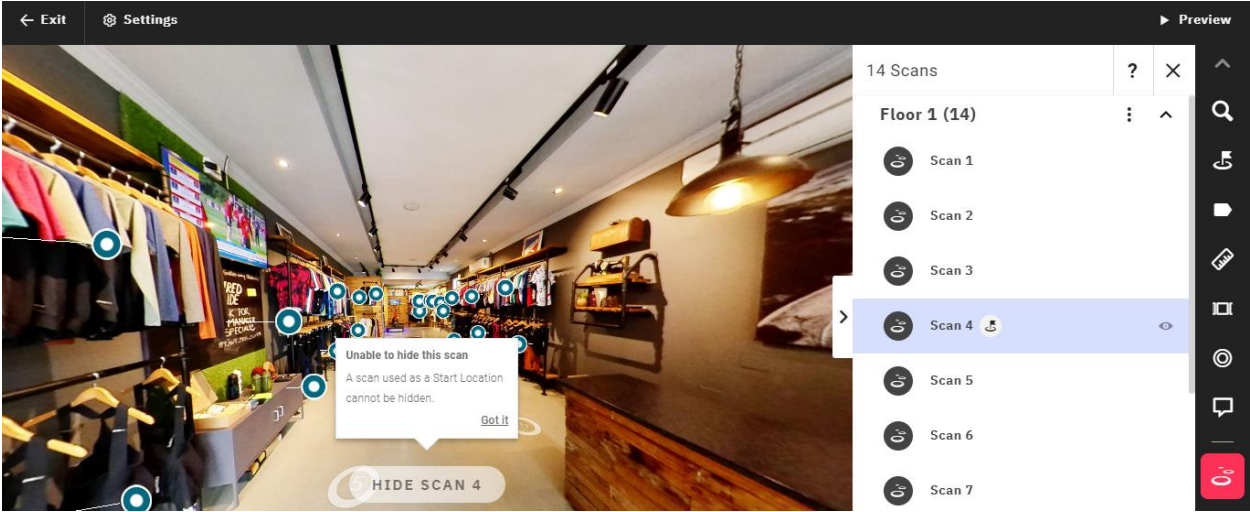


Figure 3-7 Scan 4 Hide Scan

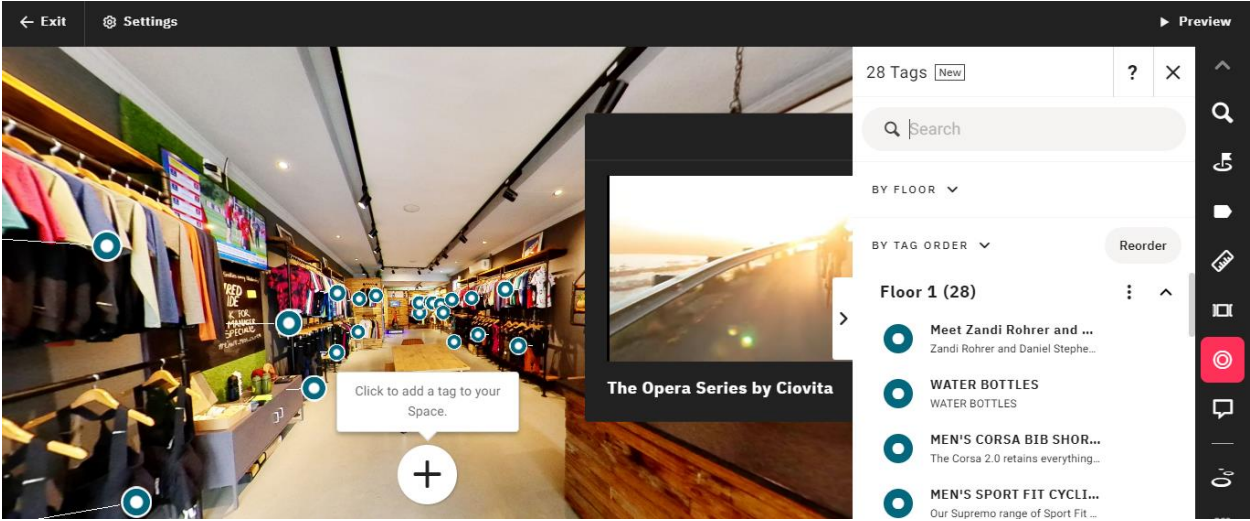


Figure 3-8 The Opera Series Version

Interactive Mapping: In an interactive virtual tour, users might click on specific points on the floor plan to instantly jump to corresponding locations within the 3D environment.

Scene 5 Add-Ons

Users have the option of customising their virtual tours to meet their needs under the "All Add-Ons" area. It understands that certain projects will have specific needs beyond those met by the default options, so it gives customers the freedom to pick and select the features that work best for them. Figure 3-9 displays these add-on features regarded as additional Matterport options. Offers include architectural floor plans with dimensions and a link to embed in Google Street View maps.

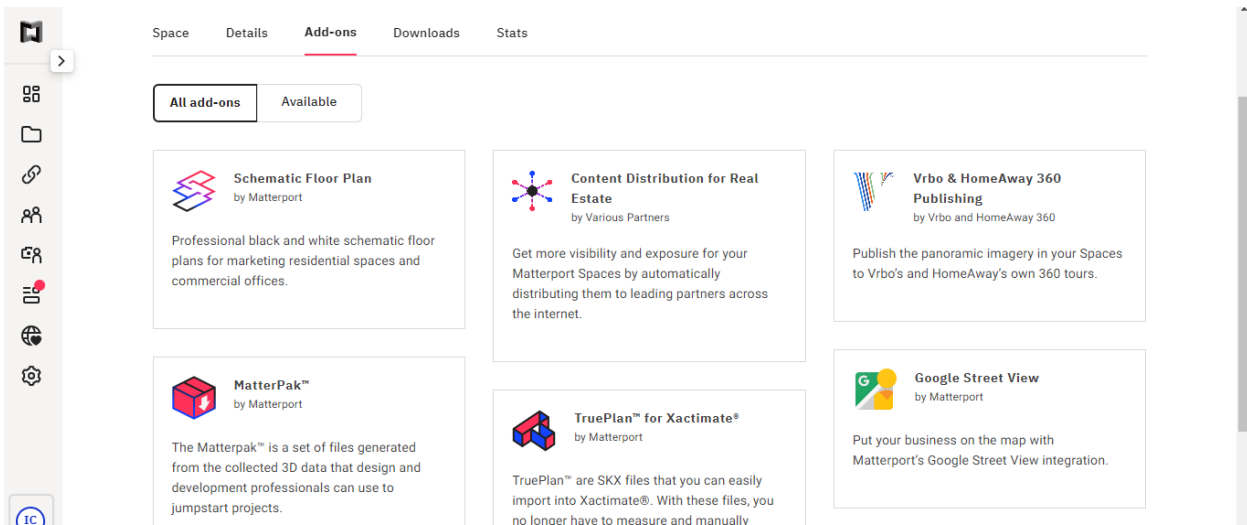


Figure 3-9 Add-Ons (Matterport, 2023)

Scene 6 Bird's Eye and Dollhouse Views

Overhead Perspective: The Bird's Eye View displays the entire virtual space as if you were looking at it from above, like a floor plan.

Layout Understanding: It offers a clear and concise visual representation of the space's layout, showing the relationships between rooms, hallways, and areas.

Navigation Aid: Users can navigate the virtual tour by clicking on different parts of the Bird's Eye View, instantly moving to those locations within the tour.

3D Model Visualisation: The Dollhouse View showcases the entire space as a 3D model. It looks like the building has been "cut" open to reveal its interior.

Pan and Rotate: Users can interact with the Dollhouse View by panning, zooming, and rotating the 3D model to see it from different angles.

Visual Understanding: It provides a unique visual understanding of how the different areas of space are interconnected.

Comprehensive Exploration: The Bird's Eye View and Dollhouse View offer a holistic way to explore and comprehend the entire virtual environment at a glance.

Spatial Relationship: Users can better understand the relationships between rooms and spaces, making it easier to plan navigation.

Contextual Overview: It provides context for the individual rooms or spaces that users will explore more closely during the tour.

Figure 3-10 displays a birds eye view of the environment, illustrating all contents and angles of the actual scanned environment.

