A MODEL FOR ACCEPTANCE OF THE INFORMATION COMMUNICATION AND TECHNOLOGY (ICT) FOR REAL ESTATE AGENCY PRACTICE IN MALAYSIA

MURNI BINTI MOHAMAD

FACULTY OF BUILT ENVIRONMENT
UNIVERSITI MALAYA

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ORIGINAL LITERARY WORK DECLARATION

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In the Name of Allah,

The Most Merciful, the Most Compassionate

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A MODEL FOR ACCEPTANCE OF THE INFORMATION COMMUNICATION AND TECHNOLOGY (ICT) FOR REAL ESTATE AGENCY PRACTICE IN MALAYSIA

ABSTRACT

The integration of Information and Communication Technology (ICT) has revolutionized various industries, including the real estate sector. The advent of ICT has significantly altered the landscape in which real estate agents operate. Real estate agents have used ICT for marketing, information dissemination, and facilitating clients, especially buyers, in property transactions. However, despite its potential benefits, many real estate agents are reluctant to adopt and use these technologies. This is because most professionals in the real estate field are underprepared to embrace ICT and feel pressured to quickly integrate these technologies into their business models. This research aims to propose a model for the acceptance of ICT among real estate agents in Klang Valley, Malaysia. Four objectives were outlined to achieve the aims of this research: (i) to determine the ICT tools used by real estate agents in practice, (ii) to examine the factors influencing Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Behavioural Intention (BI) and Acceptance (ACC) of ICT among Real Estate Agents, (iii) to analyse the importance and performance factors affecting PU, PEOU, BI, and ACC of the ICT among real estate agents, (iv) to develop a model that integrates the factors influencing the acceptance of ICT among Real Estate Agents. This research adopted the Technology Acceptance Model (TAM) as the foundation and employed a quantitative method, using a simple random sampling technique. The data were gathered through a survey conducted with real estate agents in valuation and agency firms in Klang Valley, Malaysia and 400 responses were collected within four months. Data then was analysed using Partial Least Squares Structural Equation Modeling (PLS-SEM) for inferential statistics and Importance-

Performance Map Analysis (IPMA). The results show that mobile instant messaging is the most frequently used tool by real estate agents, with 68.50% usage, followed by Social Media (56.50%) and Real Estate Agent's Website (53.50%). The least frequently used technologies are Robotic Process Automation and Metaverse Real Estate, both at 3.25%. Facilitating Conditions (FC), Innovativeness (INNO), and Perceived Enjoyment (ENJ) positively influence real estate agents' PEOU of ICT. Meanwhile, Service Quality (SERQ) positively influences PU of ICT, and Trust (TRU) positively influences BI of ICT. For the Importance-Performance Map Analysis (IPMA), Innovativeness (INNO) emerges as the important factor affecting the Perceived Ease of Use (PEOU), while Service Quality (SERQ) is the important factor affecting the Perceived Usefulness (PU). Notably, Perceived Usefulness (PU) is identified as the important factor affecting Behavioral Intention (BI). Furthermore, when examining the factors affecting Acceptance (ACC), Behavioral Intention (BI) is distinguished as the most significant factor. Finally, the model was proposed for the acceptance of ICT among real estate agents. The contribution of this research is an extension of the Technology Acceptance Model (TAM) in the context of real estate agents' acceptance of ICT. In addition, the result from this research will help the firms and educational sector to develop strategies to enhance the acceptance and utilization of ICT by improving service quality, providing better support and resources, making ICT tools more enjoyable and innovative, and building trust in shaping real estate agents willingness to use ICT.

Keywords: Technology Acceptance Model (TAM), Real Estate Agents, ICT Acceptance

MODEL PENERIMAAN TEKNOLOGI MAKLUMAT DAN KOMUNIKASI (TMK) DALAM KALANGAN AGENSI HARTA TANAH DI MALAYSIA

ABSTRAK

Integrasi Teknologi Maklumat dan Komunikasi (TMK) telah merevolusikan pelbagai industri, termasuk sektor hartanah. Kemunculan TMK telah mengubah landskap di mana ejen hartanah beroperasi dengan ketara. Ejen harta tanah telah menggunakan TMK untuk pemasaran, penyebaran maklumat, dan memudahkan pelanggan, terutamanya pembeli, dalam urus niaga hartanah. Dalam era digital hari ini, di mana interaksi dengan teknologi dan sistem maklumat adalah perkara biasa, kepentingan TMK tidak boleh dipertikaikan. Walau bagaimanapun, di sebalik potensi manfaatnya, ramai ejen harta tanah masih menunjukkan keengganan dalam mengguna pakai dan menggunakan teknologi ini. Majoriti profesional dalam bidang harta tanah kurang bersedia untuk menerima TMK dan menghadapi tekanan untuk menyesuaikan teknologi ini dengan cepat ke dalam model perniagaan mereka. Untuk menangani isu ini, adalah penting untuk memahami faktor-faktor yang mempengaruhi penerimaan ejen harta tanah terhadap TMK. Oleh itu, objektif penyelidikan ini adalah untuk mengenal pasti alat TMK yang digunakan oleh ejen harta tanah secara praktikal untuk menentukan faktor kesan langsung yang mempengaruhi Penggunaan yang Dirasakan (PU), Kemudahan Penggunaan yang Dirasakan (PEOU), Niat Tingkah Laku (BI) dan Penerimaan (ACC) TMK, untuk menentukan kepentingan dan faktor prestasi yang mempengaruhi PU, PEOU, BI dan ACC TMK dan untuk mencadangkan model untuk penerimaan TMK di kalangan ejen harta tanah. Kajian ini menggunakan Model Penerimaan Teknologi (TAM) sebagai asas dan menggunakan kaedah kuantitatif, dengan menggunakan teknik persampelan rawak mudah. Data dikumpulkan melalui tinjauan yang dijalankan dengan ejen harta tanah di firma penilaian dan agensi di Lembah Klang, Malaysia dan 400 respons telah dikumpulkan dalam tempoh empat bulan. Data kemudian dianalisis menggunakan Pemodelan Persamaan Struktur

Kuasa Dua Separa Terkecil (PLS-SEM) untuk statistik inferensi dan Analisis Peta Kepentingan-Prestasi (IPMA). Keputusan menunjukkan bahawa pemesejan segera mudah alih adalah alat yang paling kerap digunakan oleh ejen hartanah, dengan penggunaan 68.50%, diikuti oleh Media Sosial (56.50%) dan Laman Web Ejen Hartanah (53.50%). Teknologi yang paling kurang kerap digunakan ialah Automasi Proses Robotik dan Hartanah Metaverse, kedua-duanya pada 3.25%. Kondisi Pemudahcara (FC), Keinovatifan (INNO), dan Keseronokan yang Dirasakan (ENJ) secara positif mempengaruhi PEOU TMK ejen hartanah. Sementara itu, Kualiti Perkhidmatan (SERQ) secara positif mempengaruhi PU TMK, dan Kepercayaan (TRU) secara positif mempengaruhi BI TMK. Bagi Analisis Peta Kepentingan-Prestasi (IPMA), INNO muncul sebagai faktor kepentingan yang mempengaruhi PEOU, manakala Kualiti Perkhidmatan (SERQ) adalah faktor kepentingan yang mempengaruhi PU. PU dikenal pasti sebagai faktor penting yang mempengaruhi BI. Tambahan pula, apabila meneliti faktor yang mempengaruhi ACC, BI dibezakan sebagai faktor yang paling ketara. Akhirnya, rangka kerja telah dicadangkan untuk penerimaan TMK dalam kalangan ejen harta tanah. Sumbangan kajian ini adalah pengesahan dan pelanjutan TAM dalam konteks penerimaan ejen hartanah terhadap TMK. Di samping itu, hasil daripada kajian ini akan membantu firma dan sektor pendidikan untuk membangunkan strategi bagi meningkatkan penerimaan dan penggunaan TMK dengan meningkatkan kualiti perkhidmatan, menyediakan sokongan dan sumber yang lebih baik, menjadikan alatan TMK lebih menyeronokkan dan inovatif, serta membina kepercayaan dalam membentuk kesediaan ejen hartanah untuk menggunakan TMK.

Kata Kunci: Model Penerimaan, Ejen Hartanah, Penerimaan TMK

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LIST OF ABBREVIATIONS

ICT	Information and Communication Technology
TAM	Technology Acceptance Model
BOVAEP	The Board of Valuers, Appraisers, Estate Agents & Property Managers
PU	Perceived Usefulness
PEOU	Perceived Ease of Use
BI	Behavioral Intention
ACC	Acceptance
ENJ	Perceived Enjoyment
FC	Facilitating Conditions
INNO	Innovativeness
SERQ	Service Quality
TRU	Trust
PC	Perceived Cost
INQ	Information Quality
TSE	Technology Self-Efficacy
SI	Social Influence
REA	Real Estate Agents
PV	Probationary Valuers
PEA	Probationary Estate Agents
REN	Real Estate Negotiators

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CHAPTER 1: INTRODUCTION

1.1 Introduction

In an era where digital transformation is reshaping industries, the real estate sector is no exception. With the rapid evolution of Information and Communication Technology (ICT) tools and platforms, their integration into business practices has become inevitable. Information and Communication Technologies (ICT) are revolutionizing how we live, work, and interact, and their impact on the real estate sector is undeniable. From innovative marketing strategies to streamlined property management tools, the rapid evolution of ICT tools and platforms presents exciting opportunities for real estate professionals to enhance efficiency, improve service delivery, and gain a competitive edge. However, the adoption of these technologies among real estate professionals remains uneven, underscoring a gap between technological availability and its effective utilization. The adoption rates of ICT tools and platforms among real estate professionals remain uneven, highlighting a significant gap between technological availability and effective utilization. This disparity raises critical questions about the factors influencing technology acceptance and utilization in the real estate field. Understanding these factors is crucial for bridging the gap and ensuring that real estate professionals can fully leverage the power of technology to achieve their business goals. This chapter will delve into the background of the research, outline the research problem and questions, and set the stage for a detailed examination of the Technology Acceptance Model in the context of Malaysia's real estate agents.

1.2 Research Background

Information and Communication Technology (ICT) has significantly impacted the real estate industry in recent years. The rise of the internet and social media has transformed how people work, communicate, and access information. In today's digital age, where interactions with technology and information systems are commonplace, ICT has become essential. Real estate agents utilize ICT for marketing (Adedamola et al., 2021), information dissemination (Saiz, 2020), and facilitating property transactions for clients, especially buyers (Shaw, 2018; Gu & Zhu, 2021).

Traditionally, real estate agents relied heavily on physical show units and printed property images to market properties and influence potential homebuyers. However, research by Andrew & Lawrence (2018) revealed that these methods limit potential buyers' ability to perceive property quality and visualize themselves within the space. Consequently, the real estate industry needs to adopt a wider range of ICT tools (Elghaish et al., 2020).

The COVID-19 pandemic further accelerated the importance of ICT in 2020, impacting industries globally and changing how businesses operate and interact with customers (Dunning et al., 2018). In real estate, online platforms have simplified property searches, price comparisons, and agent connections. Mobile apps empower agents to access property data, communicate with clients, and manage schedules efficiently. Social media offers a platform for agents to connect with a wider audience, including potential clients (Tsakiridou & Karanikolas, 2019).

Despite these benefits, many real estate agents remain hesitant to embrace ICT (Mohd, 2019; Bakar & Yaacob, 2020). This reluctance stems from a limited understanding of effective ICT tools, concerns about service quality (Kaur & Solomon, 2021), trust

(Aldossari & Sidorawa, 2018), cost (Low et al., 2020), and relevance to daily operations. Many agents also feel unprepared and pressured to rapidly integrate ICT into their business models (Baum et al., 2020; Asensio-Soto & Navarro-Astor, 2022). This can disrupt established practices and raise concerns about costs and the availability of support (Adegoke et al., 2020).

To address this, it is crucial to understand the factors influencing ICT acceptance among real estate agents. The Technology Acceptance Model (TAM) is a well-established model for identifying these factors. It proposes that perceived usefulness (PU), perceived ease of use (PEOU), behavioral intention (BI), and acceptance (ACC) are key determinants of ICT adoption (Davis et al., 1989; Muhanna & Wolf, 2002; Albar & Hoque, 2017; Ullah et al., 2019). However, research on the direct effects of factors influencing these constructs in the real estate industry is limited. Decision-makers need to understand what drives agents' behavior and decisions regarding ICT acceptance and use (Mathieson, 1991; Azmi et al., 2021; Ullah et al., 2021).

The real estate industry has undergone a profound and rapid transformation due to ICT. Online platforms, data storage solutions, and communication tools have reshaped traditional practices and influenced how real estate transactions are conducted (Dunning et al., 2018; Bakar & Yaacob, 2020; Sulaiman et al., 2020). By developing a comprehensive model for ICT acceptance among real estate agents, we can better understand their motivations and identify interventions to promote adoption. This knowledge can help overcome barriers to ICT use, leading to increased productivity, improved customer service, and enhanced communication within the industry (Munshifwa & Chilembo, 2019; Najib Razali et al., 2014).

1.3 Research Problem

The Malaysian government's Malaysia Digital Economy Blueprint (MDEB) aims to transform the country into a digitally-driven, high-income nation and regional leader in the digital economy by 2030. This blueprint emphasizes the need for digital transformation across all sectors, including real estate, to boost economic competitiveness and achieve sustainable socioeconomic development. However, the slow adoption of ICT in the property industry hinders its development (Baum et al., 2020; Braesemann & Baum, 2020) including Malaysia (Mohd, 2019; Bakar & Yaacob, 2020). This is evidenced by Malaysia's relatively low rankings in the IMD World Digital Competitiveness Ranking for future readiness and the WEF Global Competitiveness Index for ICT adoption between 2017 and 2019 (see Figure 1.1).

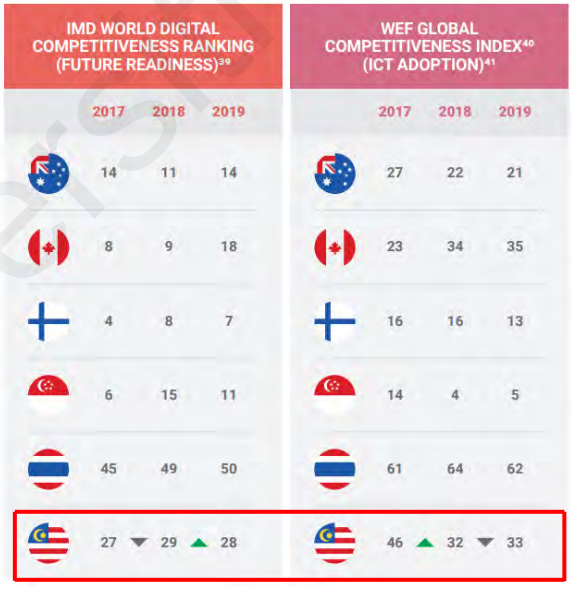


Figure 1.1: Malaysia's Performance in Key Global Indices
Sources: Malaysia Digital Blueprint Report 2021

Given that the real estate sector contributes significantly to Malaysia's Gross Domestic Product (GDP), the successful integration of digital technologies within this sector is crucial for the government to achieve its goal of becoming a digital nation by 2030. Thus, examining the factors influencing ICT acceptance among real estate agents is crucial. By understanding and meeting the specific needs of real estate agents when it comes to using technology, the government and industry leaders can create solutions that make it easier for them to use digital tools. This will help real estate agents work better, get more done, and be more competitive. When the real estate sector does well, it helps Malaysia become a stronger digital economy. Conversely, low ICT adoption can put real estate agents and the sector as a whole at a disadvantage, potentially limiting their reach, efficiency, and overall growth potential.

1.4 Research Gap

Real estate agents are increasingly relying on Information and Communication Technology (ICT) tools to conduct their business. These tools encompass a broad range of technologies, including virtual reality, drones, augmented reality, and cloud computing, reflecting the diverse needs of the real estate profession. However, in reality, there is a lack of research on the specific ICT tools that real estate agents use in practice. Comprehensive research investigating these tools would provide valuable insights into the current state of ICT adoption in the real estate industry and inform strategies to promote further integration and maximize benefits for real estate professionals.

Previous studies have explored the impact of specific technologies on the real estate industry, such as Big9 technologies (Ullah et al., 2019), virtual reality (Adegoke & Oladokun, 2020), internet strategies (Masis et al., 2017), drones for property marketing (Uglješa et al., 2019), and the role of Facebook in real estate sales (Shi et al., 2020). While

informative, these studies do not offer a complete understanding of the diverse range of ICT tools used by real estate agents daily. This knowledge gap hinders a full assessment of ICT adoption in the industry.

The COVID-19 pandemic has dramatically changed our lives, accelerating the adoption of technology in various sectors, including real estate. As traditional in-person interactions were restricted, real estate agents had to rely on technology to conduct business. This shift has significantly impacted their behavior and acceptance of technology. Therefore, it is crucial to examine the factors influencing ICT acceptance among real estate agents, especially since past literature suggests that technological adoption in the real estate industry lags behind other sectors (Baum et al., 2020; Braesemann & Baum, 2020).

Furthermore, the complexities of predicting human behavior have generated a variety of theories and models in the literature to explain patterns of adoption and use of new technologies. For example, theories such as the Theory of Reasoned Action (TRA), the Theory of Planned Behavior (TPB), and the Technology Acceptance Model (TAM) (Lai, 2017; Hoong et al., 2017; Taherdoost, 2018; Alshammari & Rosli, 2020) is an example of the model that can be used to understand and predict ICT acceptance. The lack of a comprehensive model for the acceptance of ICT among real estate agents is a significant obstacle to promoting ICT adoption and use in this industry. Therefore, this research aims to fill these gaps by proposing an extended version of the original Technology Acceptance Model, incorporating additional factors that influence real estate agents' acceptance of Information and Communication Technology (ICT).

1.5 Research Questions

To address the identified research problems, the research will focus on the following questions:

1. What are the Information and Communication Technology (ICT) tools used by real estate agents in practice?
2. What are the factors influencing Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Behavioral Intention (BI), and Acceptance (ACC) of ICT among Real Estate Agents in Klang Valley?
3. What are the importance and performance factors that influence the perceived usefulness (PU), perceived ease of use (PEOU), behavioral intention (BI), and acceptance (ACC) of ICT among Real Estate Agents in Klang Valley?
4. How to integrate the factors in the implementation of ICT acceptance among Real Estate Agents in Klang Valley?

1.6 Research Aim

Based on the research background and problem statement as discussed, this research is planned and executed to achieve the following aim:

To propose a model for the acceptance of ICT among real estate agents in Klang Valley, Malaysia

1.7 Research Objectives

Aligned with the research questions, the objectives are:

1. To determine the Information and Communication Technology (ICT) tools used by real estate agents in practice.
2. To examine factors influencing Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Behavioral Intention (BI), and Acceptance (ACC) of ICT among Real Estate Agents in Klang Valley.
3. To analyse the importance and performance factors affecting Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Behavioral Intention (BI), and Acceptance (ACC) of ICT among Real Estate Agents in Klang Valley.
4. To develop a model that integrates the factors influencing the acceptance of ICT among real estate agents in Klang Valley.

1.8 Scope of Research

1.8.1 Case Study

The scope of this research covered the area of Klang Valley, a bustling metropolitan area situated at the heart of Malaysia, encompasses the federal territories of Kuala Lumpur and Putrajaya, along with adjacent cities and towns in the state of Selangor. According to Rashid (2017) and Goh et al. (2022), Klang Valley covering 2,832 square kilometers, the cities span key areas such Shah Alam, Klang, Petaling Jaya, Subang Jaya, Kuala Lumpur, and Putrajaya. Klang Valley has earned its reputation as one of the nation's most rapidly advancing regions (Rashid, 2014; Said et al., 2022). In addition, it is a good site of research to determine the acceptance of ICT among real estate agents which Klang Valley

representing Malaysia as it is a Major transportation hub, major manufacturing hub, major financial center, major commercial center and major educational center (Bakar et al., 2021; Mun et al.,2022). Klang Valley is a major economic and commercial hub in Malaysia, and the real estate market in the Klang Valley is one of the most active in the country. As such, real estate agents practicing in Klang Valley are considered exposed to the most advanced technology compared to other states. This is because Klang Valley is a major economic hub and has a high speed of internet use in Malaysia.

1.8.2 Respondents

The respondents for this research are real estate agents with offices located in the Klang Valley area. According to the Valuers, Appraisers, Estate Agents and Property Managers Act 1981 (Act 242), practicing real estate agents include registered valuers, probationary valuers, probationary estate agents, and real estate negotiators. Therefore, this research will target these individuals practicing real estate agency in Klang Valley, Malaysia.

1.9 Research Significance

Research plays a vital role in advancing both theoretical knowledge and practical applications across various disciplines. This section highlights its impact on both theoretical development and practical implementation.

1.9.1 Significance to Knowledge

This research aims to make several key contributions to the field of real estate technology. First, it will provide a comprehensive overview of the ICT tools currently used by real estate agents, identifying the specific technologies employed in their daily work and

updating the existing literature. Second, it will investigate the factors that directly influence ICT acceptance among these agents, offering a holistic understanding of technology adoption within the industry. This knowledge will then be used to develop a model to encourage and facilitate ICT acceptance among real estate agents, serving as a valuable resource for professionals and organizations. Finally, the research emphasizes a rigorous methodological approach, employing a carefully designed questionnaire and robust statistical analysis to ensure valid and reliable results. This comprehensive approach will significantly advance our understanding of ICT in the real estate industry, paving the way for greater acceptance and adoption.

1.9.2 Significance to Industry

This research is essential to reveal the factors that drive real estate agents' behavior in accepting and using ICT in practice, as increased ICT adoption can lead to several benefits, including increased investment in the property market. According to a research by the National Association of Realtors (NAR), 90% of home buyers used the internet to search for homes in 2021. This suggests that ICT can make it easier for investors to find and invest in properties, which can lead to increased investment in the property market. Furthermore, a report in Malaysian Property Market in 2022 by National Property Information Centre (NAPIC) Malaysia indicates that the real estate industry contributed significantly to the country's GDP, reaching 8.7% in 2022 or approximately RM179.07 billion. This emphasizes the importance of a more technology-forward approach in boosting the country's income. Finally, ICT can improve the efficiency and productivity of real estate agents. For example, social media platforms can help real estate agents market properties more effectively and offer them the flexibility to work remotely.

1.10 Research Methodology

This quantitative research adopts the Positivist philosophy and using a deductive approach. It is applied research with an explanatory purpose (hypothesis testing) achieved through four phases: Preliminary Research, Development of Survey Questions, Data Analysis, and Model Development.

Phase 1: Preliminary Research

The preliminary research, consisting of an extensive review of secondary data such as journals, articles, and books, provided a comprehensive understanding of ICT acceptance among real estate agents. This literature review served to establish the research's importance and provide a foundation for understanding the Technology Acceptance Model, factors influencing technology adoption, and the professional practices of real estate agents. This initial phase was crucial in gaining an overview of ICT acceptance among real estate agents before proceeding to primary data collection.

Phase 2: Development of Survey Questions

The survey was developed in this phase in order to achieve the objectives of the research. The constructed survey was validated by the expert of this research from academic and industry for content validity. To ensure the survey's reliability and accuracy, a pilot research was conducted with a smaller participant group. The findings from this pilot research were then used to refine and finalize the survey before administering it to the target population, who are licensed real estate agents in Klang Valley, Malaysia, registered with the Board of Valuers, Appraisers, Estate Agents, and Property Managers (BoVAEP).

Phase 3: Analysis of Data

The collected survey data was rigorously analyzed using IBM SPSS version 26 and PLS-SEM software. This analysis involved both inferential statistics and the Importance Performance Map (IPMA) technique. The inferential statistics revealed patterns and relationships within the data, while the IPMA provided insights into the perceived importance and performance of various factors related to ICT acceptance among real estate agents.

Phase 4: Development of model

Ultimately, findings from the preceding phases were synthesized to formulate a model that integrated the acceptance of ICT among real estate agents. This model described the relationship among the components of the model as well as described the implications for the specified purpose.

1.11 Organization of the Thesis

This thesis consists of six main chapters namely, Introduction, Literature Review, Research Methodology, Analysis and Findings, as well as Discussion, Conclusion and Recommendations. The first chapter, Introduction presented research background, research problem, along with posited research questions, proposed research objectives, research significance and expected contribution.

The second chapter, literature review encompassed overview of real estate agents, technology and property market, an analysis of real estate agent practices, a details of ICT adoption in practices, underpinning theories that support the research, comparison of

technologies acceptance theories along with justification for choosing theories for this research and ended with hypotheses development.

The third chapter, research methodology explained how the research was design, what instruments and analyses had been used, conducted data collection procedures along with sampling justification. Furthermore, the procedure and results of the pilot survey also presented in this chapter. Selection of appropriate data analysis techniques to test proposed hypotheses and answer the related research questions were also discussed as the closing for this chapter.

The fourth chapter, data analysis presented step-by-step analysis procedures performed to test all of the hypotheses proposed in the second chapter. Besides hypotheses testing, this chapter also reported the detail about the samples gathered. Findings from the hypotheses testing were also explained and aligned with the research objectives proposed in the first chapter.

The fifth chapter will discuss the findings in line or contradict with the proposed hypotheses and research objectives. The findings will then be compared and contrasted to those previous scholars in the literature review.

Finally, chapter six concludes the thesis by summarizing the findings, confirming the achievement of research objectives, highlighting the research's implications, discussing limitations, and recommending future research directions.

1.12 Chapter Summary

This chapter explores the Information and Communication Technology (ICT) acceptance in real estate, laying the groundwork for understanding the factors that influence real estate agents' adoption of these technologies. The chapter begins with an introduction, emphasizing the growing importance of ICT in the real estate sector and highlighting the need for professionals to embrace digital transformation to enhance efficiency and service delivery. It then explores the research background, examining the impact of ICT on the real estate industry and discussing the challenges real estate agents face in adopting these technologies.

The chapter also identifies a research problem, which is the uneven adoption rates of ICT tools and platforms among real estate professionals, and this underscores the gap between technological availability and effective utilization. To address this problem, the chapter poses research questions that focus on the types of ICT tools used by real estate agents, the factors influencing their acceptance of ICT, and the integration of these factors into a comprehensive model. The research aims to propose a model for ICT acceptance among real estate agents in Klang Valley, Malaysia, to determine the ICT tools used by real estate agents in practice, examining the factors that influence the acceptance of ICT, analyzing the importance and performance of these factors, and developing a model that integrates these factors.

The scope of the research is limited to the Klang Valley area, which is considered representative of Malaysia's real estate landscape. The significance of the research is highlighted in its potential contributions to knowledge, such as determining the ICT tools used by real estate agents, examining the factors that influence ICT acceptance, and analyzing the importance and performance of these factors. The chapter concludes by

transitioning into a literature review in Chapter 2, which will provide a comprehensive overview of real estate agents, ICT tools, and the property market, as well as the theoretical foundations for technology acceptance.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter presents a thorough examination of the real estate landscape in Klang Valley, Malaysia, setting the stage for a deeper understanding of the interaction between real estate professionals and technology. It then delves into the roles and structures of real estate professional bodies, providing insights into their influence on the industry. A detailed typology of real estate agents is presented, which aids in understanding the diverse roles and responsibilities within the sector. This typology sets the stage for a discussion on the specific duties of these agents. Further, the chapter explores the variety of technologies currently in use by real estate agents, emphasizing those that have significantly impacted their daily practices. This leads into a critical analysis of the development of technology acceptance theories, where various theories are compared and evaluated to determine their applicability to the research context. The chapter concludes with an outline of the theoretical and conceptual model adopted for this research, detailing the factors that influence the acceptance of technology among real estate agents.

2.2 Overview of Real Estate Agent, ICT and Property Market

The incorporation of Information and Communication Technology (ICT) into the real estate industry gained momentum in the mid-1980s, coinciding with the widespread availability of personal computers. This technological evolution empowered real estate professionals by enabling them to utilize computers for storing and processing substantial data volumes. Microsoft Excel emerged as a pivotal tool for analysts, with regression modelling becoming a standard practice (Baum et al., 2020). In the earlier landscape, real estate agents held an information monopoly through exclusive access to the Multiple

Listing Services (MLS), a database comprising properties available for sale. This privileged position facilitated their role as intermediaries connecting buyers and sellers (Linneman, 1986).

The advent of computers facilitated the creation of specialized software applications tailored for the real estate sector. These applications automated tasks like managing property portfolios and report generation, allowing professionals to focus on strategic aspects. By 1998, the real estate domain witnessed the emergence of over 40,000 websites offering various services, from appraisal and architecture to development and construction. Utilised real estate websites to simplify property transactions, enhancing accessibility for buyers and sellers (Jones & Benjamin, 2013).

The 2000s marked a significant expansion in ICT use in real estate, driven by innovations such as mobile internet. This technology enabled real estate agents to broaden their reach to a wider audience and deliver more value-added services (Dixon, 2005). Platforms like Rightmove and Zoopla, prominent in England in the early 2000s, empowered users to search for properties online and directly engage with real estate agents, streamlining the property search process (Jud et al., 2002). Simultaneously, in 2007, PropertyGuru and PropTiger were established in Southeast Asia and India, respectively, offering online real estate services to aid customers in making informed decisions about buying, selling, or renting properties (Rapp et al.,2008; Freybote & Carstens, 2021).

The research conducted by Sing (2005) underscores the positive correlation between ICT utilization and enhanced business performance in real estate agencies. Those incorporating ICT were more likely to achieve heightened sales and profits, underscoring the transformative influence of technology on industry dynamics.

Moreover, ICT has empowered companies across various sectors to gain real-time customer insights, fostering a more personalized and customer-centric approach to marketing and sales. In the property and real estate domain, establishing an online presence has become indispensable for agents to target a broader range of buyers. Statistics reveal a shift in homebuyer behavior, with the majority preferring online platforms over traditional methods, thereby shortening the sales cycle (Ullah et al., 2020).

The year 2008 witnessed the widespread availability of cloud computing, leaner coding, and broadband, paving the way for real estate companies to innovate and develop new products and services. A pivotal development during this time was the rise of mobile applications, enabling consumers to access real estate information on their smartphones and facilitating easier property discovery and transactions.

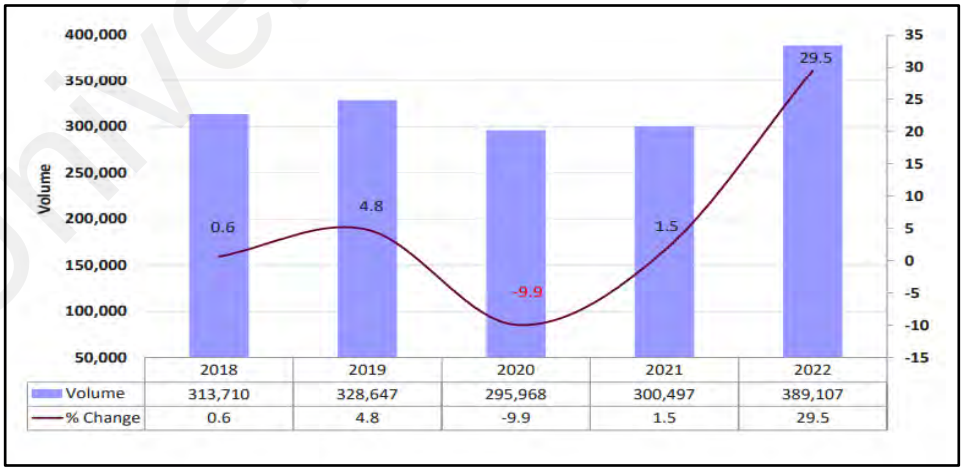
Fast forward to 2019, the COVID-19 pandemic accelerated the integration of new technologies into the real estate industry. Lockdowns and safety concerns prompted individuals to turn to online platforms for property searches, intensifying the reliance on ICT. Digital marketing emerged as a strategic response to the pandemic's effects on the real estate sector, leading to the rise of online platforms connecting buyers and sellers and challenging traditional agent roles (Shaw, 2018; Saiz, 2020; Gu & Zhu, 2021).

Despite the global trend, the Malaysian real estate sector has been relatively slow in embracing these technological shifts, lagging behind other industries in digital transformation. This gap forms the basis for the current research, which aims to explore the factors influencing technology acceptance among real estate agents in practice.

Despite initial resistance, the real estate sector is gradually undergoing digitalization, driven by growing consumer demands for convenient and efficient property transactions.

The stable economy, healthy property market yield, and foreign investment-friendly policies make Malaysia an attractive destination for investors globally. Notably, Malaysia's ranking in the Global Peace Index, as the 16th most peaceful country in 2018, further enhances its appeal, making it one of the safest nations in the ASEAN region and Asia (Zizan, 2020).

According to the Malaysia Property Market Report 2022 by National Property Information Centre (NAPIC), property transactions across all sectors experienced a substantial increase of 29.5%, totaling 389,107 transactions, with a 23.6% surge in value reaching RM179.07 billion from 2021 to 2022 (see Figure 2.1 & 2.2). This surge in property transactions directly contributed 8.7% to Malaysia's Gross Domestic Product (GDP) in 2022, a significant jump from the 3.7% recorded in 2021. Despite this positive trend, concerns arise from the persistently high number of unsold residential properties in the country. Although the number of units has decreased from 92,173 in 2021 to 68,702 in 2022 (see Figure 2.3), the issue remains a cause for worry.



	2018	2019	2020	2021	2022
Volume	313,710	328,647	295,968	300,497	389,107
% Change	0.6	4.8	-9.9	1.5	29.5

Figure 2.1: Volume of Property Transaction 2018-2022.
Source: Property Market Report 2022

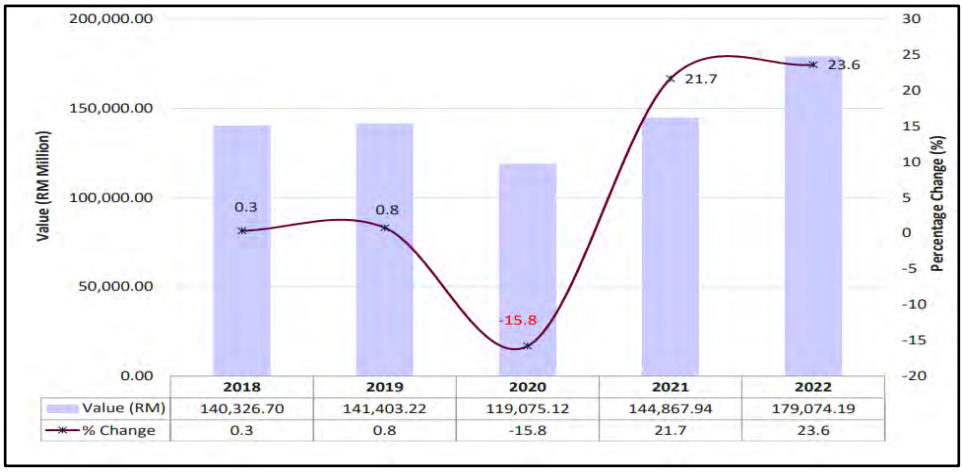


Figure 2.2: Value of Property Transaction in 2018-2022.
Source: Property Market Report 2022

As Malaysia aims to position itself as a major player in property development within the Asia-Pacific region, there is a crucial need for increased adoption of digital technology-based marketing practices. This is essential not only for the industry's growth but also to attract more foreign investors and buyers. The current slow pace of digitization within the property sector acts as a barrier to its potential expansion. Overcoming these challenges and embracing technology can propel the industry towards even faster growth, making it more appealing to potential investors.

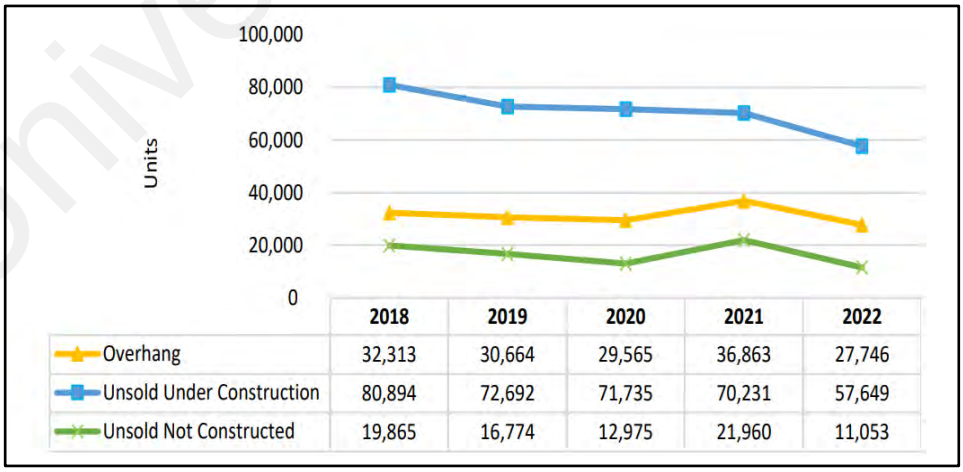


Figure 2.3:Residential Market Status in 2018-2022
Source: Property Market Report 2022

In summary, while the property market in Malaysia has shown significant positive trends in terms of transaction volumes, values, and contribution to GDP, the persistent issue of

unsold residential properties highlights the importance of addressing challenges through increased digitalization. A more technology-forward approach is essential for the sustained growth and attractiveness of the Malaysian real estate sector on both domestic and international fronts.

2.3 Klang Valley landscape and Real Estate Performance

The Klang Valley, a vibrant metropolitan area at the heart of Malaysia, encompasses the federal territories of Kuala Lumpur and Putrajaya, along with adjacent cities and towns in the state of Selangor. Spanning approximately 2,832 square kilometers, this region includes key areas such as the Federal Territory of Kuala Lumpur, Gombak, Hulu Langat, Klang, and Petaling, with cities like Ampang Jaya, Kuala Lumpur, Klang, Petaling Jaya, Shah Alam, and Subang Jaya being integral parts of this dynamic landscape (Rashid & Ishak, 2009). Strategically located in the central part of Peninsular Malaysia's west coast, the Klang Valley is known as one of the nation's fastest-growing regions (Rashid, 2014).

As a central driver of Malaysia's economic growth, the Klang Valley's prominence is due to various factors. It is a major transportation hub, home to the Kuala Lumpur International Airport (KLIA) — Malaysia's largest and busiest airport — and the Port of Klang, the nation's busiest port. These facilities establish Klang Valley as a key gateway for trade and investment, connecting Malaysia to the global market.

Furthermore, the Klang Valley is a significant manufacturing hub, hosting major industries such as electronics, electrical products, and machinery. These export-oriented sectors play a vital role in boosting Malaysia's foreign exchange earnings. The region is also a major financial center, featuring the Kuala Lumpur Stock Exchange (KLSE),

Malaysia's largest stock exchange, along with numerous notable banks and financial institutions. This financial milieu is instrumental in attracting investments to the country.