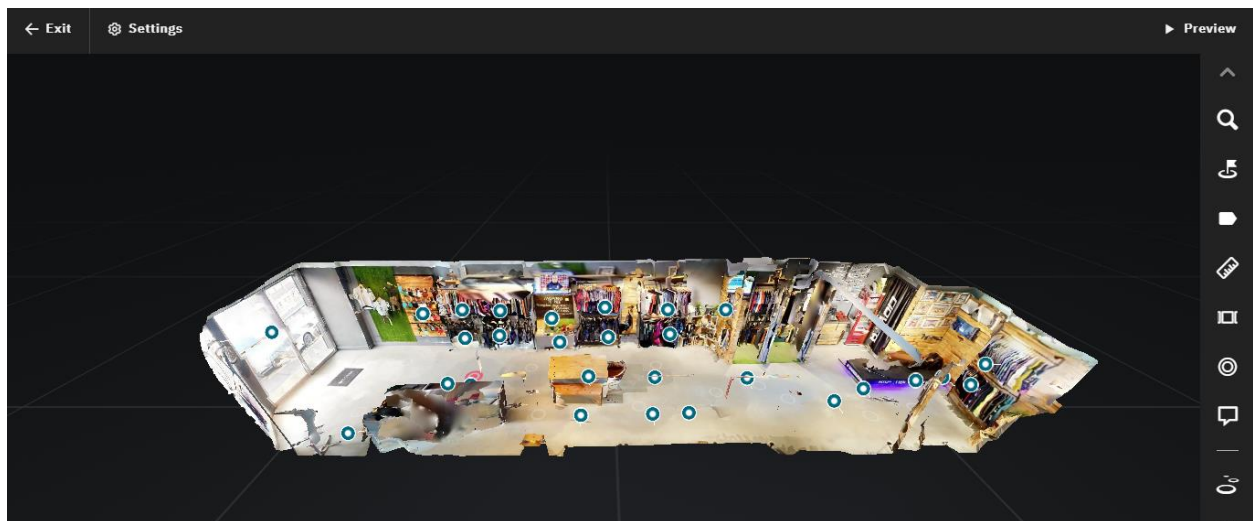


Figure 3-10 Bird's Eye-View

3.5.3 Implementation and testing

Upon completing the design and development phase, the artifact was implemented, and testing was conducted. Participants were given access to the virtual environment, and their interactions and experiences were recorded. To gather feedback, semi-structured interviews and

questionnaires were employed, focusing on aspects such as user engagement, presence, and overall satisfaction with the virtual environment.

3.5.4 Final evaluation

Following the data collection phase, the evaluation and analysis of the artifact's performance was carried out. Qualitative data analysis techniques methods were utilised to identify patterns and themes in the participants feedback. The feedback was compared against predefined evaluation criteria to assess the virtual environment's effectiveness in enhancing customer experiences and engagement.

3.5.5 Iterative refinement steps

Based on the evaluation results, an iterative refinement process was undertaken to address identified issues or areas for improvement. This iterative approach allowed the artifact to evolve and become more effective in achieving the research objectives. Further testing and refinement of the virtual environment was carried out until the predefined criteria were met or a satisfactory level of improvement was achieved.

3.6 Conclusion

Analysis: The analysis phase of the research methodology involved identifying the research problem, objectives, and target audience. Examining user engagement in virtual reality experiences using 3D Spherical Image Technology in commercial environments was the focus of the research. Participants were selected with care based on their expertise, and research queries were customised to elicit in-depth insights. Ethical considerations were incorporated seamlessly to ensure participant convenience and data confidentiality.

Design: During the design phase, data collection methods were planned systematically. A qualitative research design employing semi-structured interviews and questionnaires was selected. These align with the ADDIE design phase by describing how data was collected to meet research objectives. Customised interviews and questionnaires were used to acquire exhaustive data on user engagement, presence, clarity, and technology utilisation in the virtual environment.

Development: The development portion of the thesis corresponds to the comprehensive process of creating 3D virtual tours using the Insta360 camera and Matterport platform. The phase describes the capture of panoramic images, stitching processes, visual enhancements, and

interactive components. These stages represent the ADDIE design phase and describe the construction and development of the virtual environment in accordance with the research objectives.

In accordance with the "Implementation and Evaluation" phase of the ADDIE framework, the artefact (virtual environment) was implemented and tested with participants. This phase resembles the ADDIE implementation phase in that it describes participant interaction with the virtual environment, data acquisition via interviews and questionnaires, and qualitative data analysis using NVivo. This evaluation is crucial within ADDIE for assessing the efficacy of the artefact. While the ADDIE framework typically does not include a specific "Utilisation" phase, the thesis elaborates on this aspect. It investigates the prospective post-pandemic applications of research findings. This application embodies the substance of the ADDIE model, translating research findings into real-world scenarios including immersive showrooms, interactive experiences, product launches, training, exhibitions, and more.

In conclusion, the methodology demonstrates a seamless incorporation of ADDIE's principles. The alignment of ADDIE's phases with research stages, from problem identification and instrument design to virtual environment creation, implementation, evaluation, and future use, exemplifies a comprehensive strategy for comprehending user engagement in virtual reality. This alignment effectively depicts the sequential and iterative character of the ADDIE framework.

Immersive virtual environments can be transformed into virtual showrooms to display goods for sale by companies. Customers may explore and interact with things as if they were physically present thanks to this functionality, which is useful when they are hesitant to visit actual stores.

These digital environments present possibilities for creating engaging interactive experiences for users. Examples include "trying on" virtual garments, imagining furnishings in one's home, or viewing things in actual environments.

In the wake of an epidemic, companies can use immersive virtual environments to introduce new products or hold demos. Regardless of the constraints of the actual event, this strategy thrills customers.

These virtual spaces can be customised for employee onboarding and training in addition to marketing. New hires can learn how to traverse virtual store layouts, become familiar with the products, and comprehend business procedures.

Industry sectors that depend on events like trade exhibitions can use immersive virtual environments to host virtual versions of these events. Businesses may work together to create shared experiences.

4 CHAPTER FOUR: FINDINGS

First, this section sets out an introduction for the chapter. Thereafter the four research questions (RQ1 – RQ4) constitute a framework for the reported findings, delivered under the following headings:

- RQ1 How does user engagement vary within virtual reality experiences offered through computer-simulated virtual environments in the commercial sector? (2.2).
- RQ2 What design challenges are faced by users of immersive virtual spaces? (2.3).
- RQ3 How does embedded digital communication contribute to enhancing customer engagement within immersive virtual spaces? (2.4).
- RQ4 What is the impact of technology, especially 3D Spherical Image Technology, on the transformation of marketing strategies and user engagement within virtual reality environments during a pandemic? (2.5).

4.1 Introduction

The focus of this project revolves around the development of an immersive virtual environment specifically designed for the business sector. The primary objective is to prioritise user involvement by employing an iterative development approach. This study explores the complexities of user involvement inside immersive virtual reality during a pandemic, with the objective of revealing its fundamental nature, tactics, and obstacles. The chapter elucidates seven fundamental themes which are in accordance with the research questions (Figure 4-1). This undertaking not only promotes the development of immersive technology, but also enhances the understanding of user involvement inside virtual reality environments, revealing processes that enhance engagement beyond traditional experiences.

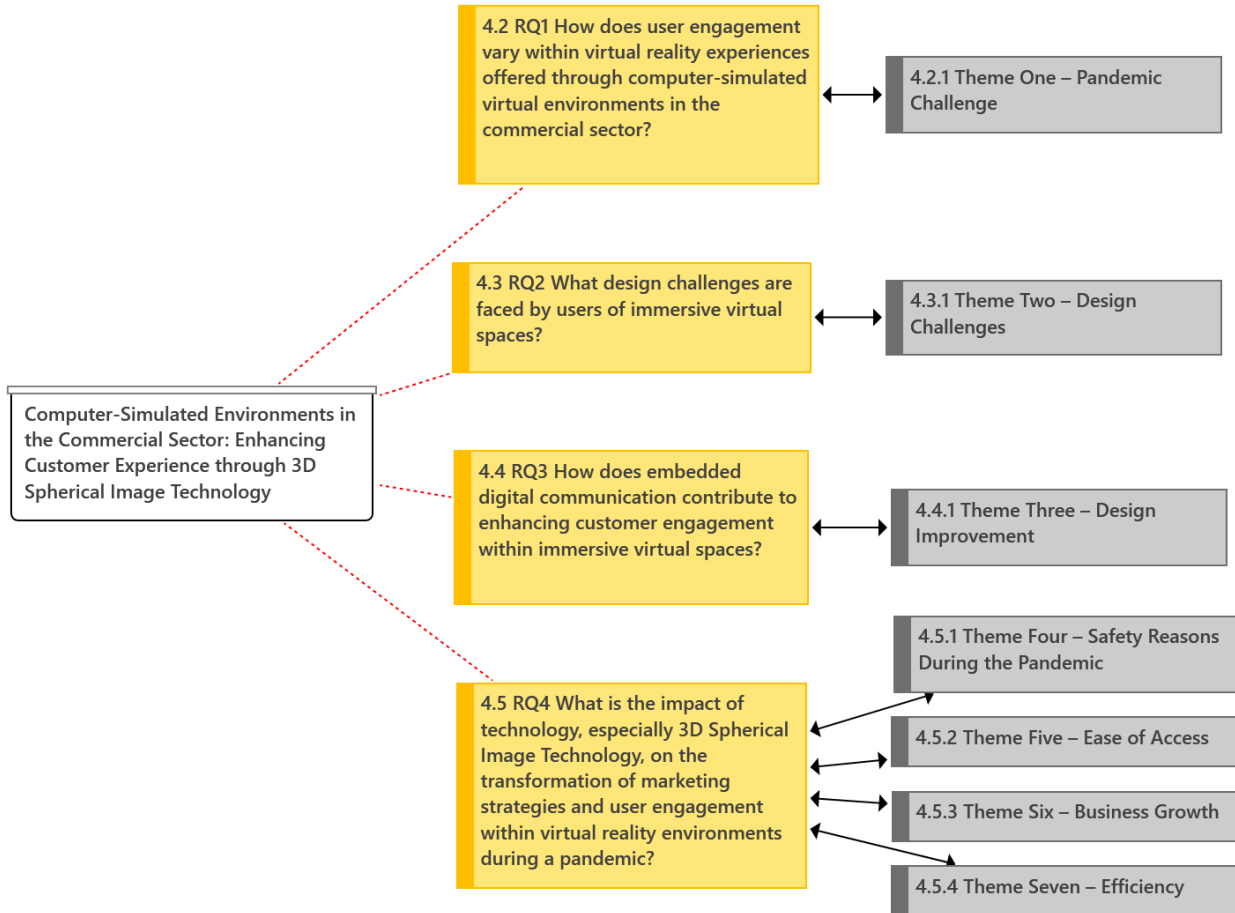


Figure 4-1 Links between Research Title, Four Research Questions and Seven Emergent Themes

Table 1-1 inserted earlier in Chapter One set out relationships between the research questions, research objectives and associated chapter sections.

4.2 RQ1 How does user engagement vary within virtual reality experiences offered through computer-simulated virtual environments in the commercial sector?

The pandemic caused a significant disruption to the status quo. One of the biggest disruptions was the restriction to both commuting and to human gatherings. Lockdowns were initiated across the globe to enforce these restrictions. Private and corporate entities were affected. Business owners and consumers were also affected. In this study, participants were asked to explain how the pandemic lockdown affected them. Their responses are presented in the theme one titled *Pandemic Challenge* and presented in Table 4.1.

Table 4-1 Pandemic Challenge - Codes and Associated Quotations

Theme	Codes	Associated Quotations
Theme One - Pandemic Challenges (n-5)	1.1. Face-to-face selling	Face to face selling is easier than digital.
	1.2 Physical limitations	It limits physical traffic to the stores.
	1.3. Ways of shopping	Older people are used to the normal way of shopping.
	1.4. Role of physical touch	Physically touching a product gives it a high selling power.
	1.5. Virtual store challenges	The difference between the virtual store and the actual store can be a challenge.

4.2.1 Theme One – Pandemic Challenge

Businesses with physical stores were some of the worse hit by the effect of the COVID-19 lockdown. People were unable to visit these businesses to purchase items, nor were retail stores able to make sales. One of the participants, Participant 1, recognised that the lack of human traffic coming into their store was a big challenge. *“Right now, our biggest challenge is getting people to our stores, justifying having retail stores.”* This participant explained that the absence of physical interaction of customers with the products negatively impacted on the potential volume of sales they would have recorded as the conversion rate was vastly reduced. She further emphasised that *“We want people in our physical store”*. It is easy to understand the value of having customers visit stores in person. Some traditional marketing techniques were difficult to execute in a digital space. *“We try and pull them in and engage with them. Because face-to-face, eye-to-eye, upselling is sometimes easier... So there’s definite power behind this as an additional marketing tool”*. Thus, despite the restrictions in place, Participant 1 said it was challenging *“getting people to people to actually physically touch our products”* as it had *“a massive selling power”*.

Although owners of businesses were negatively affected by the COVID-19 lockdown due to the low number of customers coming into their retail stores, the customers faced challenges also. The switch from physical visits to the store and online shopping was a disruption that took some time getting used to.

4.3 RQ2 What design challenges are faced by users of immersive virtual spaces?

This research question was aimed at discovering some of the challenges faced by users of immersive virtual spaces. The answers provided by the study’s participants were analysed. One theme - *Design Challenges* – emerged alongside three sub-themes, namely, *confusing for first time digital users*, *redirecting away from 3D space*, and *font size*. They are compiled in Table 4.2 and presented thereafter.

The research question needs to change – What design challenges are faced by users of immersive virtual space? Which themes should link to this question? Theme 2, Sub-themes 2A, 2B, 2C.

Table 4-2 Design Challenges - Codes and Associated Quotations

Theme	Codes	Associated Quotations
Theme Two - Design Challenges (n=6)	2.1. Navigation issues	There is difficulty navigating the items and their prices.
	2.2. Stock arrangement	Everything was not clearly arranged.
	2.3. Design performance	The design was slow.
	2.4. Touching shelf items	There was no ability to pick an item off the shelves.
	2.5. Regular store feel	The design lacks the feel of regular store.
	2.6. Details of items	Not knowing the name and price of items was challenging.

4.3.1 Theme Two – Design Challenges

Some participants had trouble navigating the items and checking their prices. For instance, Participant 5 noted that she was disappointed after her experience of a disconnection with the immersive space due to an issue she felt was avoidable. She said,

The challenge for me was just wrapping my head around and getting the name of what this item is but I cannot see. I cannot see the price. Like that was for me a big disconnect between the type of offering that I'm what I'm basically doing.

Participant 5 thought there was no use clicking a link to an online store without instantly knowing the prices of the commodities. *“So if I'm getting a link to a store where you're selling clothing, I should know what the price of the clothes are”*. Participant 2 spoke to a similar issue, stressing in addition to not being able to pick an item off the shelf, it was not an immersive space if she needed to be redirected to another e-commerce website in order to learn more about the products found on the digital shelf. *“I should be able to view the clothing piece that I tap on and not click out to a website. You should not take me out of the environment I am in. It should be more seamless.”* Narrating her experience, Participant 4 was not sure if there was an issue with her device, but she said it felt as if the design was slow. *“It took a bit too long to render. I do not know if that's just my device or if it's slowing itself, but like zooming in and stuff was a little bit delayed.”*

In further answering the question of what design challenges were observed when using immersive technology, Participant 4 lamented that she did not find it easy locating products because everything was not clearly arranged. *“So every time I move to a certain space, move past that a little bit for me, at one point I was behind the poster.”*

The first sub-theme under the *Design Challenges* theme was *Confusing for first-time digital user*. Findings in this sub-theme are presented subsequently in Table 4-4.

Table 4-3 Confusing for first-time digital - Codes and Associated Quotations

Theme	Codes	Associated Quotations
Sub-theme 2A – Confusing for first-time digital users (n=5)	2A.1. Digital space	The digital space is uncomfortable, the user clicks the 3D immersive view first to understand.
	2A.2. What to do sequence	It was difficult to know at first what to do.
	2A.3. Understanding buttons	The use of the button was not fully understood despite more information associated with it.
	2A.4. Clicking discomfort	Clicking the link might be strange to an uncomfortable user.
	2A.5. Comfort with design	The design was not straight forward for a user who is not comfortable with digital space.

Sub-theme 2A – Confusing for first-time digital Users

Getting familiar with the 3D space was somewhat confusing for some participants who were new in the digital ecosystem. Responses of some of the participants showed that navigating the immersive space was confusing for these first-timers to digital technology. For example, on first sighting the immersive space, a female participant, Participant 1, did not know what to do.

I did not know what I was supposed to do. So because if you click the light black area, nothing happens. So I mean, I obviously click the black area. Well, nothing happened. When I clicked the blocks..... I think so just what I said at the beginning when you first open the link, and there's like the black space around the black model. I think if you're a model computer person I did not know what I was looking at.

In her account, Participant 1 spoke about her engagement with links and videos. She noted that she did not know that a button had a link and more information embedded beneath it until it was clicked. *“So you're like I said, I did not realise that the clicking the button which brings up the extra information, still had a further embedded link in it.”* Other participants spoke further on their perceptual assessment of how easy it would be for a first-time digital space user to understand the immersive space. Participant 1 prescribed a method for first-timer digital space users or people who were uncomfortable in the immersive environment to get familiar with the 3D space. *“I think as a user who's potentially not as comfortable, they first would need to actually click on the 3D immersive view. And but other than that, I think that the initial layout is easy to understand.”*

The second sub-theme under *Design Challenge* is contained in Table 4.4 and its findings are discussed afterwards.

Table 4-4 Redirecting Away from 3D Space - Codes and Associated Quotations

Theme	Codes	Associated Quotations
Sub-theme 2B – Redirecting Away from 3D Space (n=6)	2B.1. Noting the model	Only the model, not the details were noted during click activity.
	2B.2. Feeling nervous	Clicking the link caused nervousness as it would take the user out of the virtual environment.
	2B.3. Other site links	Linking users to another site can discourage users.
	2B.4. Links and losses	The links to other sites might lead to loss of users.
	2B.5. User understanding	It took a while before the user understood that the dots led to links.
	2B.6. Visiting other links	Users might spend less time in the virtual environment as a result of visiting different links.

Sub-theme 2B – Redirecting away from 3D space

Participants in this study observed that the interface of the 3D space was embedded with links that led users to e-commerce websites. One participant was nervous to click the link as it would take them out of the virtual environment.

In my opinion, kind of going to I was nervous to the actual website from the specific product because it would navigate me away, or it would open a new tab taking me away from this kind of virtual store that I'm viewing...