In addition, the Klang Valley stands out as a major commercial centre with a plethora of significant shopping malls, office towers, and hotels, fostering a robust business and commerce environment that stimulates regional economic activity. Its status as a major educational centre, encompassing several prominent universities and colleges, further positions it as a hub for education and research, thereby attracting talent and contributing to Malaysia's intellectual development (Rashid et al., 2014; Mun et al., 2022).

The real estate market in the Klang Valley, being among the most active in Malaysia, positions real estate agents in this region at the forefront of technology adoption compared to their counterparts in other states. This is attributed to the Klang Valley's status as a major economic hub, coupled with its high-speed internet connectivity, making it a prime location for modern real estate practices (Poon, 2021).

The property market in the state of Kuala Lumpur continued to improve in 2022, with higher transaction volumes and values than in the previous year. The review period saw 18,312 transactions (refer Figure 2.4) worth RM22 billion (refer Figure 2.4), an increase of 25% and 7.8% in volume and value, respectively, from 2021 (14,652 transactions worth RM20.4 billion). The residential sub sector continued to be the main driver of the market, accounting for 72% of the total transaction volume, followed by the commercial (26.1%), development land (1.1%), and industrial (0.8%) subsectors cannot be overlooked. Here is where skilled real estate agents come in.

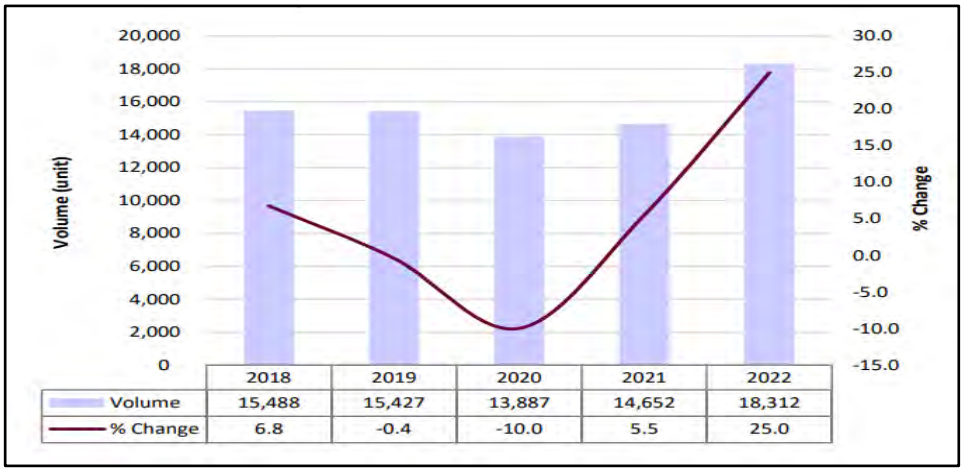


Figure 2.4: Volume of Property Transaction in Kuala Lumpur, 2018-2022
Source: Property Market Report 2022

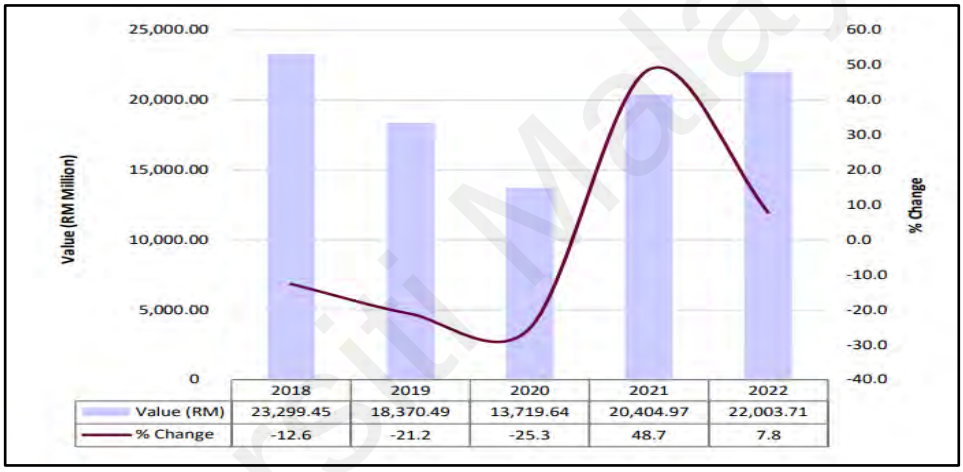


Figure 2.5: Value of Property Transaction in Kuala Lumpur, 2018-2022
Source: Property Market Report 2022

Skilled real estate agents act as market catalysts, expertly navigating complex transactions and connecting buyers and sellers across diverse property types. Their deep understanding of the local market, combined with negotiation expertise, helps unlock the full potential of each deal, driving up transaction volume and value. Furthermore, their ability to identify emerging trends and cater to specific buyer needs fosters market growth and diversification, contributing to the overall health of the economy.

Thus, the high-level use of ICT expands the reach of Kuala Lumpur's properties beyond national borders. Skilled real estate agents utilizing virtual platforms and targeted online

marketing can connect with international buyers, opening new investment avenues and increasing the market's global competitiveness.

Klang Valley is a major economic and commercial hub in Malaysia, and the real estate market in the Klang Valley is one of the most active in the country. As such, real estate agents practicing in Klang Valley are considered exposed to the most advanced technology compared to other states. This is because Klang Valley is a major economic hub and has a high speed of internet use in Malaysia.

2.4 The Real Estate Agent Profession

The role of a real estate agent in the property market is to serve as a mediator between buyers and sellers, providing information to both parties. Real estate agents play a crucial role in influencing the home-buying process and, ultimately, the selling price of a house (Besbris & Faber, 2017; Besbris, 2020). Although internet-based information about housing vacancies is now widely available, real estate agents have maintained their centrality in the purchase process. According to the National Association of Realtors, 89 percent of sellers use a real estate agent to sell their houses, while 88 percent of homebuyers use one (National Association of Realtors, 2020).

Beyond acting as intermediaries, real estate agents also connect buyers with various real estate services. These services may include solicitors for preparing sale and purchase agreements, mortgage lenders and appraisers, as well as home-care specialists like decorators, cleaners, and gardeners or lawn services. The hiring of estate agents is often attributed to their information skills, particularly in advertising and selling properties. Due to the complexity and expense of properties, coupled with their infrequent

transactions, many individuals believe professional assistance is essential (Oladokun & Olaleye, 2017).

Thus, property owners intending to sell often enlist the services of an estate agent to facilitate a prompt sale at a fair price. Conversely, prospective homebuyers typically seek out an agent to assist in finding a suitable property while minimizing costs. According to National Association of Realtors (NAR, 2018), 49 percent of home buyers and sellers prioritize finding a trustworthy and honest real estate agent. Clients also have specific expectations from their real estate agents: 15 percent expect a deep understanding of the real estate market, 13.2 percent value strong negotiation skills, 11.8 percent require positive references, 8.4 percent prioritize responsiveness, and 2.5 percent prefer to work with agents associated with established corporate brands (NAR, 2018). In the United State, most of the transaction in buying or selling a house has likely interacted with a real estate agent (Palm & Bolsen, 2022).

2.4.1 Overview of Real Estate Profession in Malaysia.

The Board of Valuers, Appraisers, Estate Agents and Property Managers was set up in 1981 under the purview of the Ministry of Finance, Malaysia. The setup and operation of this Board is governed by the provisions of the Valuers, Appraisers, Estate Agents and Property Managers Act 1981. Its primary function is to regulate the Valuers, Appraisers, Estate Agents and Property Managers practicing in Malaysia. The functions of the BOVAEP to be the responsibilities or functions of a regulatory body overseeing professionals in the fields of valuation, appraisal, real estate, and property management such as maintaining the register by involves keeping an official list or database of individuals and firms who are certified and allowed to practice as valuers, appraisers, estate agents, and property managers (LPPEH, 2022). This also includes those who are in

a probationary phase of their careers, like probationary valuers and probationary estate agents. Besides that, the Board also is the Body to approve and reject registration applications. The Board has the authority to evaluate applications from individuals or firms seeking to be registered as professionals in the aforementioned fields. They decide who meets the necessary criteria to be allowed to practice and who does not (BOVAEP, 2018).

Next is to hold disciplinary proceedings in cases where there are allegations of misconduct or professional malpractice, this body is responsible for conducting disciplinary proceedings (LPPEH, 2022). This can include investigations and hearings to determine if there has been a professional standards or ethics breach. Furthermore, the function of the Board is to conduct examinations to ensure that practitioners have the necessary knowledge and skills, the Board may conduct examinations that individuals must pass to become registered or licensed in their respective professions (BOVAEP, 2018).

Next is to prescribe scale of fees involves setting guidelines or limits on the fees professionals in these fields can charge for their services. It helps in maintaining standardization and fairness in the pricing of professional services. Besides that, the functions of Boad is regulating professional conduct/ethics (BOVAEP, 2018). The Board sets and enforces rules and standards relating to professional conduct and ethics. This is essential to ensure that all practitioners operate with integrity, transparency, and in the best interests of their clients and the public. Lastly is, awarding scholarships. This function involves providing financial support or scholarships to individuals pursuing studies or professional development in these fields. It's a way to encourage and support the education and training of future professionals in these industries. As of 2022, there are total of 4,174 registered estate agents, 2,384 probationary estate agents, 1,600

registered valuers and 2,891 registered valuers, estate agents and property managers in Malaysia (LPPEH, 2022).

In Malaysia, the duties real estate agents are also being practices by valuers, probationary valuers, probationary estate agents and real estate negotiators. The details of each practitioner are explained below.

2.4.1.1 Real Estate Agent/ Estate Agent (EA)

According to the Malaysian Estate Agent Standards Third Edition (MEAS) 2020, an Estate Agent is defined as "a person whose name has been entered under Part III (The Board shall keep and maintain the names, business address, qualifications, and other particulars of registered estate agents) of the Register and to whom an authority to practice has been issued by the Board under section 16". Meanwhile, a negotiator is defined as "a person who is either employed or engaged on a 'contract of service' or on a 'contract for service' by a firm to list and market properties and shall always be under the immediate direction and supervision of an estate agent. A person engages in estate agency practice if he acts as an agent, or holds himself out to the public or to any individual or firm as ready to act as an agent, for a commission, fee, reward, or other consideration, according to Section 22B (1A) of the Act 1981 (BOVAEP, 2018). The passage describes the specific duties and qualifications associated with being an estate agent, particularly under the context of the Malaysian Estate Agent Standards 2020. Here's a breakdown:

Duties of Estate Agents: This section outlines the various responsibilities of estate agents, which include:

a. Facilitating any sale or disposition of property and structures, as well as any related interests.
b. Managing land and building purchases, acquisitions, and related interests.
c. Handling land and building leasing or letting transactions, along with associated interests.
d. Announcing the availability of land, buildings, or related interests for sale, disposal, purchase, or lease.
e. Overseeing tenancy administration, involving tasks like rental collection, payment of outgoings, minor repair arrangements, and the process of handing over and taking over possession of a property.

Requirements for Estate Agent Registration: To become a registered estate agent, individuals must adhere to specific criteria outlined in Section 22A, Act 1981 (BOVAEP, 2018). The applicant must:

a. Be at least 21 years old, of sound mind, and possess good character, without recent convictions for crimes involving fraud, dishonesty, or moral turpitude.
b. Not have made false or misleading statements, affirmed or attested to inaccurate documents, or provided false information.
c. Not have been involved in bankruptcy without being discharged.
d. Meet the criteria specified in Section 22D*.
e. Sign a declaration in the Board's authorized form and manner.
f. Pay the required fees to the Board.
g. Not be barred from practicing valuation or property management, and their name should not have been removed from the register.

Explanation of Section 22D: This section clarifies the requirements for estate agents and probationary estate agents to be registered (BOVAEP, 2018). It involves:

a. Being registered as a probationary estate agent under the Act, subject to its provisions.
b. Passing the Board's tests or obtaining qualifications recognized by the Board as comparable to these examinations to apply for registration as a probationary estate agent.
c. Completing practical experience and passing the Board's Test of Professional Competence or an equivalent test or examination recognized by the Board.
d. Applying to the Board to have their name entered in the Register upon meeting the requirements outlined in subsection (3).

2.4.1.2 Probationary Estate Agent (PEA)

Valuers, Appraisers, Estate Agents and Property Managers Act 1981 (Act 242) has defined PEA is a person who is registered under the Act of 242 under section 22E, and whose name has been placed in the Register of Probationers and is employed or engaged by Estate Agent to assist the him in the estate agency practice. To be PEA, the individual should complete both Part I and Part II of the Written Estate Agents Examination and have officially enrolled with BOVAEP to take the Test of Professional Competence (TPC) for Estate Agents. refers to an individual who is currently taking the necessary steps to get a full license as an estate agent (BOVAEP, 2018). Prior to being registered as a Real Estate Agent, individuals are required to complete certain training and successfully pass tests. The registration number of is indicated by the acronym PEA followed by a numerical sequence.

2.4.1.3 Real Estate Negotiator (REN)

According to the Standard 2 of Malaysia Estate Agency Standard (MEAS, 2020), a negotiator is an individual employed or contracted by a company to advertise and sell properties. Negotiators always work under the direct supervision of an estate agent, meaning they cannot operate independently and must remain under the estate agent's oversight. To become REN, individual are required to complete a 2-Day Negotiator Certification Course (NCC), and are then issued a REN tag and number by a registered estate agency. REN do not need to pass a professional board exam. RENs work under the supervision of a Registered Estate Agent. After completing the course, individuals receive a REN Number and tag, which includes the prefix "REN" followed by five digits. The scope of work is the same as that of a real estate agent, where RENs are also involved in marketing and sales aspects of properties, assisting in negotiations, and facilitating communication between buyers and sellers. However, REN and PEA are limited in making independent high-level decisions and must operate under the immediate direction and supervision of an estate agent

2.4.1.4 Registered Valuer (V)

According to Act 242, a Registered Valuer (V) is an individual who can offer valuation, property management, and estate agency services. Their registration number with the Board of Valuers, Appraisers, Estate Agents, and Property Manager (BOVAEP) is represented by the letter V followed by a series of numerical digits. During their professional activity, registered valuers are obligated to follow a range of rules and practice directives set by BOVAEP, including the Malaysian Valuation Standards.

2.4.1.5 Probationary Valuer (PV)

According to section 17A of the 242 act, a Probationary valuer is an individual who is registered under this Act as a probationary valuer and whose name has been placed in the Register of Probationers. PV is an individual who can offer valuation, property management, and estate agency services but operates under the immediate direction and supervision of a Registered Valuer.

2.4.2 Types of Estate Agent Appointments

There are four types of estate agent practices in Malaysia, as referred to in the Malaysia Estate Agency Standards Second Edition, 2014:

a. **Exclusive Agency:** This refers to the instructions from a client to a single firm to act on his behalf. The client may make introductions and will leave the closing of the transaction to the firm. The client must pay the appointed estate agency firm the agreed fee even if the firm was not the effective cause of the transaction.

b. **Sole Agency:** In a Sole Agency appointment, a single estate agency firm is engaged. However, the client may wish to reserve the right to market and conclude the deal himself without the services of other estate agency firms. In this instance, the client and the appointed sole agent shall agree on the fee based on a pre-agreed formula.

c. **Joint Agency:** This is where more than one estate agent is appointed, and only the estate agent who closes the deal gets paid. The number of agents appointed is limited, and each is aware of the appointment of the others.

d. **Ad Hoc Basis or commonly referred to as "Open Listing":** The client may engage an unlimited number of firms on an ad hoc basis, and fees are paid only upon the successful conclusion of the estate agency transaction.

2.5 Overview of Real Estate Agent in Practices

The section explains the overview of real estate agents in practice in Malaysia. According to Dunning et al. (2018), estate agent practices involve five stages of activity: prospecting, appraisal, advertising, facilitation, and closing.

Prospecting is the process of seeking vendors by advertising the services of the agency. An appraisal provides advice to a potential vendor about the projected possibility of a sale and its characteristics (e.g., probable time on the market and price). Advertising is undertaken to make potential buyers aware of housing opportunities. Facilitation involves the matching process between buyers and housing opportunities and includes pre-offer communication with both buyers and sellers. Closing is the process of moving a potential buyer's interest in a specific property through to the completion of the sale.

This section will consequently focus on estate agent practices across the five business stages (prospecting, appraisal, advertising, facilitation, and closing), categorized into three situations:

1. Real estate agent selling sub-sale property.
2. Real estate agent selling a new property.
3. Real estate agents renting/leasing landlord's property.

2.5.1 Real Estate Agent Selling Sub-Sale Property

A real estate agent handling a sub-sale property works as an intermediary between the seller and buyer of a property that is already owned by someone else, typically in the secondary market. The subsequent section provides a detailed insight into the process of how a real estate agent handles sub-sale property:

Stage 1: Prospecting

Prospecting is the process of identifying potential clients who may be interested in buying, selling, or renting a property. In the past, prospecting was typically done through networking activities to build relationships with potential clients and referral sources. They attend industry events, join professional organizations, and connect with people in their community, such as community centers and homeowners' associations (Jud et al., 2002). Besides that, Estate agents can offer incentives to existing clients who refer their friends, family, and acquaintances. This can effectively expand their network and attract new clients based on positive recommendations. However, with the rise of the internet, most potential buyers and sellers now search for properties online through property portals. Occasionally, clients will contact an estate agent directly only when their friends or neighbors recommend a particular estate agent (Kumar, 2017; Ullah et al., 2018).

Stage 2: Appraisal

Once a property has been identified as a potential sale, the appraisal process commences. The seller will appoint an estate agent, selecting the appropriate type of agency appointment (e.g., exclusive or joint agency). The client needs to understand the different types of agency appointments and their implications before signing the Letter of

Engagement/Appointment. Estate agents are obligated to explain these differences in detail and their potential consequences. The estate agency firm will prepare a written Letter of Engagement/Appointment outlining the agreed terms and conditions, including the selling price, method of sale, timeframe, commission, and expense reimbursement (MEAS, 2020. Standard 5).

Upon signing the appointment letter, the estate agent will visit or inspect the property to gather comprehensive information and capture high-quality photographs and videos. In today's technology-driven environment, estate agents frequently utilize ICT tools such as drones to capture captivating 360-degree views of the property, enhancing its presentation and appeal to potential buyers (Jud et al., 2002; Tsakiridou & Karanikolas, 2019).

The estate agent will then conduct a thorough comparative market analysis, considering recent property sales in the area and referencing reports from the Valuation and Property Services Department and National Property Information Centre (NAPIC) to assess the property's fair market value. Based on this analysis, the estate agent will provide the seller with a recommended selling price, taking into account the property's unique features, condition, and location (Masis et al., 2017; Saull et al., 2020).

Stage 3: Advertising

Once the property has been appraised and the selling price has been determined, the real estate agent shifts their focus to advertising the property to potential buyers. This stage involves creating a compelling listing that showcases the property's best features and attracts potential buyers (Sing & Zou, 2021).

The agent will carefully craft a property description that highlights the property's key attributes, such as its size, layout, amenities, and location. They will use vivid language and persuasive techniques (Dunning et al., 2018) to paint a positive picture of the property and capture the attention of potential buyers. The way the agent constructs the property's content can significantly impact buyer interest. A well-written description can entice viewers and encourage them to schedule a viewing, while a poorly written description can discourage potential buyers from even considering the property (Kimberly et al., 2018). Once the property listing is complete, the real estate agent will begin marketing it to potential buyers through various channels such as online listings, social media, and open houses. The real estate agents also reach out to their network of potential buyers to find interested parties(Masip et al., 2021).

Stage 4: Facilitation

The facilitation stage involves ongoing communication and interaction between the real estate agent and potential buyers. The agent plays a crucial role in facilitating the buying process, providing guidance, addressing concerns, and encouraging buyers to move forward with an offer (Sing & Zou, 2021). Communication technology has revolutionized the real estate industry, enabling instant communication between agents and potential buyers. From emails and text messages to video conferencing and virtual tours, technology has streamlined the process of exchanging information and answering questions (Dunning et al., 2018).

The real estate agents are constantly adapting to the changing technological landscape, utilizing tools like Robotic Process Automation (RPA) to handle repetitive tasks and free up time for more personalized interactions with clients. RPA can automate tasks such as filling out forms, generating reports, and scheduling appointments, allowing agents to

focus on building relationships and providing expert advice (Hofmann et al., 2019). The facilitation stage also includes property inspections or viewings, where potential buyers have the opportunity to physically examine the property and ask questions about its condition, features, and suitability for their needs (Loke et al., 2020). The real estate agents will accompany the buyer during the inspection, highlighting the property's positive aspects and addressing any concerns (Kaye, 2021).

Throughout the facilitation stage, the real estate agent serves as a trusted advisor, guiding buyers through the complexities of the buying process and ensuring a smooth and successful transaction (Kumar, 2017).

Stage 5: Closing

The final stage of a property transaction proses comprises the negotiation between the potential buyer and landlord and the closing of the deal. A potential buyer will make an offer to buy property at a specific price, and the landlord may receive several offers or make a counter-offer until both parties have agreed on the selling price and have agreed to execute a contract (Rabiei-Dastjerdi et al., 2020). Besides that, since the property is a sub-sale the costs of repairs or improvements to the property may be negotiated as well, including who will be responsible for paying for them and when they will be completed. Once the potential buyer agrees with the selling price, he has to pay Earnest Deposit or Booking Fee to lock the property. At this stage, the Estate agent has to prepare an Agreement to purchase form in return after the payment is made. Earnest deposits will be credited into the client's accounts (MEAS, 2014. Standard 9).

From the date of agreement to purchase is issued buyer has to search for property financing. In most cases, the landlord's agent will assist the buyer in obtaining financing.

The valuer will play a role at this stage in preparing a property valuation report, and the buyer will pay the cost (Reilly & Schweihs, 2014). The valuation report will be submitted with the other document requested by the financial institution. Once the property financing application is successful, an offer letter and a notary to authenticate the signatures on the agreements will be sent to the buyer (RICS, 2023).

A buyer will be given a certain period to revert a signed agreement to the financial institution. At this stage, another actor, such as a lawyer, will assist the buyer in preparing the sale and purchase agreement (SPA). Upon the execution of the SPA, the buyer shall pay the landlord ten percent of the Purchase Price (less such sums as Earnest Deposit). The balance of ninety percent must be paid to the landlord within three months from the SPA's execution date. According to the National Land Code of Malaysia 1965, Section 214, the Memorandum of Transfer (MOT) in Form 14A is the legal document that confirms the transfer of land ownership from the seller to the buyer. Signing MOT means the land title has transferred from the previous landlord to the new buyer's name. MOT in Malaysia is the document that legally confirms the actual transfer of land ownership by referring to the National Land Code of Malaysia 1965, Section 216.

2.5.2 Real Estate Agent Selling A New Property

The process of a real estate agent selling a new property from a developer can involve several steps, and it may vary depending on the specific circumstances of the sale (Dunning et al., 2018). However, the following is a general overview of the process:

Stage 1: Prospecting

Two scenarios usually happen at this stage. First, a developer will send an intention letter to appoint a real estate agency firm to become his agent selling a new property project. Or, following the scenario, a real estate agency firm will approach the developer by sending a letter and a marketing report proposal to be appointed as the developer's sales agents (Allen et al., 2015; Markoc & Cizmeci, 2021).

Stage 2: Appraisal

Taking the first scenario as an example, the developer will next prepare an appointment letter and contract if a real estate agency firm is interested in being a marketing agent in the project. The agreement's content discusses a type of agency appointment (for example: exclusive agent), duration of the position, professional fees, abortive fees, developer's expectation towards its marketing agent, administrative support, and other matters subject to interest by both parties (Chika Nwaogu & Christian, 2021). Besides that, the marketing proposal report will be prepared and presented by the real estate agent to the developer with the marketing strategies and planning, quotations for a marketing budget, and market research (Benites-Gambirazio, 2020). Both parties will sign them upon agreed terms and conditions.

Meanwhile, by taking the second scenario as an example, it will begin with property developers typically initiating contact with estate agents who they believe have the necessary experience and expertise to sell their properties. This may be done through a variety of channels, including phone, email, or in-person meetings (Kaur & Solomon, 2021). Once an estate agent expresses interest in working with the developer, they will typically arrange a meeting to discuss the specifics of the project, including the location,

size, features, and target market of the properties (McAllister, 2020). The developer may also provide the estate agent with marketing materials, such as brochures, floor plans, and renderings, to help them better understand the project.

If the estate agent and developer agree to work together, they will typically negotiate the terms of the agreement, including the commission rate, marketing budget, and other details related to the sale of the properties (Markoc & Cizmeci, 2021). Once the terms are agreed upon, they will sign a formal agreement outlining the terms of their working relationship.

Stage 3: Advertising

Once the estate agent has been appointed, they will typically begin the process of promoting the properties to potential buyers. This may involve a range of marketing activities, including online and offline advertising, social media promotion, property viewings, and more (Allen et al., 2015 & Goodwin et al., 2018). An estate agent will start advertising the project after the project obtains an advertising & sales permit from the authority. The details of project sales such as floor plan, price, loan facility, rebate, and promotion will be uploaded by an agent on the property website, social media, and other online platforms (Masip et al., 2021). Besides that, a scale model, banner, brochures, flyers, and local newspaper will also be prepared for public preview. Outdoor marketing, such as property exhibition fairs, is also part of the marketing conducted by the estate agent (Dunning et al., 2018). Nowadays, using technology such as virtual reality (VR) during exhibition events is a cost-effective way to develop show houses and better marketing strategies (Sulaiman et al., 2020).

Stage 4: Facilitation

Once a potential buyer has expressed interest in a property, the estate agent will work to negotiate the sale, including the price and terms of the transaction. If the buyer is obtaining financing for the purchase, the loan must be approved and funded before the sale can be completed (Jasimin & Nordin, 2022). This may involve coordinating with the lender or financial institution to ensure that all necessary documentation and funding are in place. Various legal documents need to be prepared and signed to transfer ownership of the property from the seller to the buyer (MIEA, 2022). These documents may include a sales and purchase agreement (SPA) and facility agreement/ loan agreement, a form of transfer of land known as Form 14a (Section 215, National Land Code), and another relevant document.

Stage 5: Closing

Once all the necessary documentation has been signed, the funds are disbursed to the seller, and ownership of the property is transferred to the buyer. After the sale has been completed, the estate agent may continue to work with the buyer and the developer to ensure that the transaction is properly documented and that any issues that arise after the sale are resolved (Bendixen et al., 2014). This may involve coordinating repairs or other activities to address any problems that arise with the property.

2.5.3 Real Estate Agent Rent/Lease Landlord's Property

The process of a real estate agent renting or leasing a landlord's property is as follows:

Stage 1: Prospecting

The estate agent will search for properties from landlords interested in renting or leasing their properties and approach the landlord with an estate agent's services to help them get a prospective tenant. Besides that, there is a situation where the landlord itself will research and identify several estate agents who specialize in leasing properties in their local area. They may ask for recommendations from friends, family, or other landlords or do an online search (Goodwin et al., 2018). Once the landlord has identified potential agents, they will typically contact them and provide some basic information about their property, such as the location, size, and rental value. The landlord will then schedule appointments with the agents to discuss their services in more detail. During these meetings, the agents will typically provide more information about their experience, marketing strategies, and fees. Once the landlord has chosen an agent, they will typically sign an agreement that outlines the terms of the appointment. This may include details such as the length of the appointment, the agent's fees, and any marketing or advertising activities that will be undertaken (Davenport, 2018).

Stage 2: Appraisal

The issuance letter of "exclusive authorization to let" will be prepared by an estate agent to the landlord for his signature. The estate agents will visit a landlord's property to take photos and videos and collect property details (Ullah & Sepasgozar, 2020). The real estate agent also makes recommendations on any improvements that could be made to increase

the property's rental value. The estate agent has to ensure the property looks neat and presentable by making minor makeovers to the arrangement in the property, for example, cleaning the countertops, cleaning a cluttered room, and switching on lights to produce presentable pictures and videos (Chika Nwaogu & Christian, 2021).

Stage 3: Advertising

After the estate agent takes the property details, the signboard "To LET" will hang at the property's entrance or the place with maximum visibility. The estate agent will prepare a write-up to be uploaded to the website and other marketing platforms. The choice of words and construction of the property can impact property marketing time and sales price. The positive opinion words and a comprehensive list of property characteristics sell for higher prices. On the other hand, listings that include fewer words and opinion words have a shorter marketing time (Kimberly et al.,2014 & Davenport, 2018 & Benjamin et al., 2000). The inquiries from prospective tenants are received via mobile phone Apps, Third party websites, Facebook, email, and walk-ins to the estate agent company. An estate agent must submit a progress report to the landlord if he is appointed as an “exclusive agent”. Among the matters to update the landlord are marketing strategies and feedback/inquiries from prospective tenants. An estate agent will respond to all questions, and a mutual date will be confirmed with the interested prospective tenant to view a property.

Stage 4: Facilitation

An estate agent will accompany the prospective tenant to view the property physically. Once potential tenants show interest in the property, the agent will screen their applications to ensure they meet the landlord's requirements (Johnson et al., 2007). The

agent will collect personal information from the tenant, including their name, current address, and employment details. The landlord will then have the final say in approving the tenant. If a suitable tenant is found, the agent will negotiate the lease terms with the tenant and the landlord. This may include determining the length of the lease, the rent amount, security deposit, and any other conditions. An estate agent will prepare an "Agreement to rent" for the tenant and landlord to sign. The tenant has to make an initial payment or deposit the rental/lease to the estate agent's company bank or client's account (McAllister, 2020).

Stage 5: Closing

Once both parties acknowledge and sign the agreement, an estate agent will take the property off the market and prepare the "tenancy/lease agreement" for the tenant and landlord to sign. The agent may assist the tenant in moving in and provide any necessary instructions or advice. They may also conduct a move-in inspection to document the condition of the property at the start of the lease. Throughout the lease term, estate agent may handle any maintenance requests, rent collection, and other issues that arise (Benites-Gambirazio, 2020). Estate agent will also conduct periodic inspections to ensure that the property is being maintained properly. As the lease term nears its end, estate agent may assist in negotiating a lease renewal or termination (Bendixen et al., 2014). If the tenant decides to vacate the property, estate agent will begin the process again to find a new tenant.

2.6 Typology of Technology

Typology is the systematic classification of things according to their common characteristics. It is a method of grouping things that share similar features. For example, according to (Kerckhoff, 2003, pp. 251–267) in Sociology, typology is used to classify social groups based on the following types:

a. Upper class: The highest social class, typically consisting of wealthy individuals and families.
b. Middle class: The social class between the upper class and the working class, typically consisting of professionals and white-collar workers.
c. Working class: The social class below the middle class, typically consisting of blue-collar workers and service workers.

Just as sociologists employ typologies to categorize social groups based on their socioeconomic status or cultural norms, ICT experts utilize typologies to classify technologies according to their functions, applications, or underlying principles. For instance, Babatunde & Ajayi, (2018) have defined, ICT as a subset of information technology (IT) that is related to digital devices that are used to process digital information in a communication system, these also draw in telephony and media broadcasting. ICT is a broad term encompassing all technologies used to communicate and share information. Meanwhile, according to Al-Rahmi et al., 2020, ICT is referred to as the infrastructure and invention development that facilitates the assortment, storing, analysing, and implementation of information that may be communicated electronically. Pigato (2001) quoted the World Bank's definition of ICT as the series of activities that expedites electronic means of planning, collecting, storing, processing, communicating, and displaying information for better improvement.

Meanwhile, the term digital technology (DT) has been used interchangeably with ICT (Chowdhury et al., 2019). Even though definitions and synonyms of ICT are numerous, they still share much common ground and drive towards the same concept. DT is any technology that facilitates information gathering, consumption, production, distribution, and storage (Ibem & Laryea, 2014). A DT consists of different components, like hardware (physical devices and peripherals); software applications (operating systems and application software), network connectivity (local networking infrastructure, access to the Internet and video conferencing), and storage (databases and cloud services). A type of technology that uses digital signals to represent information (Ahn et al., 2019; Yean et al., 2023). For example, a digital camera is a digital technology, but it is not ICT unless it is used to communicate or share information.

Next is Property Technology, or PropTech, which refers to the use of technology in the real estate industry. It encompasses various technological tools and platforms that aim to improve and streamline processes related to property management, sales, and transactions (McAllister, 2020). PropTech is characterized by the widespread implementation of emerging technologies in the real estate sector, such as home matching tools, drones, virtual reality, building information modeling (BIM), data analytics tools, artificial intelligence (AI), the Internet of Things (IoT), blockchain, smart contracts, crowdfunding, real estate-related fintech, smart cities and regions, smart homes, and the shared economy (Siniak et al., 2020).

The Internet of Things (IoT) is a network of physical objects that are connected to the internet. These objects can be anything from sensors to machines to vehicles. They can collect and exchange data, and they can be controlled remotely (Oke et al., 2020). The IoT is made possible by the convergence of two technologies: wireless connectivity and smart sensors. Wireless connectivity allows the objects to communicate with each other

and with the internet. Smart sensors allow objects to collect data and make decisions without human intervention (Grindvoll et al., 2012). In the real estate industry, the IoT is being used to create smart homes and buildings that are more energy-efficient, secure, and convenient. For example, smart thermostats can adjust the temperature of a home based on the occupancy and the weather.

Artificial intelligence (AI) is the ability of machines to perform tasks that are typically associated with human intelligence, such as learning and problem-solving (Collins et al., 2021). AI is achieved through the use of algorithms, which are sets of instructions that tell the machine how to perform a task. Natural language processing is a type of AI that allows computers to understand and process human language (Salau et al., 2022). For example, the adoption of virtual assistants including Alexa, Siri, and Google Assistant is used for tasks like translation, summarization, and question answering. AI has been used in a variety of fields, including medicine, chemistry, biology, manufacturing, sales and marketing, disaster response, and environmental monitoring. It is a rapidly growing field, and it is expected to have a major impact on many aspects of our lives in the years to come.

The real estate industry is a domain that requires extensive information and hence can be effectively supported by information and communication technology (ICT) devices and amenities such as the use of uncrewed aerial vehicles or drones, as well as immersive technologies like augmented reality (AR) or virtual reality (VR) and a variety of other technology tools, offers benefits to estate agents and buyers and sellers. (Jud et al., 2002) found that ICTs have been viewed as tools that are generally beneficial to the business of real estate agents, leading to increased levels of patronage and income for agents. This research revealed a diversity of ICT products and services employed by real estate agents

context, here referring to all technologies, tools, applications, services, platforms, and devices used in practices. Table 2.1 below is the summary typology of technology.

Table 2.1: Typology of Technology. Source: Babatunde & Ajayi, (2018); Baum et al. (2020); Oke et al., (2020); Bosch-Sijtsema et al., (2021) & Salau et al., (2022)

Term	Definition
ICT	A broad term that encompasses all technologies that are used to communicate and share information
DT	A type of technology that uses digital signals to represent information. For example, a digital camera is a digital technology, but it is not ICT unless it is used to communicate or share information.
IoT	A network of physical objects that are connected to the internet. In general, ICT is a broader term that encompasses IoT. However, not all IoT devices are ICT devices. For example, a smart thermostat is an IoT device, but it is not ICT unless it is used to communicate with other devices or systems.
PropTech	A used in real estate to automate tasks, improve efficiency, and make the real estate market more transparent. For example, the use of computers to create spreadsheets is an ICT application, but it is not PropTech unless it is used to manage real estate data.
Ai	It is a field of computer science that deals with the creation of intelligent agents, which are systems that can reason, learn, and act autonomously. For example, the use of computers to process data is an ICT application, but it is not AI unless the computers are used to perform tasks that require intelligence, such as machine learning or natural language processing.

2.7 ICT Tools Used by Real Estate Agents in Practice

Technologies have dramatically transformed how people work, communicate, and receive information in the past ten years. Like many other businesses, real estate agents have fallen behind the technological trend and need help to incorporate social networking and smartphone technologies into their marketing strategies. The use of uncrewed aerial vehicles or drones, as well as immersive technologies like augmented reality (AR) or virtual reality (VR) and a variety of other technology tools, offers benefits to estate agents

and buyers and sellers. This section will explain the technologies adopted by real estate agents in practice.

2.7.1 Clouds

The cloud refers to web-connected servers and software that users can access the system from wherever the Internet is available. Those emails, videos, and or files are not being stored on a personal computer but can be accessed quickly, easily, and cheaply with the existence of cloud computing technology (Davis & Watts, 2021). Cloud computing has become a popular service system providing affordable, secure storage and sharing under a single umbrella (Evgeniy, 2021). For example, a Geographic Information System (GIS) is designed to capture, store, manipulate, analyze, manage, and present all spatial or geographical data types (Arshad et al., 2018). This information can be used to identify areas of potential investment and areas likely to be appreciated by various factors. This includes location, physical characteristics, and legal and economic factors.

2.7.2 Drones

The drone is a broad term used to describe any crewless aerial vehicle to fly autonomously and can look like a small airplane with fixed wings (Vergouw et al., 2016). They can be controlled by mobile apps installed on smartphones or tablets, wrist-worn devices, or consoles as ground stations. Drones can be equipped with cameras, sensors, and other electronics, providing live streaming or recording capabilities (Uglješa et al., 2019). Drones have been used to livestream and monitor crowds at events and to create dramatic footage for television and film (Sakiyama et al., 2017). In the real estate industry. drones are usually used to take aerial photos and videos of residential, commercial, construction activity, and land parcels. It also can create 3D models, and even generate virtual tours.

This allows real estate agents to provide potential tenants or buyers with a more comprehensive view of properties. Besides that, using drones allows real estate agents to show potential tenants or buyers the property from a different perspective by showing the layout of the property, the surrounding area, and any potential features or amenities that are not visible from the ground. The images captured by the drones can then be relayed to a real estate agent's server and displayed on a webpage for potential buyers to view (Song et al., 2018). In addition, drones also be used to identify potential problems with properties. For example, drones can be used to inspect the roof for leaks or damage to the exterior of the property for cracks or other signs of wear and tear. A real estate agent could use a drone to inspect the roof of a property before listing it for sale. If the drone finds any leaks or damage, the real estate agent can disclose this information to potential buyers (National Association of REALTORS, 2021). Overall, drones have become a valuable tool in real estate agency transactions, improving efficiency and providing access to crucial property information. The pandemic has confirmed to all of us in the industry that technology will continue to transform real estate, and we believe it will significantly impact the real estate business.

2.7.3 Virtual Reality (VR)

Virtual reality (VR) is a computer-generated environment that aims to replicate a real-life situation. This technology identifies the users' movement control, making the virtual experience more enjoyable (Anna et al., 2018). Meanwhile, Alcañiz et al., 2019 have defined VR as the simulation of an interactive three-dimensional environment that users can be immersed in and interact with. Marketers or Sales person may employ VR's capacity to imitate real-life scenarios and the physical world to create more engaging marketing and improve customer experience.

In the real estate industry, VR is being used to create immersive experiences that allow potential buyers to tour properties without having to be physically present. This can be done by creating 360-degree images or videos of a property, or by using VR headsets to create a fully immersive experience (Nguyen et al., 2019). A research by the National Association of Realtors found that 72% of real estate agents believe that VR will be an important tool in the future of real estate sales. The research also found that 62% of potential homebuyers would be more likely to buy a property if they could experience it virtually (Chen & Chang, 2019). Another research found that virtual reality had a favorable impact on the home buying process, providing both homebuyers and estate agents with significant time savings, for example, by allowing homebuyers to experience properties in various geographical areas (Debika, 2018).