She described how she was able to deal with the fear of being taken away from the original Ciovita 3D space, stating that she utilised the “open a new tab” function.

Yeah, so my opinion on that is pretty much just kind of, as I mouse over something, I get a black block that says, for instance, women's cycling G lays a link to go out or a link to do some potentially open a new tab until I've clicked it, I do not know. But potentially right click and open a new tab.

Other participants opined that the linking of users to another site meant that users might spend less time in the virtual environment as a result of visiting different links. “You may lose the user and they may spend less time in the virtual environment compared to when the entire experience is in one place.” (Participant 3). According to Participant 2, “No links should take you out of the virtual experience,” as it can discourage users, resulting in “a huge drop off on user conversions”.

The third sub-theme in the *Design Challenges* theme is presented in **Error! Reference source not found.** and discussed subsequently.

Table 4-5 Font Size - Codes and Associated Quotations

Theme	Codes	Associated Quotations
Sub-theme 2C - Font Size (n=2)	2C.1. Font size	The fonts were too big.
	2C.2. Required scrolling	Using the design required continuous scrolling because of the big fonts.

Sub-theme 2C – Font size

In addition to the confusion that new or unfamiliar users of immersive technology experienced navigating the 3D space and redirecting of users from the original virtual environment, participants also mentioned that the font size was too big. Hence, using the design required continuous scrolling as a result of the size of the fonts. “I had to scroll down to click the link to the website. The font is too big hence the scrolling.” (Participant 2).

4.4 RQ3 How does embedded digital communication contribute to enhancing customer engagement within immersive virtual spaces?

Subsequent to the challenges experienced during their interaction with the immersive environment, participants in this study made suggestions for improvement. The suggestions were analysed and presented in the following themes, *Design Improvement*. The report is contained in Table 4.3 and discussed afterwards.

The findings under the theme of *Design Improvement* were compiled in **Error! Reference source not found.** and are discussed subsequently.

Table 4-6 Design Improvement - Codes and Associated Quotations

Theme	Codes	Associated Quotations
Theme Three - Design Improvement (n=12)	3.1. Links to venue usage	A link indicating when the venue was used for previous events can be placed there.
	3.2. Item inspection	Ability to inspect an item through a 3D move or model will be impressive.
	3.3. Items on rails	The design enables the good ability to take off an item from the rail.
	3.4. Product images	Having the image of customers in the store will also be good.
	3.5. Overload of information	It is better to have the space clean to avoid overload of information.
	3.6. Item visibility	One or two items from the selection should be made visible to the user.
	3.7. Environment	The environment should be flawless.
	3.8. Display shelving	The little display shelves can be improved.
	3.9. Interactive navigation	The navigation and interaction in the virtual store can be improved.
	3.10. Technology partners	There is need for a tech partner to improve the design.
	3.11. Links to cart	There should be a straight link to the cart.
	3.12. Live feedback	There should be provision for live feedback or FAQ.

4.4.1 Theme Three – Design Improvement

Responses from participants in this study showed that they thought there was a need for technology partners to improve the design. It was noted the 3D space was prone to overload of information. This overload of the 3D space impacted on its visual ambience. *“Okay, so if they were all the videos and everything as you walk by; everything all within that space would be information overload”* (Participant 1). It was suggested that the orderliness of the immersive space ought to mirror what a physical store should look like, as in, *“The way it is now; clean like how you would walk into a shop”* (Participant 1). She believed that it is better to have the space clean to avoid overload of information. *“I think it’s clearer to have it clean and then you popped up on information overload would be too much”* (Participant 1).

In another instance, Participant 2 stated that the navigation and interaction in the virtual stores *“can be improved”*. The areas noted for improvement were few. For example, it was mentioned that the little display shelves in the immersive environment can be improved on because *“You know, that’s what gets you when shopping in an Apple store”* (Participant 1). Another area recommended for improvement was the connection of links that redirected users to another website to obtain more information about products. Some participants were not comfortable with it. They believed that the environment should be seamless. *“I should be able to view the clothing piece that I tap on and not click out to a website. You should not take me out of the environment I am in. It should be more seamless”* (Participant 2). Another participant’s response resonated the discomfort with being redirected away to another website. *“For me when I’m navigating an online space like this, I expect to get all the information in one place and not to be redirected to three different pages”* (Participant 5). Not only did the participant find it uncomfortable, she perceived that it would cause *“a huge drop off on user conversions”* as customers have to open a lot of tabs. To prevent this, Participant 3, said *“it is better to have all the information – like how the YouTube videos display”*. In addition to adding seamlessness to the shopping experience on the 3D space, participants advised that there should be a straight link to the cart, *“Built-in tech that allows the virtual clothing that you selected go straight to your cart”* (Participant 2). It did not matter much if the cart was a separate web page, *“I would not mind that. So even if I could bag here in the bag as a separate link that takes me to the website, then I’ll do that”* (Participant 5).

Furthermore, one participant stated that it would be a great improvement to the customer experience if it were possible to take an item off the rail. Although the participant was *“not*

completely sure how possible that is within the limitations of the software.....being able to 3D like move it around”, by simply pointing the mouse pointer, “would be incredible, even just seeing it on a human” (Participant 6). To buttress the point, the participants gave an illustration from the business they run.

...with our brand, we've got photos of all of the products in the store, so kind of going mouse over that. Here's the photo of what it looks like. And it mounts away and that goes away and the next one comes up (Participant 6).

In a similar light, Participant 5 was being ambitious when she suggested that the picture of real people be added to the 3D space; pictures of customers. “*It'd be nice to have someone sitting on the seat here as you walk into the...as you kind of navigate into the space as if they were actually in the store*”. In her opinion, it would be adding “*a level of interaction or further engagement from my perspective*”. Lastly, two participants stated that there should be provision for live feedback or frequently asked questions.

4.5 RQ4 *What is the impact of technology, especially 3D Spherical Image Technology, on the transformation of marketing strategies and user engagement within virtual reality environments during a pandemic?*

Another objective in this study was to examine the rationale that inspired the introduction of immersive technology into business organisations amid the pandemic. The participants responses were analysed and grouped into four themes, namely, *Safety Reasons during pandemic*, *Ease of access*, *Efficiency*, and *Business Development*. The report is contained in Table 4.5, Table 4.6, Table 4.7, and Table 4.8.

The findings under the theme of *Safety Reasons during pandemic* are compiled in **Error! Reference source not found.** and discussed subsequently.

Table 4-7 Safety Reasons - Codes and Associated Quotations

Theme	Codes	Associated Quotations
Theme Four – Safety Reasons during COVID-19 Pandemic (n=3)	4.1. Physical presence needs	It gives the opportunity to visit spaces without physical presence during the pandemic.
	4.2. Contact avoidance	It helps to avoid contact during pandemic.
	4.3. Pandemic shopping	The design is a good option for shopping during pandemic.

4.5.1 Theme Four – Safety Reasons During the Pandemic

The pandemic raised serious health concerns all over the globe due to the evasive nature and mode by which the virus was spread. Religious centers, sporting venues, business centers among others, were restricted from hosting large gatherings of people. Some participants in this study believed that prohibitions on human gatherings in business centers around the world prompted the need to introduce immersive access to these organisations. The immersive space, according to some participants, reduced physical contact and hence helped to stem the spread of the COVID-19 virus. In the words of Participant 1, immersive technology was “*obviously 100 effective...That’s the main benefit*” – as she agreed that being in shopping centers and retail stores was a health risk during the pandemic.

I think it is in smaller spaces like this where it would easily spread among people. So I think obviously, the benefit is that I do not have to interact with people, which is nice when you’re trying to avoid a virus (Participant 1).

Although the immersive technology was beneficial in the face of the lockdown, its benefit transcended the pandemic. Due to personal experiences, Participant 1 thought the technology presented consumers with a time-saving option of “*just putting something in your house and serverless and checking out versus like, going and like spending time in the shop and that’s what it feels like when you go into the 3D one*”.

Similarly in this study, participants revealed that the introduction of immersive technology presented a good option for shopping during the pandemic as it gave “*people an opportunity to see a space that they would not be able to access physically*” (Participant 6). Instead of making it appear like a regular e-commerce website, a participant suggested that the technology be improved upon by making it more personalised. Participant 4 explained that with 3 children, it “*makes everything easier...I think it makes sense to use as an option for shopping. Much better than just going on with the delivery on ShopRite app and just finding the products.*”

The findings under the theme of *Ease of access* are compiled in **Error! Reference source not found.** and are discussed afterwards.

Table 4-8 Ease of access - Codes and Associated Quotations

Theme	Codes	Associated Quotations
Theme Five – Ease of Accessibility (n=7)	5.1. Advantage of access	Accessibility is the greatest advantage of this design.
	5.2. Access for many people	Numerous people can access the store without physical presence.
	5.3. Physical presence	The 3D design does not require physical presence.
	5.4. Increased accessibility	The 3D design will make the industries more accessible to more people.
	5.5. Simultaneous views	The 3D space allows different customers to view things at the same time.
	5.6. Online content	The 3D space gives opportunity to relate with online content without physical presence.
	5.7. Categorisation	The model will help users find things in categories.

4.5.2 Theme Five – Ease of Access

Furthermore, in examining the understanding of the need to build and introduce immersive access to organisations amid the pandemic, for participants in this study, accessibility was top on the list. Accessibility was considered to be the greatest advantage of this design because it gave “*people who might not have had the potential, the ability to get to that physical space*” (Participant 6). The 3D design does not require the need “*to physically be in the space or need to travel*” (Participant

3). The ability to grant access to people who would have otherwise not had access to certain products also opens up companies to the possibility of greater exposure because 3D space allows different customers to view things at the same time.

That's gonna be something definitely that companies can use to their advantage. I mean, for us, if we can get those out to the world. We're gonna have plenty of people now experiencing the store without actually having to be you know, that shows you that the brand is not just this online. Lose Weight sale. It's not just buying brand you know, we do have a store we do have a space where you can work people that know what they're talking about. You know, you can get a feel for the guns. You can put yourself into the company where you can experience everything. (Participant 7).

The findings under the theme of *Business Growth* are summarised in **Error! Reference source not found.** and are discussed below.

Table 4-9 Business Growth - Codes and Associated Quotations

Theme	Codes	Associated Quotations
Theme Six – Business Growth (n=20)	6.1. Video links	Having links to other videos is an improvement on the actual experience in real life
	6.2. Social media links	Having the social media link on the model is helpful to growing the platform
	6.3. Marketing content	Integrated marketing content is beneficial for businesses in the digital space
	6.4. Future trends	Many people will need the 3D space in time to come
	6.5. Impulsiveness	It acts on the impulse of the buyer
	6.6. Product information	It helps to provide more information about the product and the company
	6.7. Product item names	It helps with the names of items you cannot remember
	6.8. Store items visualised	The 3D model helps to visualise all the items in the store
	6.9. Customer contact	The 3D space does not allow contact between customers
	6.10. Efficient advertisement	The 3D space will be an efficient advertisement for stores
	6.11. Personal experiences	The design gives a personalised experience
	6.12. Business information	The design gives adequate information about the business to the owner
	6.13. Tracking online sales	The design helps in tracking online sales
	6.14. Inventory management	The design helps to make proper inventory based on previous data
	6.15. Future business options	The design will help in creating future businesses
	6.16. Virtual experiences	The design will increase customers' virtual experience
	6.17. Shared information	The social media platform helps to share more information
	6.18. Improved sales	The virtual design will improve sales for business
	6.19. Social media exposure	Visiting the 3D model gives the opportunity to follow the store on social media
	6.20. Knowledge security	You have the security of knowing what you are looking for.

4.5.3 Theme Six – Business Growth

In addition to the justifications given by participants in this study as to the reason for the need to build and introduce immersive access to organisations amid the pandemic, endless opportunities for business growth was one of them. They believed the immersive design would help in creating future businesses while improving sales for existing ones. For example, Participant 6 stated that with the immersive technology, *“there is definitely an opportunity there for people to view a specific space, which is correct. It builds interest and it builds and particularly to create a future business as well”*. In the same light but on the premise that the technology holds for existing business, participant 2 said immersive design *“is very beneficial and will drive sales for the business”*.

Successful businesses are required to grapple with creating and keeping an inventory of their customers to help the business learn more about their needs and preferences. In this regard, participants in this study explained that the design also helped to make a proper inventory based on previous data such as names of items that customers could not remember or products that recorded the most patronage. During the visit of customers and with the assistance of embedded software, *“the owner will have then a good idea when their best selling days are and do a proper inventory based on previous data”* (Participant 2). This function is made possible because immersive design helps with tracking online sales, especially answer the question of *“what is their best seller?”* (Participant 2).

In the all-important aspect of marketing and advertising, participants in this study reported that the 3D model was beneficial. First, the model helped to visualise all the items in the stores. Narrating how their business benefited from the model in the area of product marketing, Participant 7 said,

So I think when it comes to our store as well, not that they can see all the types of foods you know just shows him that we have this variety of items and that we are looking on the website you're not just looking or stuck on one category. You are now seeing all the foods that we have all the items plenty of leads to utilise.

Similarly, Participant 5 disclosed that the 3D platform was embedded with a facility that provided more information about the product and the company:

...in terms of like the information is also embedded in this model. If I think about the fact that it gives you more information and other links to like, easily access

and read up on more on the product and more on ... what this company is about two other things that they do, I think that that's great.

Information about products and the company was also promoted via social media. Links were provided on the 3D model which redirected visitors from the model to company social media. This method was particularly beneficial as it helped companies to grow their online community.

I do not think enough people follow us on social media because often have been times if you will, like what's special, but it was advertised on social media. So now that we are having a direct link to the Instagram page, which you could access while you are visiting the model online system to grow the platform or the profile on the platform a lot bigger than what okay. (Participant 7)

Participant 5 added a voice concerning the numerous benefits of 3D modelling, stating "*I think that I can see so many people needing to use something like this.*"

4.5.4 Theme Seven – Efficiency

Error! Reference source not found. below sets out the findings for Theme Seven – Efficiency, illustrating codes and associated quotations.

Table 4-10 Efficiency - Codes and Associated Quotations

Theme	Code	Associated Quotation
Theme Seven – Efficiency (n=13)	7.1. Cost savings	It saves cost.
	7.2. Cost effectiveness	The 3D space is cost effective for the industry.
	7.3. Search efficiency	It saves you the stress of checking the Internet.
	7.4. Effort	The 3D space saves effort.
	7.5. Transport costs	The 3D space saves me petrol.
	7.6. Time factors	The 3D space saves time.
	7.7. Ease of use	The design makes everything easier especially during COVID-19.
	7.8. Understandability	The design was easy to understand.
	7.9. Shopping joy	The experiences bring back the joy of shopping.
	7.10. Reach of the shopper	It brings the world closer.
	7.11. Event management	It can be used to pick a venue for events.
	7.12. Knowledge acquisition	It made me interested in knowing more.
	7.13. Convenience	It provides convenience.

This theme presents some of the participants responses which explain what they consider to be reasons for the introduction of the immersive space. Two of them stated that it provided convenience, *“the option to do things from home”* (Participant 4). In the same instance, Participant 5 said, *“I suppose there’s also the benefit of convenience, like I love convenience....if I do not have to go anywhere, and I can just be getting something from my phone and have a great experience in habit be super easy”*.

It was mentioned also that the 3D space is cost-effective just as it accurately replicates the physical store in 3D. It saved time and fuel as customer would otherwise be required to travel to a physical

store. Six participants report that they “*strongly agreed*” that the design was easily accessible.

4.6 Conclusion

Analysis of interview transcripts led to the elicitation of seven emergent themes namely:

- Theme One – Pandemic challenge.
- Theme Two – Design challenges
- Theme Three – Design improvement.
- Theme Four – Safety reasons during the pandemic.
- Theme Five – Ease of access.
- Theme Six – Business growth.
- Theme Seven – Efficiency.

These themes signify noteworthy outcomes of the study and are viewed as valued theoretical and practical contributions of the study. Chapter 5 includes further discussion of these outcomes in Sections 5.3.1 to 5.3.7. Table 7-1 in Appendix A presents a consolidated codebook which results from the synthesis of all 79 emergent codes noted in this chapter. This artifact suggests a foundation for a framework of guidelines for best practices based on these codes.

5 CHAPTER FIVE: CONCLUSIONS, RECOMMENDATIONS AND CONTRIBUTIONS OF THE STUDY

Chapter 5 incorporates an introductory section (5.1) followed by a review of the research questions (RQ1-RQ4). Section 5.3 sets out a discussion of emergent recommendations. Theoretical, methodological and practical considerations associated with the study are then proposed (5.4). The chapter shares noted limitations, delimitations and future research in sections 5.5, 5.6 and 5.7 respectively before finality is achieved.

5.1 Introduction

This chapter will serve as the study's conclusion by providing a summary of the most important research results, analysing the significance and contribution of those findings, and relating those findings to the research goals. In addition, it will examine the limitations that were placed on the study and suggest new avenues for investigation.

The goal of this study was to assess the experience of participants interacting with integrated marketing messaging inside 3D virtual reality environments during a pandemic, as well as to provide suggestions for how the prototype might be improved for a better consumer experience. Using an iterative and pragmatic approach to artifact production, the build and evaluate method was used to drive the construction and offer directions for the development of an immersive experience within the business sector. The themes uncovered by evaluating participants interactions with immersive technology were presented in the same order as the research topics. Using the NVivo data analysis program, the answers submitted by research participants were analysed and displayed as themes in accordance with the research questions.

5.2 Revisiting the Research Questions

Section 5.2 revisits the research questions included as Table 1-1 in Chapter One.