VR helps to improve the customer experience by allowing potential buyers to experience a property as if they were there. It helps potential buyers to make more informed decisions about whether or not to buy. This can lead to higher satisfaction rates for both buyers and sellers. Apart from that, houses in development or under construction can also be visualized using virtual reality, which is especially useful for sell-and-build properties. Studies in Malaysia have suggested using virtual reality (VR) in the local real estate sector as a cost-effective way to develop show houses and better marketing strategies (Sulaiman et al., 2020) and help to reach a wider audience (Li et al., 2018). In the past, real estate agents were limited to showing properties to people who were able to physically visit them. However, VR allows agents to show properties to people all over the world. This can help to expand the market for a property and increase the chances of it selling.

2.7.4 Augmented Reality (AR)

Augmented reality is a technology that adds digital information to real-world objects or locations to improve the user experience (Arena et al., 2022). AR technology allows users to use it in the virtual and real world at the same time. AR technology enriches our experiences by including virtual mechanisms such as graphics, digital images, or sensations as a novel of interaction with the real world. AR can be accessed with a smartphone or tablet, or with a headset that projects images onto a user's eyes (Schmalstieg & Hollerer, 2016). AR is considered information and communication technology (ICT) adoption (Alam et al., 2021). Several businesses have begun to adopt AR technology to interact with their customers. AR can help marketers promote their products more creatively.

AR technology can be used to create a virtual try-on experience for consumers. This allows consumers to see how products would look on them without having to physically try them on. This can be especially helpful for online shoppers, as it allows them to see how a product would look on them before they buy it. AR technology is already being used by a variety of retailers to market their products. For example, Sephora uses the Virtual Artist augmented reality app to allow consumers to virtually try on makeup. This app allows consumers to see how different makeup looks on them, and it also provides tips on how to apply makeup.AR technology has the potential to revolutionize the way that consumers shop. By providing a more immersive and interactive shopping experience, AR can help to increase sales and improve the customer experience (Alam et al., 2021).

In the real estate industry, AR is being used to create interactive experiences that allow potential buyers to see how furniture, appliances, and other items would look in a

property. It helps potential buyers visualize how furniture would look in a property and it is helpful for buyers who are trying to decide what kind of furniture they want to buy for their new home (Lee et al., 2017).

Moreover, it also can help real estate agents to improve the sales process and increase sales as AR can help to minimize costs and time by allowing potential buyers to virtually explore properties without having to travel to them. This can save both the buyer and the agent time and money. Additionally, AR is being used to create interactive experiences that allow potential buyers to see how furniture, appliances, and other items would look in a property (Zhang & Weng, 2018). It helps potential buyers visualize how furniture would look in a property and it is helpful for buyers who are trying to decide what kind of furniture they want to buy for their new home.

This can be supported by the research conducted by (Wang & Wang, 2018), the research was published in the Journal of Retailing and Consumer Services in 2018. The authors surveyed a sample of potential homebuyers to assess their perceptions of AR in real estate transactions. The research found that 72% of potential homebuyers would be more likely to buy a property if they could experience it virtually. The research also found that potential buyers who used AR were more likely to make an offer on a property than those who did not use AR.

In addition to its other uses, augmented reality (AR) can also be used to provide 3D images of products to potential customers in real-time. This technology has the potential to provide customers with highly interactive experiences, which can be especially beneficial for complex products that are difficult to explain in words alone. For example, at trade shows and showrooms, AR can be used to show potential buyers the animated interior of a product, which can provide a much more engaging and informative

experience than a traditional presentation (Lee et al., 2017). Overall, AR has the potential to be a valuable tool for businesses in a variety of industries, including real estate, by providing a more immersive and interactive customer experience.

2.7.5 Real Estate Online Platform

Real estate online platforms make finding and comparing property listings simple for buyers. It offers a centralized location where individuals can look for properties, see images as well as video clips, and find out about each residential property's special or relevant attributes. This also allows people to compare properties with each other, which can aid them in making a more well-informed decision when it comes to their home purchases. Besides facilitating property search and comparison, online real estate platforms also make it easier for buyers to connect with real estate agents (Karayaneva, 2023 & Boeing et al., 2020). According to a survey by the National Association of Realtors, in 2020, 97% of buyers will utilize the Internet to search for a home to buy rather than visiting sales agents by appointment, shortening the selling process. iProperty.com, PropertyGuru, and Propwall are the most prominent real estate third-party internet platforms in Malaysia (Najieha et al., 2017), which estate agents employ to reach a larger audience.

One research conducted by Li and Chen (2022) has found that online real estate platforms have had a positive impact on the residential property market in China whereby it led to increased transparency in the market, as buyers and sellers have more access to information about properties. The research also found that online real estate platforms have led to increased efficiency in the market, as buyers and sellers can more easily find the properties that they are looking for. Importantly, these platforms have led to increased competition in the market, as more real estate agents can reach a wider potential client

through these platforms. (Xie & Yu, 2022) argued that online real estate platforms have led to increased market liquidity in the market, as more properties are being traded through these platforms.

Overall, real estate online platforms are having a significant impact on the real estate industry. They are making it easier for people to find and compare properties, and they are also providing more transparency into the market. Online real estate platforms will continue to play an important role in the market in the future.

2.7.6 Mobile Instant Messaging (MIM)

MIM is a communication technology that allows users to send and receive text, images, videos, geographic locations, and real-time messages through their smartphones. MIM platforms like WhatsApp, Line, and WeChat are popular among users worldwide (Safieddine & Nakhoul, 2021). In Spain, WhatsApp is the most popular MIM, with 78% of the population using it to send messages to individual users or exchange messages in groups (Gascón et al., 2019). Meanwhile, in China, WeChat is the most widely used instant messaging platform. Furthermore, it provides text and audio message generation features similar to WhatsApp and is available for download, installation, and use on all smartphone platforms (Sandel et al., 2019).

A research by the Malaysian Communications and Multimedia Commission (MCMC) in 2020 found that WhatsApp is the most popular means of communication in Malaysia, with 98.7% of citizens using it. Other popular messaging platforms include Facebook Messenger (53.9%) and Telegram (40.1%). This means that WhatsApp is a very popular communication tool in Malaysia for social connections and the dissemination of work-

related information, and estate agents are no exception, utilizing it to communicate and exchange property information with clients.

A research by Sheer and Rice (2017) found that 80% of real estate agents in Hong Kong use MIM at least occasionally. This means that a large majority of real estate agents use MIM in their work. This is likely because MIM is a convenient and easy way to stay in touch with clients and colleagues. It is also a more informal way of communication, which can be helpful when building relationships with clients. The most common uses for MIM among real estate agents are to stay in touch with clients, collaborate with colleagues, and answer questions. These are all important tasks for real estate agents. Staying in touch with clients is essential for building relationships and keeping them updated on the status of their property search (Dunning, 2018). Collaborating with colleagues can help agents share information and ideas, and it can also be helpful for brainstorming solutions to problems. Answering questions is another important task, as it can help agents provide better customer service and build trust with clients. The research also found that MIM has a positive impact on real estate agents' work practices as MIM is a more efficient way to communicate. It allows real estate agents to send messages quickly and easily, and it also allows them to share files and documents to the clients. This can save agents time and effort, which can free them up to focus on other tasks. Additionally, MIM can help agents build relationships with clients and colleagues more effectively. This is because it is a more informal way of communication, which can help agents to connect with people on a personal level.

Another research by Wang et al., 2021, has found that MIM is a popular tool among real estate agents, with 70% of respondents reporting that they used it to generate leads in the United States. The most common uses for MIM for lead generation were to share property listings, answer questions, and provide advice. This is likely because MIM is a convenient

and easy way to connect with potential clients. It is also a more informal way of communication, which can be helpful when building relationships with potential clients. As overall, MIM help real estate agents stay in touch with clients, collaborate with colleagues, and generate leads.

2.7.7 Social Media

Social media has become a popular way to connect with friends and family, even when they are far away. It is a new trend in every sector of our lives, and it is easy to understand why. The word "social" implies interaction with other people, and the word "media" refers to advertising through a communication instrument, such as the internet or traditional media like TV, radio, newspapers, and magazines. Therefore, social media can be understood as web-based communication tools that enable people to interact with each other by sharing and consuming information (Tsakiridou & Karanikolas, 2019; OECD, 2019; Tian et al., 2019). Among the popular social media applications are Facebook, Twitter, YouTube, LinkedIn, and Instagram (Kapoor et al., 2018; Oliverio,2018).

For advertising, real estate agents can use Facebook business page to share information or knowledge about the real estate market. This can help potential buyers and property owner make informed decisions about their home purchase or sale. The information can include market trends, prices, and financing options. Real estate agents can share this information by creating blog posts, infographics, or videos. The reader can also share links to articles or websites that contain information written by real estate agents (Tsakiridou & Karanikolas, 2019).

A Facebook business page is a great way to develop a community, attract new customers, advertise the product's brand, and gather client feedback. When the "Like" button below

a post is clicked, the number of Facebook likes grows. It is a way of indicating that people like it without having to leave a comment. Many buyers use Facebook likes to determine whether or not to purchase a product (Kapoor et al., 2018; Mazzucchelli et al., 2018). In other words, if a real estate firm has more Facebook likes, it is more likely to sell the property (Shi et al., 2020).

One research by has been conduct to examines the impact of social media on the performance of real estate agents in Nigeria (Nwaogu & Christian, 2021). The authors argue that social media such as Facebook and Twitter can have a positive impact on the performance of real estate agents, as it can help them to reach a wider audience, build relationships with potential clients, and generate leads. Social media has had a profound impact on the real estate market. It has changed the way that buyers and sellers find each other, and it has given agents new ways to market their listings.

Kapoor et al. (2018) and Kaye (2021) agreed that social media can be used to market products and services in a variety of ways, including through advertising, social media marketing, and influencer marketing. Advertising on social media allows an individual to reach a large audience with their message. They can target their ads to specific demographics, interests, and even locations. Meanwhile, social media marketing is a more effective way to market products and services on this platform. This involves creating and sharing content that is relevant to your target audience and the content can be in the form of blog posts, articles, videos, images, or infographics. Influencer marketing can be defined as people who have a large following on social media. The use of influencers is another marketing strategy to promote products or services. When influencers promote your products or services, their followers are more likely to see your message and take action. Real estate agents can leverage the power of social media to promote services and increase sales.

Another research conducted by (Shi et al., 2020) showed that a majority of real estate agents in China use Facebook to market their services. The most popular social media platforms used by real estate agents in China are Facebook, Weibo, and QQ. The authors also found that real estate agents who use Facebook are more likely to report that Facebook has had a positive impact on their sales. The authors conclude that Facebook can be a valuable tool for real estate agents in China. However, they also note that the impact of Facebook on real estate sales may vary depending on the specific use of Facebook and the target audience.

As overall, an active use of social media can be a significant signal to assess sales trends. Thus, real estate agents could take advantage of social media to achieve more sales.

2.7.8 Mobile Application

A mobile application, also known as a mobile app, is a software application designed to run on a mobile device such as a smartphone, tablet, or wearable. Mobile apps are typically downloaded and installed from an app store. Mobile applications, such as Google Maps, are very popular apps (Savino et al., 2021). Millions of people use mobile maps regularly to find directions to any location in the world. Simply enter your starting point and destination, and Google Maps will provide you with a step-by-step route.

One research by Böhmer et al. (2011) found that Google Maps is the fourth-most-used app in terms of total usage time. While Google Maps is the most popular mobile map app, there are other popular alternatives, such as Apple Maps, Waze, and OpenStreetMap (Savino et al., 2021). In the field of real estate, the use of mobile maps can improve communication with clients as real estate agents can use mobile maps to share property locations and directions with the client. Besides that, the use of mobile maps also is for

navigating the properties (Elhashash et al., 2022). Google Maps for instance able to provide real-time traffic updates, so real estate agent can avoid traffic jams and get to their appointments on time. Real estate agents can use mobile maps to explore amenities available in a particular area, such as schools, parks, and restaurants near to property listed (Ali & Abid, 2021).

Besides, the other mobile application useful for real estate agents is Video Editor. These apps is a software application that allows users to edit videos on user mobile devices and typically offer a variety of features, such as trimming, cropping, adding music and effects, and exporting videos to social media or other platforms. Mobile app video editors are becoming increasingly popular, as people are using their mobile devices to record and share videos. These apps make it easy to edit videos on the go, and they offer a variety of features that can help users create professional-looking videos (Lee et al., 2016; Karasavvidis, 2019). Some popular mobile app video editors include VivaVideo, InShot, PowerDirector, and KineMaster.

Real estate agents can use mobile app video editors to create marketing videos for their properties. These videos can be used to showcase the properties to potential buyers, and they can also be used to promote the agent's services (Biørn-Hansen et al., 2019). Besides that, Real estate agents can use mobile app video editors to create virtual tours of properties. These tours can be used to show potential buyers around the properties without having to be there in person. This can be especially helpful for buyers who are out of town or who cannot physically visit the properties (Aubry, 2021).

The next mobile app is a mortgage calculator. This app is a software application that allows users to calculate their monthly mortgage payments (Treece & Esene, 2023). Real estate agents can use these apps to help clients understand their financial options and

determine how much they can afford to spend on a home. By using this app real estate agents can help a client determine how much they can afford to spend on a home. Real estate agents can input the client's desired down payment, interest rate, and loan term, and the app will calculate the monthly payment (Riquier, 2022). This information can help real estate agents narrow down the list of properties that the client should consider.

Additionally, this app will assist the client in comparing the monthly payments for different properties (Fontinelle & Esene, 2023). Real estate agents will fill up the details of each property, such as the purchase price, down payment, interest rate, and loan term, and the app will calculate the monthly payment for each property. This information can help the client make an informed decision about which property is right for them. Examples of this app are Karl's Calculator, Mortgage Calculator Loan Rates, and Office Calculator.

2.7.9 Metaverse Real Estate

The metaverse is an open and shared virtual world that allows users to explore and interact with different types of virtual spaces, content, and services in three-dimensional spaces. Users can access the metaverse through virtual reality and other technologies such as augmented reality glasses, personal computers, and smartphones. Interestingly, the user can participate in various experiences in the metaverse as a virtual avatar, which resides in the virtual space (Rahaman, 2022).

Parcu et al. (2022) have defined the metaverse as a persistent, online, 3D world that is inhabited by users with avatars. It is a space where people can interact with each other and with digital content in a more immersive and realistic way than is currently possible on the internet. The metaverse is a fully immersive experience that allows users to feel

like they are present in the virtual world where users can interact with each other and with digital content in a variety of ways. This could include playing games, attending events, shopping, or simply exploring the world. This is achieved through the use of virtual reality headsets and other technologies that track the user's movements and provide them with a 360-degree view of the environment.

Nowadays, the world has become more digital, and real estate follows suit where the property is not only physical property but also in a made-up world (metaverse) or a real one. Like with regular real estate, properties can be bought, sold, or developed in metaverse real estate. Their owners can rent them out to others without the hassles of physically traveling to find a property, and dealing with transactional paperwork. Besides that, it is flexible to the buyer or investor where they can buy a piece of land in the virtual world and create whatever they want, whether it be a gaming experience, a virtual shop, a digital art gallery, an event center, or a school. In addition, the metaverse creates a new opportunity for collaboration between real estate agents and other professionals (Finn, 2022). For example, real estate agents can collaborate with architects and interior designers to create virtual models of properties, or they can collaborate with lawyers to facilitate virtual property transactions.

Nowadays, an estate agent is not only selling property in reality but also in the virtual world. Metaverse real estate agents will assist the buyer in finding a property in their favorite game, and the buying transaction will be in cryptocurrency (Azmi et al., 2021).

2.7.10 Robotic Process Automation (RPA)

Robotic Process Automation (RPA) is a software technology that automates repetitive tasks typically performed by humans. RPA imitates human actions on computer systems,

allowing for faster and more efficient completion of rule-based tasks (Hofmann et al., 2019). RPA is a technology for office automation to imitate human behavior when interacting with computers to perform digitized tasks manually, such as opening and closing applications, reading documents, entering data, and sending e-mails (Axmann & Harmoko, 2022). RPA is an application of technology, governed by business logic and structured inputs, to automate business processes. Using RPA tools, a company can configure software, or a robot, to capture and interpret applications for processing a transaction, manipulating data, triggering responses, and communicating with other digital systems.

RPA can help real estate agents automate repetitive and time-consuming tasks, such as data entry, document processing, and sending out marketing emails. This frees up real estate agents to focus on more strategic work, such as building relationships with clients and closing deals. RPA can also help to reduce errors by automating tasks that are prone to human error, such as preparing contracts and calculating costs (Gallino, 2020; Gharbia et al., 2020). This can help improve the accuracy of data entry and processing, saving real estate agents time.

In addition, RPA can help real estate agents produce better selling results by quickly analyzing complex data sets to more effectively match properties to client wish lists and automating some steps of the closing process. It can also help real estate agents stay in touch with clients by instantly obtaining client information and sending automatic reminders (Marshall, 2019). This makes staying in touch with clients easier without losing the personalized nature of real estate service. Finally, RPA allows real estate agents to focus on the client and accomplish higher-value work for the company while RPA works in the background.

2.8 The Development of Technology Acceptance Theories

Various models have been developed to understand user acceptability and adoption of technology better. These models include factors and variables used to determine user adoption of technology. The acceptance and usage of technology are important in this era, as individuals frequently engage with and use technology in their daily routines. When a new technology or system is suggested or implemented, it is a common problem that people will resist. The acceptance or rejection of the technology comes with various reasons. There are various models and theories have been investigated to assess the acceptance and usage of technology, such as the theory of reasoned action (Fishbein & Ajzen, 1975), the theory of planned behavior (Ajzen, 1985), and the TAM (Davis, Bagozzi, & Warshaw, 1989). Thus, this section provides more details about the most widely used models related to the acceptance and usage of technology.

2.8.1 Theory of Reason Action (TRA) (1975)

The theory of reasoned action (TRA) was founded in 1967 by Martin Fishbein and further developed by Martin Fishbein and Icek Ajzenin in 1975 (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980). TRA is the first theory on technology acceptance and is a fundamental theory for many upcoming theories later developed. This theory has provided insights into an individual's behavior by defining the relationships between intention, attitude, and subjective norms (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980). Figure 2.6 shows that TRA comprises three determinants: behavior intention, subjective norms, and attitude toward behavior. Attitude toward the behavior represents the individual's beliefs about the consequences of the behavior. These beliefs can be positive or negative, and they can be either salient or weak. Salient beliefs are those that are important to the individual, while weak beliefs are those that are not as important.