5.2.1 RQ1 *How will integrated marketing communications in virtual reality environments contribute towards customer experience during a pandemic?*

This research question was aimed at discovering challenges faced during a pandemic, and participants were asked to explain how the pandemic lockdown affected them. Their responses are presented in theme one titled *Pandemic Challenges*

Theme one – Pandemic challenges

Businesses with physical stores were among the worst hit by the effect of the COVID-19 lockdown. People were unable to visit these businesses to purchase items, nor were retail stores able to make sales. One of the participants recognised that the lack of human traffic coming into their store was a big challenge. Some traditional marketing techniques were difficult to execute in a digital space while the switch from physical visits and online shopping was a new situation that took some time to normalise.

5.2.2 RQ2 *What design challenges are faced by users of immersive virtual spaces?*

This research question was aimed at discovering challenges faced by users of immersive virtual spaces. The answers resulting from the study's participants were analysed and presented in theme two – "*Design Challenges*" alongside three sub-themes, namely, "*Confusing for first-time digital user*", "*redirecting away from 3D space*", and "*font size*".

Theme two – Design challenges

Participants experienced difficulty navigating the items and checking their prices. Others complained about disconnection, not being able to instantly know the price of a commodity without leaving the virtual space, and difficulty locating products because the items were not clearly arranged.

Sub-theme – Confusing for first-time digital user

Becoming familiar with the 3D space was somewhat confusing for some participants who were new to the digital ecosystem. They explained that navigating the immersive space was confusing for these newcomers to digital technology.

Sub-theme – Redirecting away from 3D space

Participants in this study observed that the interface of the 3D space was embedded with links that led users to e-commerce websites, a function that one participant was nervous about, as clicking the link would take them out of the virtual environment. They expressed the view that the linking of users to another site meant that users might spend less time in the virtual environment because of visiting different links.

Sub-theme – Font size

The size of the font was a subject of concern to participants because it was too big. As a result, using the design required continuous scrolling.

Research question three was “*What are the prescribed suggestions for improvement in the immersive environment?*” Stemming from challenges experienced during their interaction with the immersive environment, participants prescribed suggestions for improvement. An analysis of the response was presented in theme, Design Improvement.

5.2.3 RQ3 How does embedded digital communication contribute to enhancing customer engagement within immersive virtual spaces?

Subsequent to the challenges experienced during their interaction with the immersive environment, participants in this study made suggestions for improvement. The suggestions were analysed and presented in the following themes, *Design Improvement*. The report is contained in Table 4.3 and discussed afterwards.

Theme three – Design improvement

The respondents thought there was a need for a technology partner to improve the design. It was noted that the 3D space was prone to information overload. This overload of the 3D space impacted on its visual ambience. It was suggested that the orderliness of the immersive space

ought to mirror what a physical store should look like as it is better to have the space clean to avoid overload of information. In another instance, a participant stated that the navigation and interaction in the virtual stores could be improved upon. The areas noted for improvement included the little display shelves in the immersive environment and the connection of links that redirected users to another website to obtain more information about products. They also believed the environment should be seamless. A participant stated that it would be a great improvement to customer experience if it were possible to take an item off the rail. Other participants suggested that real pictures of real persons be added to the 3D space and for provision for live feedback or frequently asked questions.

5.2.4 RQ4 What is the impact of technology, especially 3D Spherical Image Technology, on the transformation of marketing strategies and user engagement within virtual reality environments during a pandemic?

Another objective in this study was to examine the rationale that inspired the introduction of immersive technology into business organisations amid the pandemic. The participants responses were analysed and grouped into four themes, namely, *Safety Reasons during pandemic, Ease of Access, Efficiency, and Business Development.*

Theme Four – Safety Reasons During pandemic

It was believed that prohibitions to human gathering in business centers around prompted the need to introduce immersive access to these organisations. They said it reduced physical contact and hence helped to stem the spread of disease. It also presented consumers with a time-saving option of checking out products virtual versus spending time in a physical store. Instead of making it appear like a regular e-commerce website, a participant suggested that the technology be improved upon by making it more personalised.

Theme Five – Ease of access

Ease of access was top on the list of what was considered to be the greatest advantage of this design because it gave people the chance to be in a space without the need to travel. They thought the ability to grant access to people who would have otherwise not had access to certain products also would open up companies to the possibility of greater exposure because 3D space allows different customers to view things at the same time.

Theme six – Business growth

It was believed that the immersive design would help to create future businesses while improving sales for existing ones. Participants in this study noted that the design also helped to make proper inventory based on previous data such as names of items that customers could not remember or products that recorded the most patronage. With regard to marketing and advertisements, participants in this study reported that the 3D model was beneficial. The model helped to visualise all the items in the stores. Similarly, a participant disclosed that the 3D platform was embedded with a facility that provided more information about the product and the company.

Information about products and the company was also promoted via social media. Links were provided on the 3D model which redirected visitors from the model to company social media. This method was particularly beneficial as it helped companies to grow their online community.

Theme seven – Efficiency

This theme presents some of the participants responses which explains what they consider to be reasons for the introduction of the immersive space. It was mentioned also that the 3D space was cost-effective as it accurately replicated the physical store in 3D. It saved time and fuel as customers would otherwise be required to travel to a physical store. Participants also said the design was easy to understand.

5.3 Recommendations

Four research questions designed to address the problem noted in the study resulted in seven recommendations listed below in sections 5.3.1 to 5.3.7.

5.3.1 Considering the impact of pandemic lockdown on consumer experiences and actions

The topic of discussion in this thesis is the contribution that integrated marketing communications in immersive settings may make toward enhancing the experience that a company provides for its customers when a pandemic is in progress. The purpose of the study question was to clearly identify the issues that customers encountered during the pandemic and to determine how virtual reality environments may solve these challenges. The results of this study might be given in a

topic that is named "Pandemic Challenges." This topic could contain the comments of participants about the influence the pandemic lockdown had on their experiences and actions as consumers.

5.3.2 Investigating aspects associated with design features

Approaches should be explored to enhance the arrangement and display of items in 3D spaces in order to make them simpler to locate and price. The influence of various price information delivery tactics on user engagement and satisfaction could be scanned, as could examining the usage of search and filtering tools in virtual reality environments and how they might be enhanced to better aid users in locating the desired content. The special issues encountered by first-time digital users in immersive settings could be investigated, and solutions provided. Examining the efficacy of training or onboarding programs should be undertaken to assist novice digital users to traverse immersive settings more efficiently. So too the use of virtual assistants and other kinds of artificial intelligence to aid first-time digital users in becoming more used to immersive surroundings. The use of various design features should be investigated, such as visual signals and explicit instructions, to make virtual reality environments more user-friendly for digital users with little experience.

5.3.3 Designing improvements linked to realistic virtual reality environments

On the basis of these results, the following suggestions for more study could be made: to investigate how virtual simulations affect customer satisfaction and the retail environment by examining how to make more immersive environment designs by using technology partners or other professionals; additionally to investigate how various design components, such as visual clues or explicit instructions, might improve the user experience in virtual reality environments and the ability to retrieve information; and to examine the effects on customer satisfaction of the usage of actual people and other realistic features in virtual reality environments.

5.3.4 Exploring contextual safety inherent during pandemics

Exploring the efficacy of immersive technology in preventing the transmission of illness in a variety of contexts and under a variety of conditions might be the focus of more study in this field. It might also entail researching the effects that immersive technology has on the habits and preferences of consumers, such as the ways in which individualised immersive experiences may influence customer choices about the acquisition of certain goods. Other potential areas for further research could include the technical challenges and limitations of implementing immersive technology in a

variety of settings, as well as the potential ethical concerns that may arise when using this technology.

5.3.5 Enabling users to gain easy access to products

According to the results, this function is useful since it enables users to gain access to items that they might not have been able to acquire in any other way. This opens up a whole new world of possibilities. Additionally, immersive technology enables businesses to display their wares to a bigger audience by allowing multiple buyers to see the same item at the same time. This opens the door for more sales. The degree to which immersive technology increases accessibility for certain groups of individuals, such as those with impairments or those living in distant regions, might be the subject of more study. It could also entail research on the effects that immersive technology has on companies and how it has an effect on their capacity to attract new clients. Other possible topics for future study might include the difficulties and constraints posed by the implementation of immersive technology in a variety of contexts, as well as the potential financial advantages and costs that are involved with the usage of this technology.

5.3.6 Expanding company growth with improved online earning capacity

The capability of immersive technology to support the expansion of an existing brick and mortar space is the central idea of the artifact development. According to the results, immersive technology may be able to boost sales for already-established enterprises and open up new doors of opportunity for those yet to be established. Additionally, it may assist with inventory management by collecting consumer data and determining which goods are most in demand.

5.3.7 Investigating potential cost savings and improved efficiency

Based on the findings related to the theme of efficiency, it is recommended that further research be conducted to explore the potential cost savings and improved efficiency that virtual reality environments can provide for businesses. This could include a more detailed examination of the specific ways in which virtual reality environments can reduce the need for physical storefronts and increase the reach of businesses to customers. It would be also beneficial to investigate the potential for virtual reality environments to increase customer engagement and satisfaction. This could be done by conducting a follow-up study to track customer engagement and satisfaction over time, and by comparing the results with those from customers who have not had the opportunity to engage with virtual reality environments.