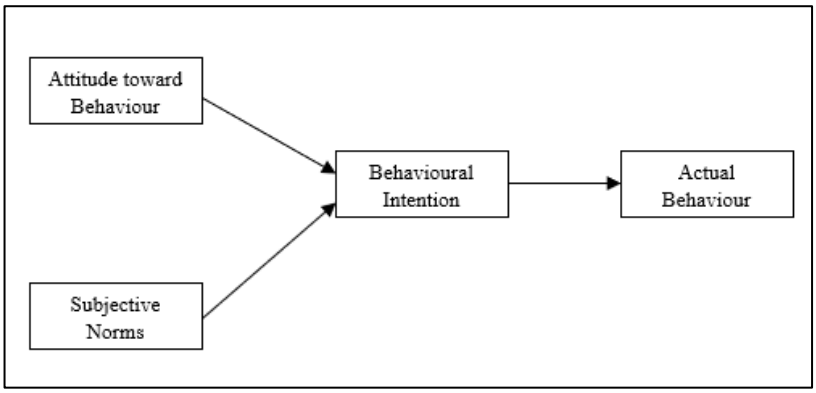


Figure 2.6: Theory of Reason Action.
Source: Fishbein & Ajzen, 1975

Subjective norms represent an individual's beliefs about whether relevant others (friends, family, co-workers) would support the decision to engage in that action (Ajzen, 1991; Alshammari, 2020). Fishbein and Ajzen (1975) further define subjective norms as the influence of a person's close peers and how this influence shapes their attitude toward a behavioral intention. Subjective norms are "determined by the perceived expectations of specific referent individuals or groups and by the person's motivation to comply with those expectations" (Fishbein & Ajzen, 1975). Behavioral intention, on the other hand, assesses an individual's willingness to perform a specific behavior (Fishbein & Ajzen, 1975). Table 2.2 shows more details on determinant behavior in TRA.

Table 2.2: The Determinants of TRA

Determinant	Definition
Behavioral intention	An individual’s aim or plan to behave in a certain way with no guarantee to do so.
Attitude toward behavior	The degree to which an individual believes that performing the behavior is positive or negative
Subjective norms	The degree to which an individual feels that people think he or she should perform the behavior (Kocaleva, Stojanovic, & Zdravev, 2015).

Icek Ajzen argued that the Theory of Reasoned Action (TRA) overlooks a crucial factor: an individual's beliefs about their ability to control their behavior. In his 1985 paper,

"From Intentions to Actions: A Theory of Planned Behavior," Ajzen highlighted this limitation, stating, "The TRA does not consider the possibility that people may differ in their beliefs about the ease or difficulty of performing a given behavior". He proposed that this factor, termed "perceived behavioral control," significantly impacts behavior.

Ajzen emphasized the importance of perceived behavioral control, explaining, "Perceived behavioral control is a measure of the individual's subjective probability that he or she will be able to perform the behavior." Consequently, he developed the Theory of Planned Behavior (TPB) to address this limitation of the TRA by incorporating perceived behavioral control as a key determinant of intention and subsequent behavior.

2.8.2 Theory Planned Behavior (TPB) (1985)

As mentioned previously, TRA has limitations in predicting individuals may differ in their beliefs about the ease or difficulty of performing a given behavior in which individuals have a low level of volitional control (Davis, Bagozzi, & Warshaw, 1989). To overcome this limitation, TRA was extended by Icek Ajzen to include a third contributor towards behavioral intention, so-called perceived behavioral control (refer to figure 2.7), and renamed to the theory of planned behavior (TPB) (Ajzen, 1985).

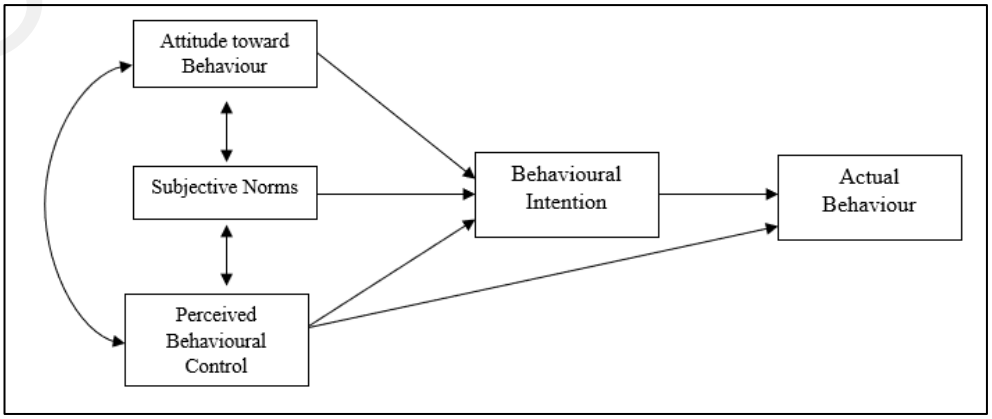


Figure 2.7: Theory Planned Behaviour (TPB)
Source: Ajzen, 1991

Perceived behavioral control refers to whether an individual perceives performing a behavior will be either easy or difficult (Ajzen, 1991). The first two factors (attitude and subjective norms) are the same as the Theory of Reason Action. The third factor, known as the perceived control behavior, is the control users perceive that may limit their behavior (Lai, 2017). Perceived behavioral control means "the perceived ease or difficulty of performing the behavior, and it is assumed to reflect experience as well as anticipated impediments and obstacles" (Ajzen, 1991, p. 188). This is the individual's belief about how easy or difficult it is to perform the behavior. This belief is based on the individual's past experiences with the behavior, as well as their assessment of the availability of the resources, including time, money, information, and ability, which are constraints that control the behavior wanted to perform.

2.8.3 Technology Acceptance Model (TAM) (1989)

The technology acceptance model was initially created by Davis (1986) in his unpublished PhD thesis and further developed by Davis and his colleagues in a 1989 paper in the MIS Quarterly journal (Davis et al. 1989). TAM aims *"to explain the determinants of computer acceptance, which is capable of explaining user behavior across a broad range of end-user computing technologies and user populations, while at the same time being both parsimonious and theoretically justified'* (Davis, et al., 1989, p.985). In this quote, Davis and colleagues state that the TAM aims to be a comprehensive model of technology adoption that can be used to explain user behavior across a wide range of technologies and user populations. The TAM is also designed to be parsimonious, meaning that it should be simple and easy to understand. Finally, the TAM is designed to be theoretically justified, meaning that it should be based on sound theoretical principles.

The TAM is based on the Theory of Reason Action and the Theory of Planned Behavior (Ajzen & Fishbein, 1980). TAM expanded the basic concepts of attitudes and behavioral patterns in the TRA/TPB by suggesting that two specific beliefs, perceived ease of use and perceived usefulness, influence an individual's attitudes toward technology acceptance (Davis, 1989). In addition, consistent with TRA, TAM explains attitudes towards technology acceptance as being influenced by external variables (e.g., self-efficacy, anxiety) predicted by the individuals' perceived ease of use and perceived usefulness. TAM excluded subjective norms in TRA as Davis (1986) justified the elimination of subjective norms as there is not enough information available to participants about the social influence during the stage of acceptance testing.

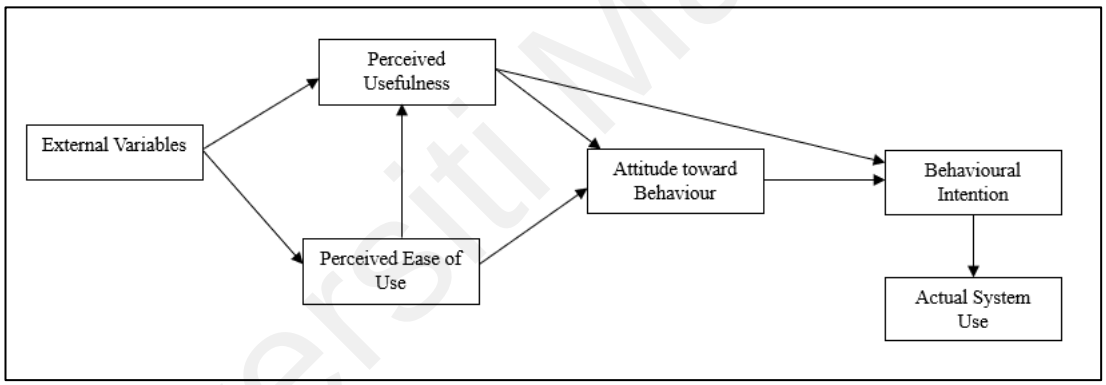


Figure 2.8: First version of the Technology Acceptance Model (TAM) Source: Davis Bogozzi, and Warshaw, 1989

Initially, the development of TAM is determined by six constructs (see Table 2.3): perceived usefulness, perceived ease of use, attitude towards using the technology, behavioral intention, and actual use of the technology. Figure 2.8 shows that the actual system use is directly influenced by behavioral intention, which is affected by both attitude towards behavior and perceived usefulness. Attitude towards behavior is directly influenced by perceived ease of use and perceived usefulness alike. The TAM primarily depends on two variables, perceived ease of use and perceived usefulness, to examine an individual's beliefs and attitude toward computer technology acceptance (Davis, Bagozzi,

& Warshaw, 1989). Perceived ease of use affects perceived usefulness directly, and both perceived ease of use and perceived usefulness are influenced by external variables.

Table 2.3: The Determinants of Initial TAM

Determinant	Definition
External Variables	External variables that may influence PU and PEU such as characteristics of a system, characteristics of user, and task, social influence, and user habits, or which directly or indirectly affect the user's cognitive beliefs. (Fishbein and Ajzen, 1975; Davis et al., 1989; Kuo et al., 2020)
Perceived Usefulness	The degree to which a person believes that using a particular system would enhance his or her job performance (Davis, 1989).
Perceived Ease of Use	The degree to which a person believes that using a particular system would be free of effort.
Attitude toward behavior	The degree to which an individual believes that performing the behavior is positive or negative (Fishbein & Ajzen, 1975).
Behavioral intention	An individual's aim or plan to behave in a certain way with no guarantee to do so (Fishbein & Ajzen, 1975).
Actual System Use	The end-point is where people use the technology (Davis,1989).

In their final model, Davis et al. (1989) eliminated the construct of attitude toward behavior (ATT) because of its weak mediation of the effect between perceived usefulness (PU) and behavioral intention (BI). Furthermore, the direct influence of perceived usefulness (PU) on behavior intention (BI) was strong. On the other hand, attitude toward behavior (ATT) was not successful in mediating the relationship between perceived ease of use (PEOU) and behavior intention (BI). Figure 2.9 depicts the revised version of the original TAM.

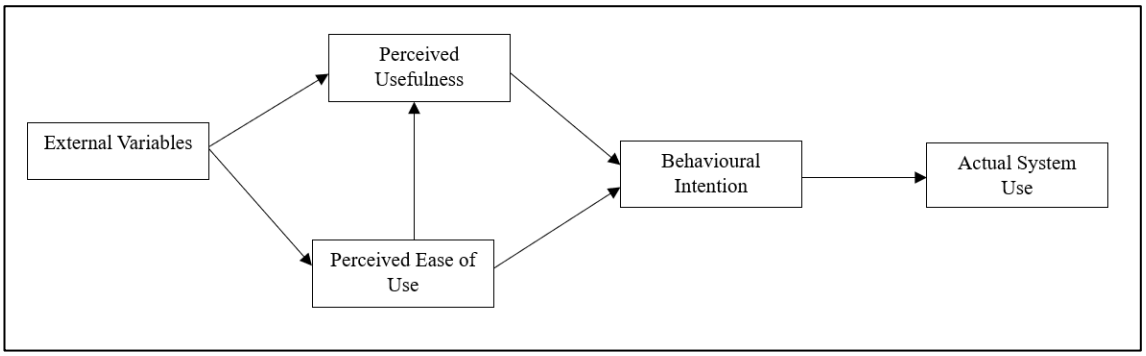


Figure 2.9: Revised Technology Acceptance Model (TAM)
Source: Venkatesh and Davis, 1996.

PU and PEOU are two key variables of TAM, playing a fundamental role in analysing Information System (IS)/ Information Technology (IT) acceptance and use (Davis, 1989). PU and PEOU represent the user's beliefs about the usefulness of and the effort required for using an IS/IT respectively (Davis, 1989; Venkatesh and Davis, 2000). Based on observation, one's attitude toward using an IS/IT is dependent on whether they believe the use would be helpful to their job performance (Davis et al., 1989; Martin, 2022). As such, PU was defined as the degree to which an individual believes that using the IS/IT would enhance performance in completing particular tasks (Davis, 1989; Davis et al., 1989). Additionally, one would use an application only if he or she perceived it was both useful and easy to use (Davis, 1989; Venkatesh and Davis, 2000; Martin, 2022). Thus, PEOU was introduced as another influential factor that refers to the expected effort required in using the target IS/IT (Davis et al., 1989).

The Technology Acceptance Model (TAM) is a widely recognized and reliable model for predicting technology adoption across various contexts, including e-learning, e-commerce, and social media (Al-Sabawi et al., 2018; Verkijika, 2020; Altay & Okumus, 2021; Chatterjee et al., 2021). Despite its validity, researchers have identified certain limitations.

Firstly, the TAM has been criticized for not fully explaining the underlying reasons behind an individual's perception of a technology's usefulness and ease of use (Venkatesh & Davis, 2000; Venkatesh, 2000). While the TAM posits that these two factors are paramount in technology adoption, some argue that they do not provide a comprehensive explanation. For instance, individuals might adopt a technology due to perceived social pressure or its importance within their social group, even if they don't find it particularly useful or easy to use.

Secondly, the TAM's explanatory power is limited, accounting for only around 40% of the variance in behavioral intention (Davis, Bagozzi, & Warshaw, 1989; Venkatesh & Davis, 2000; Venkatesh & Morris, 2000). This indicates that 60% of the variation in actual technology use is influenced by factors beyond the TAM's core constructs of perceived usefulness and perceived ease of use, such as enjoyment and social pressure. In essence, while the TAM can predict technology adoption in some cases, it fails to do so in a significant number of instances, highlighting the influence of other factors.

Finally, the TAM's primary focus on individual factors is another limitation. While it recognizes the role of perceived usefulness and ease of use, it overlooks the impact of social influence on technology adoption (Davis and Venkatesh, 1996 & Venkatesh, 1999). Social influence encompasses an individual's perception of how important others consider the technology to be. For instance, if an individual believes their peers value a particular technology and they are motivated to conform, they are more likely to perceive the technology as useful. The TAM2 attempts to address this limitation by incorporating social influence as a new construct, acknowledging the individual's beliefs about others' opinions on the technology and their motivation to comply with those expectations (Venkatesh & Davis, 2000).

2.8.4 Extension of Technology Acceptance Model (TAM 2)

Within ten years (1989-1999), the Technology Acceptance Model (TAM) solidified its position as a robust and powerful model for predicting user acceptance. Across numerous empirical tests, perceived usefulness consistently emerged as a strong predictor of usage intentions. However, recognizing the TAM's limitations, Venkatesh and Davis (2000) extended the model to better explain the critical determinants of perceived usefulness. This extended model, known as TAM2, incorporates two new variables: social influence processes (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and perceived ease of use).

While TAM2 retains the core determinants of perceived ease of use (PEOU) and perceived usefulness (PU) from the original TAM, it provides a more nuanced understanding of the factors influencing technology adoption. Figure 2.10 and Table 2.4 illustrate the adopted determinants of perceived usefulness within TAM2.

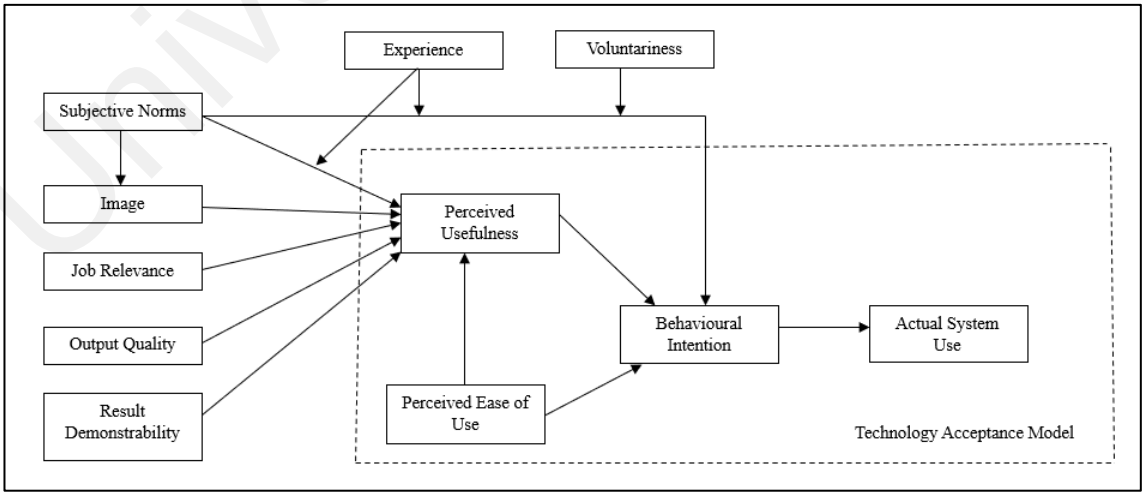


Figure 2.10: Extension of Technology Acceptance Model (TAM 2)
Source: Venkatesh & Davis, 2000, pp.188

Venkatesh and Davis (2000) conducted a longitudinal research involving 156 workers across four organizations to examine the proposed TAM2 model. The research focused on the use of four systems, two of which were voluntary and the other two mandatory. The results validated the model's effectiveness in both voluntary and compulsory settings, notably revealing that subjective norms did not influence voluntary contexts. Additionally, the research found that the impact of subjective norms on perceived usefulness and behavioral intention diminished as experience with the technology increased. Empirical findings suggested that TAM2 explained 40-60% of the variance in perceived usefulness and 37-52% of the variance in behavioral intention.

Table 2.4: Determinant of Perceived Usefulness in the TAM 2

Determinant	Definition
Subjective Norms	A person's perception is that most people who are important to him think he should or should not perform the behavior (Malhotra & Galletta, 1999; Venkatesh & Davis, 2000).
Image	The degree to which the use of an innovation is perceived to enhance one's image or status in one's social system (Karahanna et al., 1999; Venkatesh & Davis, 2000).
Job relevance	The capabilities of a system to support an individual's task (Venkatesh & Davis, 2000).
Output Quality	The perception of how well the system performs tasks that match with individual's job goals (Lucas & Spitler, 2000; Lederer et al., 2000).
Result Demonstrability	The results of adopting/using the Information System innovation are observable and communicable to others (Karahanna et al., 1999; Venkatesh & Davis, 2000).
Experience	Individual knowledge of strengths and weaknesses of the system over time (Venkatesh & Davis, 2000).
Voluntariness	The degree to which individual adopters perceive the adoption decision to be non-mandatory (Moore & Benbasat, 1991; Hartwick & Barki 1994; Agarwal & Prasad, 1997).

2.8.5 Model of Determinant Perceived Ease of Use

Previous research has established that perceived ease of use is an important factor influencing user acceptance and usage behavior of information technologies. However, very little research has been conducted to understand the perception of individual beliefs about information technologies over time. Thus, further research was conducted on a model of perceived ease of use that integrates control, intrinsic motivation, and emotion in 2000 (Venkatesh, 2000). The model proposes control (internal and external—conceptualized as computer self-efficacy and facilitating conditions, respectively), intrinsic motivation (conceptualized as computer playfulness), and emotion (conceptualized as computer anxiety) as anchors that determine early perceptions about the ease of use of a new system (refer figure 2.11 and table 2.5). With increasing experience, it is expected that system-specific perceived ease of use, while still anchored to the general beliefs regarding computers and computer use, will adjust to reflect objective usability, perceptions of external control specific to the new system environment, and system-specific perceived enjoyment.

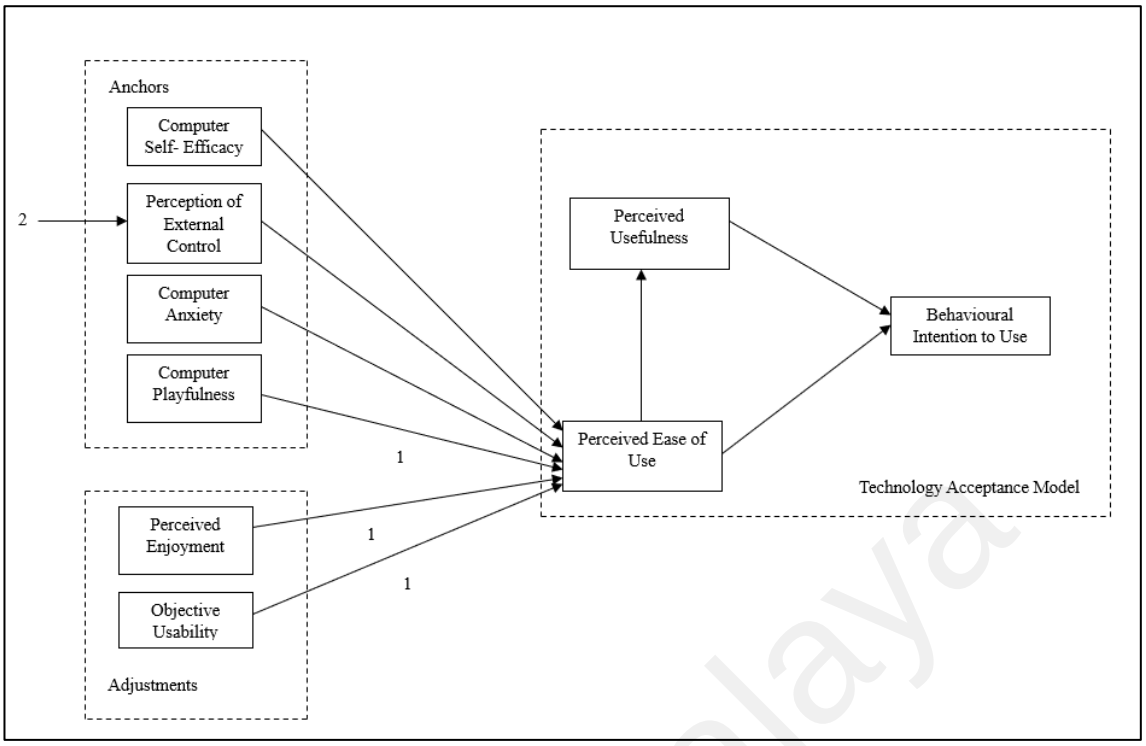


Figure 2.11: Model of Determinant Perceived Ease of Use
Source: Venkatesh, 2000, p.346

The proposed model was tested in three different organizations among 246 employees using three measurements taken over three months, and the proposed model was strongly supported at all points of measurement, explaining up to 60% of the variance in system-specific perceived ease of use (Venkatesh, 2000). The results suggest that control, intrinsic motivation, and emotion are important determinants of system-specific perceived ease of use, and that perceptions about the ease of use of a new system adjust over time to reflect objective usability, perceptions of external control specific to the new system environment, and system-specific perceived enjoyment. The findings have important theoretical and practical implications for designing and implementing user-friendly IT systems that have higher user acceptance and usage behavior.

Table 2.5: Determination of Model Perceived Ease of Use

Determinant	Definition
Computer Self-Efficacy/ Internal Control	Individuals believe her/his ability to perform specific/job tasks using computers (Venkatesh and Davis 1996).
Perceptions of External Control/Facilitating Condition	The availability of support staff, which is an organizational response to help users overcome barriers and hurdles to technology use, especially during the early stages of learning and use (Bergeron et al. 1990)
Computer Anxiety	Individual's apprehension, or even fear, when she/he is faced with the possibility of using computers (Simonson et al. 1987)
Computer Playfulness	The degree of cognitive spontaneity in microcomputer interactions. It is related to human-computer interaction (Webster and Martocchio 1992, p. 204)
Perceived Enjoyment	The role of generic computer playfulness as a determinant of perceived ease of use of the target system is projected to reduce as firsthand experience with the system grows, and system-specific perceived enjoyment is expected to take over (Venkatesh, 2000).
Objective Usability	A user interpretation to the target system is easy or hard to use as individuals gain direct experience with it. Mainly depending on how easy it is to use from an objective standpoint (Venkatesh, 2000).
Anchors	An individual difference variable and general belief regarding computers is based on prior experience with computers in general and other systems in the organization (Venkatesh, 2000).
Adjustment	With the increasing experience with the system, individual is expected to adjust their system-specific perceived ease of use to reflect their interaction with the system (Venkatesh, 2000).

2.8.6 Integrated Technology Acceptance Model (TAM3)

The most recent revision of the TAM resulted in a new model, referred to as the TAM3. The key contribution of the TAM3 is in addressing the determinants of perceived ease of use and perceived usefulness (Venkatesh & Bala, 2008); therefore, the TAM3 was born from the incorporation of the TAM2 (Venkatesh & Davis, 2000) and the model of

perceived ease of use determinants (Venkatesh, 2000). Figure 2.12 depicts the determinants of the TAM3.

Venkatesh and Davis (2000) hypothesized that perceived usefulness is influenced by subjective norms, image, job relevance, output quality, results demonstrability, and perceived ease of use. The determinants of perceived usefulness were explained in section 2.8.4 and Table 2.4. Output quality, experience, and voluntariness are considered as moderators.

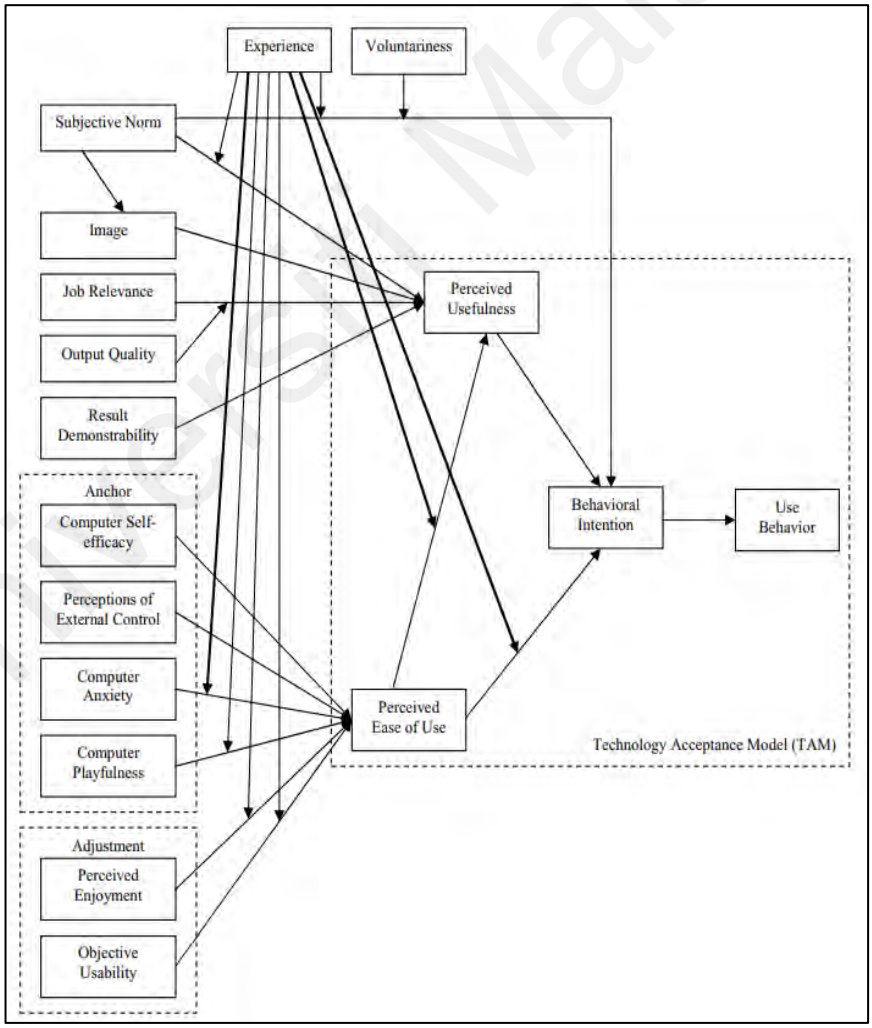


Figure 2.12: Technology Acceptance Model (TAM 3)
Source: Venkatesh & Bala, 2008

Interestingly, the influence of computer anxiety and computer playfulness on PEOU tends to decrease with increased experience, whereas the impact of computer self-efficacy and perceptions of external control tends to increase (Venkatesh & Bala, 2008; Venkatesh, 2000). While an individual's perception of PEOU can be adjusted through experience, it remains anchored to these initial factors. These anchors establish a baseline for PEOU perception. With greater experience, users can make more informed judgments about the system's ease of use. Nevertheless, the initial anchors continue to exert a significant influence.

For instance, a person with high computer anxiety likely starts with a low baseline PEOU for any new technology. Even if they find the technology easy to use after gaining experience, their initial anxiety can still negatively color their perception. Anxiety may lead them to focus on potential difficulties, causing them to overestimate the technology's complexity, even if it's inherently user-friendly (Simsek, 2011).

Furthermore, Venkatesh (2000) theorized that the influence of adjustments - like perceived enjoyment and objective usability - on PEOU strengthens with experience. This is because users develop a deeper understanding of the technology, enabling them to make more accurate usability assessments.

Consider someone using a new ICT system for the first time. They might initially find it challenging and not particularly enjoyable. However, as they gain experience, they might discover it's easier to use and even enjoyable. This shift occurs because they better comprehend the system's workings and can make more informed judgments about its usability.

2.8.7 The Unified Theory of Acceptance and Use of Technology (UTAUT).

In 2003, Venkatesh and his research group reviewed the following eight theories of technology acceptance: Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), Technology Acceptance Model (TAM), the combination form of TAM and TPB (C-TAM-TPB) (Taylor & Todd, 1995b; Shokouhyar et al., 2017), Model of PC Utilization (MPCU) (Thompson et al., 1991), Innovation Diffusion Theory (IDT) (Moore & Benbasat, 1996), Motivational Model (MM) (Davis et al., 1992), and the Social Cognitive Theory (SCT) (Bandura, 1986). As a result, they proposed a new theory named as the unified theory of acceptance and use of technology (UTAUT) to be a unified form benefiting from the unique characteristics of all other older mentioned theories and models. Figure 2.13 shows the model of the UTAUT.

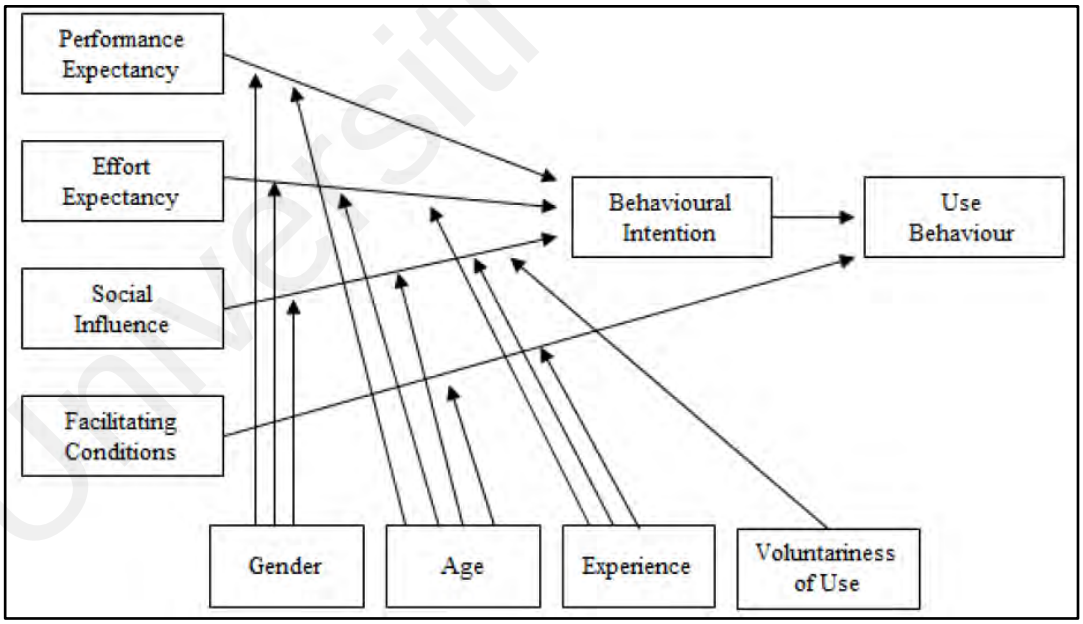


Figure 2.13: Unified Theory of Acceptance and Use of Technology.
Source: Venkatesh, Morris, Davis, & Davis, 2003

Venkatesh et al. (2003) theorize that new technology acceptance is determined by four key factors: performance expectancy, effort expectancy, social influence, and facilitating conditions. These factors influence both user intention and actual behavior. The

definitions of these UTAUT determinants are outlined in Table 2.6. The unified theory posits that performance expectancy, effort expectancy, and social influence directly impact behavioral intention. In contrast, facilitating conditions and intention directly affect actual usage behavior (Taiwo & Downe, 2013).

Table 2.6: The Determinants of the UTAUT. Source: Venkatesh et al., 2003

Determinant	Definition
Performance Expectancy	The degree to which an individual expects that his or her performance will be enhanced when performing a certain behavior.
Effort Expectancy	The degree to which an individual expects that performing a certain behavior will not require significant effort.
Social Influence	The degree to which an individual believes that people think he or she should perform a certain behavior.
Facilitating Conditions	The degree to which an individual thinks that organizational resources are available to facilitate performing a certain behavior

The Unified Theory of Acceptance and Use of Technology (UTAUT) identifies four moderating variables: gender, age, experience, and voluntariness of use (see Table 2.6). These moderators can influence the relationships between the four core UTAUT constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) and both behavioral intention and usage behavior (Dwivedi et al., 2019).

Performance expectancy, the belief that using a new technology will help achieve goals, is a strong predictor of behavioral intention. However, its effect is moderated by gender and age (Onaolapo & Oyewole, 2018), with younger men being more susceptible to its influence. Meanwhile, effort expectancy, the belief that using a new technology will be easy, also strongly predicts behavioral intention. Its effect is moderated by gender, age, and experience (Ayaz & Yanartaş, 2020), with young women and older, less experienced workers being more influenced.

Social influence is the perception that important others believe the user should use a new technology. It is a strong predictor of behavioral intention, and its effect is moderated by all four moderators (Joa & Magsamen-Conrad, 2021). Older women, particularly in mandatory usage situations, are more likely to be influenced by social influence than other users. Lastly, facilitating conditions refer to the perceived resources and support available for using the technology. While it does not directly affect behavioral intention, it strongly influences usage behavior. Older, more experienced workers are particularly influenced by facilitating conditions (Batucan et al., 2022).

2.8.8 Extended Unified Theory of Acceptance and Use of Technology (UTAUT 2)

The Unified Theory of Acceptance and Use of Technology (UTAUT), introduced by Venkatesh et al. (2003), has served as a foundational model for numerous studies examining technology use and adoption. To address the limitations of the original UTAUT, Venkatesh et al. (2012) later incorporated consumer effect, automaticity, and monetary costs, leading to the development of UTAUT2. This extended model (illustrated in Figure 2.14) includes the four original UTAUT constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) and three new constructs (hedonic motivation, price value, and habit) as predictors of behavioral intention and use behavior. effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit all influence behavioral intention while facilitating conditions, habit, and intention directly impact user behavior.

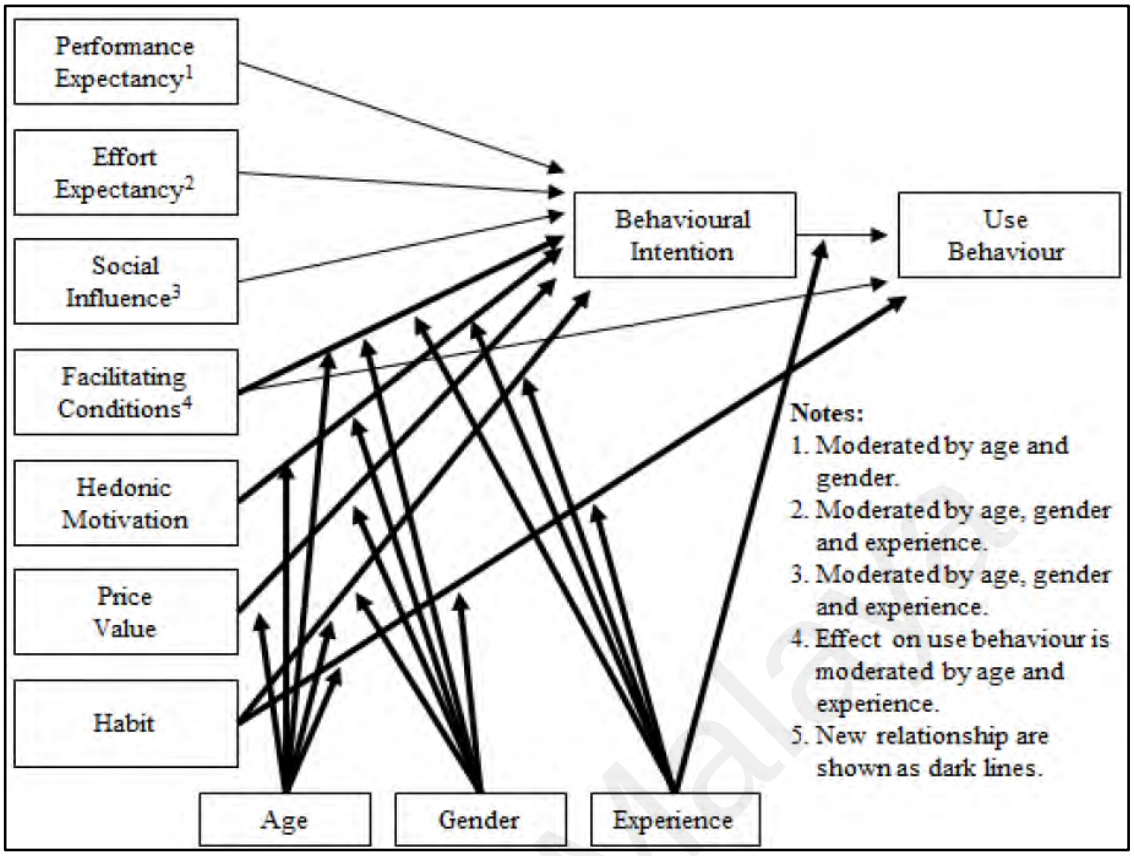


Figure 2.14: Extended Unified Theory of Acceptance and Use of Technology
Source: Venkatesh et al., 2012

The UTAUT2 model also suggests that personal characteristics like age, gender, and experience can moderate the relationships between its key determinants and both intention and use behavior (Venkatesh et al., 2003). This means the impact of factors like performance expectancy, effort expectancy, etc., can vary depending on the individual user.

In addition, the impact of hedonic motivation (enjoyment and fun) has a stronger influence on intention for younger, male, and less-experienced users, who are often more motivated by the perceived enjoyment of new technologies. Meanwhile, the impact of price value (perceived cost) on intention is stronger for younger and female users. This is because younger users and female users are more likely to be sensitive to the cost of new technologies. The influence of habit (tendency to use technology out of routine) on intention and use behavior is stronger for older, male, and more experienced users. This

is because these users are more likely to have established habits around using technology. Finally, the effect of intention on use behavior (actual use of technology) is stronger for less-experienced users. This is because less-experienced users are more likely to rely on their intentions to guide their behavior.

Table 2.7: The Determinants of the Extended UTAUT2. Source: Venkatesh et., 2012

Determinant	Definition
Hedonic Motivation	It refers, also known as perceived enjoyment, to the degree to which an individual believes that using a specific technology would be fun.
Price Value	An individual's trade-off between the advantages of a specific technology and the monetary cost of using the technology.
Habit	The degree to which a user believes the behavior to be automatic.