5.4 Theoretical, Methodological and Practical Contributions of the Study

The study contributed valued theoretical, methodological and practical knowledge regarding computer-simulated environments in the commercial sector: enhancing customer experience through 3D spherical image technology.

The study combined design and build approached together with theoretical foundations (literature review) and an empirical strategy (semi-structured interviews). The theoretical contribution of this study produced a synthesised codebook, informing potential guidelines for the evolution of computer-simulated environments using 3D spherical image technology. Methodologically, the study applied the ADDIE model, traditionally used in a teaching and learning context to design and build an artifact. The application of the ADDIE model sought to create and evaluate an environment which could inform guidelines for best practices in the retail industry, specifically considering the impact of the COVID-19 pandemic. In the process, the outcomes of the study offer practical significance.

5.5 Limitations and delimitations

Limitations of the study included the COVID-19 pandemic itself which precluded the wider collection of feedback from customers. Thematic analysis of interview data resulted from personal perception of a relatively small sample of participants. The study explored participant responses linked to a single retail context. Further research could be conducted in other spaces.

5.6 Finally, future research

Exploring the efficacy of various forms of integrated marketing communications in immersive settings may be an interesting avenue for further study in this field. This may be done with the goal of solving the issues that customers confront during a pandemic. Researching the effects of virtual reality environments on consumer happiness, loyalty, and other outcomes, as well as the possible advantages and disadvantages of such settings for companies in terms of how marketing and sales might potentially be part of this endeavor. Other potential areas for further research could include the technical challenges and limitations of implementing immersive technology in a marketing context, as well as the potential ethical considerations that may arise when using this technology for marketing purposes. These are just two examples. Other potential areas for further research could include the investigation of a lockdown's long-term implications on enterprises that operate brick-and-mortar locations, as well as the identification of measures for minimising these

consequences and comparing the efficacy of various digital marketing strategies to those of their analog counterparts. Further areas could be analysing the differences and similarities between the two, researching the movement from traditional purchasing to online shopping and finding solutions to assist companies in adjusting to the new standard; and doing research on the effects that a lockdown has had on different kinds of businesses, and finding any particular difficulties those companies might have had to deal with.

The following are also recommended: examining the effect of external linkages on user engagement and pleasure inside immersive settings; examining the use of various design features, including visual signals and clear instructions, to make virtual reality environments more user-friendly and eliminate the need for scrolling; and examining the efficacy of various font sizes in immersive settings to discover the best size that is simple to read while reducing the need for scrolling and eye strain.

Studying the effect that immersive technology has on the expansion of businesses in a variety of sectors and under a variety of market situations might be the focus of more research in this field. It might also entail investigating the efficacy of immersive technology for a variety of goods and services, as well as the possible difficulties and constraints associated with applying this technology in a commercial context. Other possible topics for future study might include the potential ethical problems that may emerge when employing this technology for commercial objectives, as well as the potential economic gains or costs that are linked with adopting immersive technology.

When it comes to marketing and advertising, immersive technology may make it easier to picture things in shops as well as deliver more information about those products. In addition, immersive technology may be used with social media in order to expand a company's online community and increase the sales of the company's goods.

Additionally, it would be interesting to conduct a study that compares the cost of creating and maintaining an immersive environment with that of a physical store, to quantify the potential cost savings and to identify any additional costs associated with virtual reality environments.

Finally, it would be valuable to explore the barriers and challenges that businesses may face when implementing virtual reality environments, and to provide recommendations for overcoming these

obstacles. This could include a survey of businesses that have already implemented virtual reality environments to identify common challenges and best practices for overcoming them.

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7 APPENDICES

7.1 APPENDIX A: Code Book

Table 7-1 Consolidated Codebook

Themes	Codes	Associated Quotations
Theme One – Pandemic Challenges (n=5)	<ul style="list-style-type: none"> 1.1. Face-to-face selling 1.2. Physical limitations 1.3. Ways of shopping 1.4. Role of physical touch 1.5. Virtual store challenges 	<p>Face to face selling is easier than digital. It limits physical traffic to the stores. Older people are used to the normal way of shopping. Physically touching a product gives it a high selling power. The difference between the virtual store and the actual store can be a challenge.</p>
Theme Two - Design Challenges (n=6)	<ul style="list-style-type: none"> 2.1. Navigation issues 2.2. Stock arrangement 2.3. Design performance 2.4. Touching shelf items 2.5. Regular store feel 2.6. Details of items 	<p>There is difficulty navigating the items and their prices. Everything was not clearly arranged. The design was slow. There was no ability to pick an item off the shelves. The design lacks the feel of regular store. Not knowing the name and price of items was challenging.</p>
Sub-theme 2A – Confusing for first-time digital users (n=5)	<ul style="list-style-type: none"> 2A.1.Digital space 2A.2.What to do sequence 2A.3.Understanding buttons 2A.4.Clicking discomfort 2A.5.Comfort with design 	<p>The digital space is uncomfortable, the user clicks the 3D immersive view first to understand. It was difficult to know at first what to do. The use of the button was not fully understood despite more information associated with it. Clicking the link might be strange to an uncomfortable user. The design was not straight forward for a user who is not comfortable with digital space.</p>
Sub-theme 2B – Redirecting Away from 3D Space (n=6)	<ul style="list-style-type: none"> 2B.1.Noting the model 2B.2.Feeling nervous 2B.3.Other site links 2B.4.Links and losses 2B.5.User understanding 2B.6.Visiting other links 	<p>Only the model, not the details were noted during click activity. Clicking the link caused nervousness as it would take the user out of the virtual environment. Linking users to another site can discourage users. The links to other sites might lead to loss of users. It took a while before the user understood that the dots led to links. Users might spend less time in the virtual environment as a result of visiting different links.</p>
Sub-theme 2C – Font Size (n=2)	<ul style="list-style-type: none"> 2C.1.Font size 2C.2.Required scrolling 	<p>The fonts were too big. Using the design required continuous scrolling because of the big fonts.</p>
Theme Three – Design Improvement (n=12)	<ul style="list-style-type: none"> 3.1. Links to venue usage 3.2. Item inspection 3.3. Items on rails 3.4. Product images 3.5. Overload of information 3.6. Item visibility 3.7. Environment 3.8. Display shelving 3.9. Interactive navigation 3.10. Technology partners 3.11. Links to cart 3.12. Live feedback 	<p>A link indicating when the venue was used for previous events can be placed there. Ability to inspect an item through a 3D move or model will be impressive. The design enables the good ability to take off an item from the rail. Having the image of customers in the store will also be good. It is better to have the space clean to avoid overload of information. One or two items from the selection should be made visible to the user. The environment should be flawless. The little display shelves can be improved. The navigation and interaction in the virtual store can be improved. There is need for a tech partner to improve the design. There should be a straight link to the cart. There should be provision for live feedback or FAQ.</p>

Themes	Codes	Associated Quotations
Theme Four – Safety Reasons during COVID-19 Pandemic (n=3)	4.1. Physical presence needs 4.2. Contact avoidance 4.3. Pandemic shopping	It gives the opportunity to visit spaces without physical presence during the pandemic. It helps to avoid contact during pandemic. The design is a good option for shopping during pandemic.
Theme Five – Ease of Accessibility (n=7)	5.1. Advantage of access 5.2. Access for many people 5.3. Physical presence 5.4. Increased accessibility 5.5. Simultaneous views 5.6. Online content 5.7. Categorisation	Accessibility is the greatest advantage of this design. Numerous people can access the store without physical presence. The 3D design does not require physical presence. The 3D design will make the industries more accessible to more people. The 3D space allows different customers to view things at the same time. The 3D space gives opportunity to relate with online content without physical presence. The model will help users find things in categories.
Theme Six – Business Growth (n=20)	6.1. Video links 6.2. Social media links 6.3. Marketing content 6.4. Future trends 6.5. Impulsiveness 6.6. Product information 6.7. Product item names 6.8. Store items visualised 6.9. Customer contact 6.10. Efficient advertisement 6.11. Personal experiences 6.12. Business information 6.13. Tracking online sales 6.14. Inventory management 6.15. Future business options 6.16. Virtual experiences 6.17. Shared information 6.18. Improved sales 6.19. Social media exposure 6.20. Knowledge security	Having links to other videos is an improvement on the actual experience in real life Having the social media link on the model is helpful to growing the platform Integrated marketing content is beneficial for businesses in the digital space Many people will need the 3D space in time to come It acts on the impulse of the buyer It helps to provide more information about the product and the company It helps with the names of items you cannot remember The 3D model helps to visualise all the items in the store The 3D space does not allow contact between customers The 3D space will be an efficient advertisement for stores The design gives a personalised experience The design gives adequate information about the business to the owner The design helps in tracking online sales The design helps to make proper inventory based on previous data The design will help in creating future businesses The design will increase customers' virtual experience The social media platform helps to share more information The virtual design will improve sales for business Visiting the 3D model gives the opportunity to follow the store on social media You have the security of knowing what you are looking for.
Theme Seven – Efficiency (n=13)	7.1. Cost savings 7.2. Cost effectiveness 7.3. Search efficiency 7.4. Effort 7.5. Transport costs 7.6. Time factors 7.7. Ease of use 7.8. Understandability 7.9. Shopping joy 7.10. Reach of the shopper 7.11. Event management 7.12. Knowledge acquisition	It saves cost. The 3D space is cost effective for the industry. It saves you the stress of checking the Internet. The 3D space saves effort. The 3D space saves me petrol. The 3D space saves time. The design makes everything easier especially during COVID-19. The design was easy to understand. The experiences bring back the joy of shopping. It brings the world closer. It can be used to pick a venue for events. It made me interested in knowing more.

Themes	Codes	Associated Quotations
	7.13. Convenience	It provides convenience.

7.2 APPENDIX B: Transcripts of participant interviews

https://drive.google.com/drive/folders/1SNLCsi1EbEd-JW2cKkNTE9wTug4KULgH?usp=share_link

7.3 APPENDIX C: Editing Certificate

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Editing and research writing services

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17 February 2023


To whom it may concern

This is to certify that I have copy-edited the following thesis by Mr Marco Pestana:

Integrated marketing communications through immersive technology

Please note that this does not cover content, conceptual organisation or textual changes made subsequent to the editing process.

Best regards



KEN BARRIS

7.4 APPENDIX D: Institutional Ethical Clearance Documentation



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Office of the Chairperson Research Ethics Committee	FACULTY: BUSINESS AND MANAGEMENT SCIENCES
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The Faculty's Research Ethics Committee (FREC) on **14 September 2021**, ethics **APPROVAL** was granted to **Marco Pestana ((211236349))** for a research activity for **M Tech: Business Information Systems** at the Cape Peninsula University of Technology.

Title of project:	Emergence of Immersive Technology in Integrated Marketing Communications
	Researcher (s): Prof J Cronje

Decision: APPROVED

	29 November 2021
Signed: Chairperson: Research Ethics Committee	Date

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the CPUT Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study requires that the researcher stops the study and immediately informs the chairperson of the relevant Faculty Ethics Committee.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing accompanied by a progress report.
5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines, and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, notably compliance with the Bill of Rights as provided for in the Constitution of the Republic of South Africa, 1996 (the Constitution) and where applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003 and/or other legislations that is relevant.
6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.
7. No field work activities may continue after two (2) years for Masters and Doctorate research project from the date of issue of the Ethics Certificate. Submission of a completed research ethics progress report (REC 6) will constitute an application for renewal of Ethics Research Committee approval.

Clearance Certificate No | 2021_FBMSREC 099


7.5 APPENDIX E: Interview Protocol

Table 7-2 Interview Protocol

Category	Questions
A. Usability/ Compatibility	1. When you first opened the link and viewed the 3D space, what were some of the thoughts that came to mind?
	2. What did you find interesting about it throughout the interaction? List in detail.
	3. Was the 3D environment easy to navigate on my device? Offer any suggestions.
B. Presence/ Immersion	1. Considering that the 3D environment is a real-life digital twin of a physical store, how much did you feel like you were really in a virtual shopping environment? How realistic was it to you? Provide details of what captured your eye.
	2. How did engaging with the marketing material prompt you to visit the internet page where the products were listed in further detail?
	3. The Ciovita shop's virtual atmosphere is fully digital. Its aims were to display marketing content and offer a realistic portrayal of the store. In your perspective, how would this be beneficial in your opinion during a pandemic such as Covid 19? Keeping in mind a digital space and marketing content embedded within it.
	4. To what extent did you feel like it was an immersive 3D experience?
C. Engagement/ Flow	1. What did you find interesting about the space? What were some of the challenges you had to deal with when navigating the immersive area? (e.g., clicking the hyperlinks, obtaining information, and examining the three-dimensional objects in the virtual environment)
	2. What changes or improvements would you recommend on certain aspects?
	3. Was it simple to navigate and interact with things in the virtual store? Share your experiences of the environment.
D. Clarity/ Experience Implications	1. Do you believe it's better to have links to other sites like the website, or do you think it's better to have all you need to know already present in the 3D environment itself? Please explain why you chose your answer.
	2. Have you had any problems viewing the links or the items within the virtual store itself, and if so, what caused those problems?
	3. Was everything clear, easy to understand, and accessible?
E. Utilization of Available Technology	1. Given what you've learned, would you suggest the introduction of a 3D digital twin of a real-life space to businesses in other sectors? What would the features, advantages, and benefits be?
	2. In what ways, do you think a 3D digital space would be beneficial to these industries? Take into account the lockdown as well as any potential pandemics in the future.
	3. How do you think integrated marketing content could be beneficial for businesses within an immersive digital space?

7.6 APPENDIX F Informed Consent Document

~~XXXXX informed consent form~~



CONSENT TO PARTICIPATE IN A RESEARCH STUDY							
Category of Participants (tick as appropriate):							
<i>Staff/Workers</i>	<input type="checkbox"/>	<i>Teachers</i>	<input type="checkbox"/>	<i>Parents</i>	<input type="checkbox"/>	<i>Lecturers</i>	<input type="checkbox"/>
<i>Other (specify)</i>							

You are kindly invited to participate in a research study being conducted by Marco Pestana from the Cape Peninsula University of Technology. The findings of this study will contribute towards (tick as appropriate):

<i>An undergraduate project</i>	<input type="checkbox"/>	<i>A conference paper</i>	<input type="checkbox"/>
<i>An Honours project</i>	<input type="checkbox"/>	<i>A published journal article</i>	<input type="checkbox"/>
<i>A Masters/doctoral thesis</i>	<input checked="" type="checkbox"/>	<i>A published report</i>	<input type="checkbox"/>

Selection criteria

You were selected as a possible participant in this study because you are:

- Expert in the field

The information below gives details about the study to help you decide whether you would want to participate.

Title of the research:

Emergence of Immersive Technology in Integrated Marketing Communications

A brief explanation of what the research involves:

The primary research method for this study is based on the design science research framework which is cyclic and seeks to provide solutions and prescriptive knowledge on how to solve problems relevant to real world scenarios. The direction of the proposed study seeks to build an immersive virtual environment using the cyclic framework of design science as a base of research, knowledge and artifact evaluation in order to deduct best processes and procedures for further knowledge on design process. Van den Akker's (2007) elucidated that design science stages are predominately preliminary investigation, theoretical embedding, empirical testing and documentation, analysis and reflection on process and outcome, each paradigm in the cyclic framework has to be addressed independent of the other in a sequential manner. Cronje (2013) argued that research will be the result of design cycles and design will essentially be the outcome of exploring, describing, building and applying

Figure 7-1 Informed Consent Document

The principal objective of this study is to eliminate challenges of IMC through spherical imagery technology and to build a computer-simulated virtual environment within the business sector amid the COVID-19 pandemic. Due to the sudden outbreak of the COVID-19 pandemic, people are practicing precaution and generally apprehensive to physically enter establishments, business enterprises, or organizations. Ali (2020) explores that due to the COVID-19 pandemic and heavy restrictions, consumers behavior has changed (Ali, 2020). As well, Eger et al. (2021) investigate that COVID-19 has dramatically changed consumers purchasing behavior where most of the consumers are concerned with health fear and economic crisis (Eger *et al.*, 2021). This circumstance subsequently resulted in a gap for immersive access to virtual spaces whereas consumers are able to have a close to real-life viewing experience.

Procedures

If you volunteer to participate in this study the following will be done:

1. Describe the main research procedures to you in advance, so that you are informed about what to expect;
2. Treat all interviewees with respect by arriving on time for all the interview schedules and well prepared;
3. Conduct an introduction with the interviewee in order to break ice;
4. All the interviewees will be asked for permission to record the interviews and also take some note where applicable;
5. In a case where there is no clarity, the interviewees will be allowed to ask for confirmation or clarity of words/sentences/phrases to ensure accuracy of the data collected;
6. Participants will be told that their data will be treated with full confidentiality and that, if published, it will not be identifiable as theirs;
7. Participants will be given the option of omitting questions they do not want to answer or feel uncomfortable with;
8. Participants will be told that questions do not pose any realistic risk of distress or discomfort, either physically or psychologically, to them;
9. At the end of each interview all the interviewees will be thanked for their time and information provided for this study;
10. Participants will be debriefed at the end of their participation (i.e. give them a brief explanation of the study).

You are invited to contact the researchers should you have any questions about the research before or during the study. You will be free to withdraw your participation at any time without having to give a reason.

Kindly complete the table below before participating in the research.

Tick the appropriate column		
Statement	Yes	No
1. I understand the purpose of the research.		
2. I understand what the research requires of me.		

3. I volunteer to take part in the research.		
4. I know that I can withdraw at any time.		
5. I understand that there will not be any form of discrimination against me as a result of my participation or non-participation.		
6. Comment:		

Please sign the consent form. You will be given a copy of this form on request.

Signature of participant	Date

Researchers

	Name:	Surname:	Contact details:
1.	Marco	Pestana	0837275137
2.			

Contact person:
Contact number: _____ Email: _____

TYPE IN HERE THE INTERVIEW RESEARCH QUESTIONS OR THE SURVEY QUESTIONS

Please see PDF attached.