Venkatesh et al. (2012) found that the UTAUT2 model was able to successfully explain variance in behavioral intention and use behavior for users of internet mobile technology in Hong Kong. The model explained 74% of the variance in behavioral intention and 52% in use behavior. However, El-Masri and Tarhini (2017) criticized the UTAUT and UTAUT2 models for producing biased results across cultures. They argued that the models do not take into account the different cultural values and norms that may influence user acceptance and use of technology.

2.9 Comparison of Technology Acceptance Theories

The field of ICT has a variety of models that can be used to assess the acceptance and use of technology. This variety provides flexibility but can also complicate the selection process for researchers. This section discusses the strengths and weaknesses of several popular technology acceptance models—TRA, TPB, TAM, TAM2, TAM3, UTAUT, and UTAUT2—to inform this decision-making process.

The Theory of Reasoned Action (TRA) and the Theory of Planned Behavior (TPB) are two theories that explain how attitudes, subjective norms, and perceived behavioral control influence user intention and behavior. TRA is a simpler model that only considers attitudes and subjective norms, while TPB adds the concept of perceived behavioral control. Ajzen (1985) developed TPB as an extension of TRA to address its limitations in predicting user behavior in situations where participants have a low level of control. TPB is a more accurate predictor of behavior than TRA, but it is also more complex. Besides that, TRA and TPB are both social psychological theories, which means that they were developed to explain behavior in social settings. This may limit their applicability to other types of behavior, such as individual decision-making or behavior in non-social settings. Despite their limitations, TRA and TPB are still widely used to predict user intention and behavior. They are relatively easy to understand and use, and they have been validated in many studies (Brodowky et al., 2018; Tommasetti et al., 2018; Copeland & Zhao, 2020; Taing & Chang, 2020).

The Technology Acceptance Model (TAM) is an extension of the Theory of Reasoned Action (TRA). Both theories posit that attitude toward behavior directly affects behavioral intention. However, the main difference between TAM and TRA is the concept of subjective norms. TAM does not consider subjective norms as a key determinant of behavioral intention (Tarhini et al., 2015; Murillo et al., 2021). This is because TRA was developed in social psychology, where social influence is a major factor in decision-making (Davis, 1986). However, TAM was developed specifically to explain the acceptance of technology, and in many cases, technology is used in voluntary settings where social influence is not a major factor (Davis et al.,1989). In addition, Davis et al. (1989) argued that there is not always enough information available to participants about the social influence during the stage of acceptance testing. This is because participants may not be aware of the opinions of their peers or superiors about the

technology. As a result of these two factors, TAM does not include subjective norms as a predictor of behavioral intention. Instead, TAM focuses on the two factors of perceived usefulness and perceived ease of use. Perceived usefulness is the belief that using technology will improve a person's job performance or personal life. Perceived ease of use is the belief that using the technology will be effortless. TAM has been shown to be a more accurate predictor of behavioral intention than TRA, especially for the acceptance of technology. This is because TAM is specifically designed to explain technology acceptance, and it does not rely on the concept of subjective norms, which may not be a major factor in all situations (Lai, 2017). In addition, TAM is simpler and more robust than TRA. This makes it easier to use and understand, and it is less likely to be affected by extraneous factors. As a result, TAM has become the most widely used model for predicting the acceptance of technology.

The Extended Technology Acceptance Model (TAM2) is an extension of the Technology Acceptance Model (TAM). Both models posit that behavioral intention directly influences actual system use. However, the TAM2 has excluded the construct of attitude toward behavior. The TAM2 was developed to overcome the limitations of the TAM in explaining the reasons for which an individual would perceive the investigated technology useful. TAM2 extends the perceived usefulness construct to include social influence processing factors (subjective norms, image, and voluntariness) and cognitive instrumental processing factors (job relevance, output quality, result demonstrability, and perceived ease of use).

In addition, TAM2 has two moderators, experience and voluntariness, that influence the relationships between subjective norms and behavioral intention from one side and subjective norms and perceived usefulness from the other side. TAM2 has been shown to be a more accurate predictor of behavioral intention than TAM. This is because TAM2

takes into account a wider range of factors that influence perceived usefulness, including social influence and cognitive instrumental processing. However, TAM2 has not been as successful in identifying the external variables that influence perceived ease of use. This is a limitation of the model, and it suggests that further research is needed to identify the drivers of perceived ease of use.

The explained variance in user intention is 40% by the TAM (Davis, Bagozzi, & Warshaw, 1989) and around 52% by the TAM2 (Venkatesh & Davis, 2000). This suggests that there are still other factors that influence user intention, and that further research is needed to identify these factors. Overall, TAM2 is a more accurate predictor of behavioral intention than TAM. However, it is still not perfect, and there are still some limitations to the model. Further research is needed to identify the drivers of perceived ease of use and other factors that influence user intention.

The Technology Acceptance Model 3 (TAM3) is the most recent revision of the Technology Acceptance Model (TAM). It is considered as a combination of the TAM2 (Venkatesh & Davis, 2000) and the model of perceived ease of use determinants (Venkatesh, 2000). Both TAM3 and TAM2 adopt the determinants of perceived usefulness. However, TAM3 and the model of perceived ease of use determinants adopt the factors of perceived ease of use. Unlike TAM, TAM2, and the model of perceived ease of use determinants, TAM3 identifies the determinants of both perceived ease of use and perceived usefulness.

TAM3 posits that perceived usefulness and perceived ease of use directly influence behavioral intention, which in turn influences actual system use. TAM3 also posits that social influence, facilitating conditions, experience, and voluntariness moderate the relationships between perceived usefulness and perceived ease of use and behavioral

intention. TAM3 has been shown to be a more accurate predictor of behavioral intention than TAM and TAM2. However, the explained variance in user intention is only 53% by the TAM3. This suggests that there are still other factors that influence user intention, and that further research is needed to identify these factors. TAM3 is a complex model, and it is not always easy to apply in practice. However, it is still a useful model for predicting the acceptance of technology. It is more accurate than the TAM, and it takes into account a wider range of factors that influence the adoption of technology.

Integrating eight technology acceptance theories, including TAM, UTAUT incorporates moderating variables such as gender, age, experience, and voluntariness of use (Venkatesh et al., 2003). UTAUT2 builds upon this by adding hedonic motivation and price value (Venkatesh et al., 2012). These comprehensive models offer higher explanatory power, but their complexity can pose challenges in practical application.

Both UTAUT and UTAUT2 offer high explanatory power due to their comprehensive nature. They consider a wider range of factors than simpler models like TAM, which allows for more nuanced predictions of technology acceptance. However, this complexity can also be a disadvantage. The large number of variables and relationships can make these models difficult to apply in practical research settings, especially when resources are limited. Given its complexity, extending the UTAUT2 with an additional twelve factors would require substantial effort and resources not feasible for this research. Moreover, this research's primary objective is to examine the factors influencing ICT acceptance among real estate agents. Consequently, selecting UTAUT2 as the base model may not be appropriate, as some of its independent variables, such as price value and habit, are irrelevant to this context.

In addition, compared to the newer UTAUT2, TAM has been extensively used to examine technology acceptance. For example, as of May 2022, the TAM (Davis, 1989) had been adopted in over 79,831 studies according to Google Scholar. This popularity suggests the reliability and validity of TAM in examining ICT acceptance among real estate agents. Finally, while TAM has been criticized for limitations such as inconsistent results in non-Western cultures, lack of moderating variables, and low explanatory power (Baki et al., 2018; Quandt & Freitag, 2021; Alsyouf et al., 2023) this research aims to address these by extending the TAM with variables within the Non-Western cultural context (Malaysia).

2.10 Research Theoretical Model

A theoretical framework is a set of theories that explain the research problem and provide a foundation for the research. It helps the researcher to understand, predict, and explain the concepts and relationships in the phenomenon under research. By referring to the existing knowledge in the theoretical framework, the researcher can either extend or challenge that knowledge. This helps to ensure that the research is conducted rigorously and systematically. Without a theoretical framework, there is no theoretical basis for the research to be conducted (Piaw, 2020). The theoretical model of this research is depicted in Figure 2.15 using the Technology Acceptance Model (TAM) by Davis et al. (1989). The external variable of this research will be confirmed once rigorous research has been conducted to identify the variables to be used for this research.

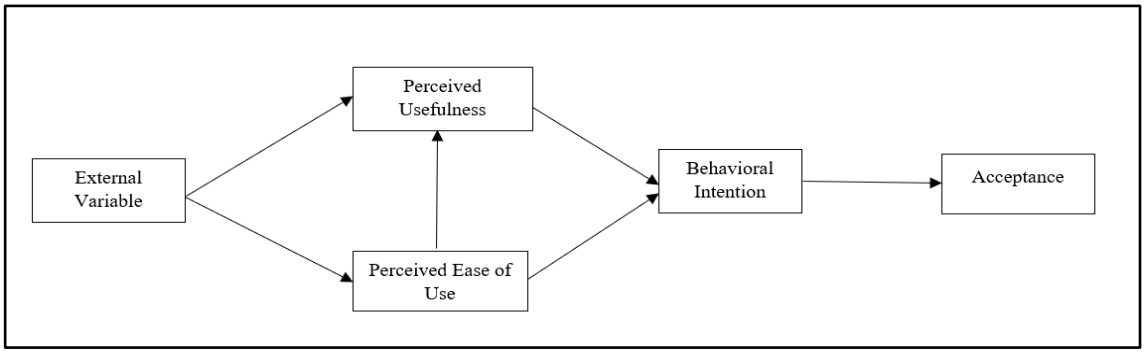


Figure 2.15: Theoretical Model of this Research

2.11 Justification for Choosing Theory TAM

1) Popular in theory of technology acceptance

The TAM is a most widely used theories in ICT research to predict whether a new technology will be use by individuals, groups or organizations (Morteson & Vidgen, 2016; Lai, 2017; Taherdoost, 2018; Granic & Marangunic, 2019; Verkijika, 2019; Park & Park, 2020; Al-Husamiyah & Al-Bashayreh, 2021). It has been found to be effective in predicting user behavior in a variety of contexts, including e-learning, e-commerce, and social media (Al-Sabawi et al., 2018; Verkijika, 2020; Altay & Okumus, 2021; Chatterjee et al., 2021) under different cultures and time, with different moderators (e.g., age, gender, experience, and educational level) and different users (Tarhini et al.,2015; Wu, 2020). As of May, 2022, this theory has been cited 79,831 times, according to Google Scholar in top 100 publication (e.g., Frontiers in Psychology, IEEE Access, Sustainability and Journal of Business Research) and 64 times average numbers (A value of 100 is the peak popularity for the term) being searched worldwide in google trends for the past 5 five years (refer figure 2.16).

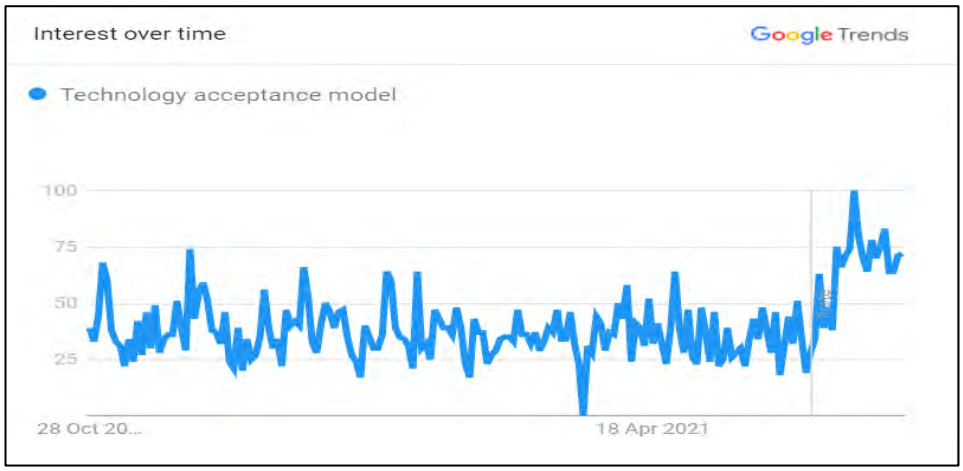


Figure 2.16: Google Trends Search on TAM as of May,2022
Source: Google Trends

2) Flexibility

The Technology Acceptance Model (TAM) is flexible and can be easily adapted to include additional variables that may influence the acceptance and use of new technologies. This has been demonstrated in previous studies (Yoon, 2016; Revythi & Tselios, 2019; Hong et al.,2021; Verkijika, 2020; Al-Husamiyah& Al-Bashayreh, 2022; Park & Park, 2020; Chawla & Joshi, 2021). As the goal of this research is to examine the factors influencing the acceptance of information and communication technology (ICT) among real estate agents, the TAM's flexibility allows the researcher to easily incorporate desired usability attributes into the proposed model. In simpler terms, TAM is a versatile model that can be used to research the acceptance of new technologies in a variety of contexts. It is flexible enough to be adapted to include additional variables that may be relevant to the specific context, such as the usability of the ICT. This makes TAM a valuable tool for researchers who are interested in understanding the factors that influence user acceptance of new technologies.

3) Overcome the limitation of TAM

The Technology Acceptance Model (TAM) has been criticized for having some limitations. First, the TAM has been shown to produce inconsistent results when used in non-Western cultures. This is because the TAM was originally developed in the United States (Davis, 1989), and it may not be applicable to other cultures with different values and beliefs. Second, the TAM only explains about 40% of the variance in user intention, which is considered to be a low explanatory power (Davis, Bagozzi, & Warshaw, 1989; Venkatesh & Davis, 2000; Venkatesh & Morris, 2000). This means that the TAM is not able to fully explain why people decide to use a technology. This research addressed these limitations by extending the TAM variables. The research also tested the model in a non-Western culture, Malaysia.

4) Simple to understand

TAM is based on two key concepts: perceived usefulness and perceived ease of use. These concepts are easy to understand and measure, which makes TAM a good choice for researchers and practitioners who are not familiar with complex theoretical models. For example, a company is developing a new software application for customer service representatives. The company wants to know how likely customers are to use this new application. They can use the TAM to predict customer acceptance by measuring the perceived usefulness and perceived ease of use of the application. If the company finds that customers perceive the application to be both useful and easy to use, then they can be confident that customers will be more likely to use the application. On the other hand, if customers perceive the application to be either not useful or not easy to use, then

they may be less likely to use the application (Taherdoost, 2018; Puspita & Kusumawati, 2019; Jung et al., 2021).

5) Limited Research in Real Estate Field

It is important to understand the factors that influence real estate agents' acceptance of Information and Communication Technology (ICT). The Technology Acceptance Model (TAM) is a well-established model for identifying these factors. According to TAM, perceived usefulness (PU), perceived ease of use (PEOU), and behavioral intention (BI) are key in influencing ICT acceptance, as evidenced by research from Lai (2017), Hoong et al. (2017), Al-Emran et al. (2018), Taherdoost (2018), Alshammari & Rosli (2020), and Al-Husamiyah & Al-Bashayreh (2022). These factors may include service quality, facilitating conditions, perceived enjoyment, trust, among others, which directly affect users' perceptions and intentions towards adopting ICT. However, research on how these factors directly influence PU, PEOU, BI, and acceptance (ACC) of ICT in the real estate sector is scarce.

While previous studies have explored ICT's impact on the real estate industry, few have directly examined the effects of specific factors on PU, PEOU, BI, and ACC among real estate agents. For example, Oyentunji et al. (2018) investigated critical factors for effective ICT deployment in Nigeria's real estate practice, such as technological infrastructure and service delivery efficiency, without directly linking these factors to PU, PEOU, BI, and ACC. Similarly, Park and Park (2020), Debika (2018), and Babatunde and Ajayi (2017) contributed to the literature on technology acceptance and ICT effects in real estate but did not directly address the relationship between specific factors. This research aims to

fill that gap by identifying factors that directly influence the acceptance of ICT among real estate agents.

2.12 Factors and Hypothesis Development Influence the Acceptance of ICT

The Technology Acceptance Model (TAM) is a theoretical framework that explains how external variables influence the perceived ease of use and perceived usefulness of a technology, which in turn influence individuals' behavioral intention and actual use of the technology. The TAM was first proposed by Davis (1989) and has been widely used to research the adoption of new technologies in a variety of contexts. The TAM has two main constructs: perceived ease of use and perceived usefulness (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989).

The external variables that influence the perceived ease of use and perceived usefulness of a technology can vary from one technology to another, from one culture to another, and from one user to another (Al-Busaidi & Al-Shihi, 2010). These external variables can ultimately influence individuals' behavioral intention and actual use of the technology through the mediation of perceived ease of use and perceived usefulness (Davis, Bagozzi, & Warshaw, 1989). Tang and Chen (2011) conducted a systematic review of TAMs and recommended the extension of TAM constructs and the adoption of new external variables from other theory and fields. The variables were used in this research, based on the most frequently used variables in previous research in real estate field (refer table 2.8). Information Quality, Self-Efficacy, Service Quality, Perceived Enjoyment, Social Influence, Facilitating Conditions, Perceived Cost, Innovativeness, and Trust were selected for this research due to their frequency of five or more, compared to other variables. These variables have also been validated by academics and industry experts, as discussed further in Chapter 3.

Table 2.8: Literature Matrix of this Research

Authors	Year	Variables																												
		Information Quality	Technology Self-efficacy	Service quality	Playfulness & usability	Perceived enjoyment	System Quality	Perceived Risk/Insecurity	Performance Expectancy	Effort Expectancy	Social Influence	Facilitating condition	Communication	Perceived flexibility	Perceived Cost	Energy Saving	Time Saving	Mobility	Innovativeness	Experience	Trust	Brand Image	Government Support	User Friendly	Perceived Convenience	Perceived Compatibility	Job Relevance	Security	Presence
Kaur & Solomon	2021	/	/	/	/	/	/																							
Ullah et al.	2021	/		/			/	/																						
Adegoke & Oladokun	2020		/			/			/	/	/	/																		
Al-Sabawi et al.	2021	/	/			/					/	/	/	/																
Sepasgozar et al.	2018	/	/	/								/			/	/	/													
Altay & Okumus	2021										/							/												
Sagnier et al.	2020																		/	/										/
Wang et al.	2020		/			/					/	/							/											
Al-Momani et al.	2019										/				/					/	/								/	
Hu et al.	2019							/											/		/	/	/							
Taherdoost	2018											/	/								/			/						

Table 2.8, Continued

		Variables																											
		Information Quality	Technology Self-efficacy	Service quality	Playfulness & usability	Perceived enjoyment	System Quality	Perceived Risk/Insecurity	Performance Expectancy	Effort Expectancy	Social Influence	Facilitating condition	Communication	Perceived flexibility	Perceived Cost	Energy Saving	Time Saving	Mobility	Innovativeness	Experience	Trust	Brand Image	Government Support	User Friendly	Perceived Convenience	Perceived Compatibility	Job Relevance	Security	Presence
Al-Husamiyah & Al-Bashayreh	2021							/							/										/	/			
Ullah et al.	2021	/		/			/																						
Hong et al.	2021		/									/			/												/		
Dieck & Jung	2015	/		/				/			/	/							/										
Chawla & Joshi	2021											/									/					/		/	
Yalcin & Kutlu	2019		/								/													/					
Akram et al.	2021												/					/			/			/					
Do et al.	2020			/		/							/																
Adegoke et al.	2021								/	/	/	/			/														
Gansser & Reich	2021								/	/	/				/				/						/			/	
Frequency		6	7	6	1	5	3	4	3	3	9	9	4	1	6	1	1	2	5	2	5	1	1	3	2	2	1	3	1

2.12.1 Technology Self-Efficacy (TSE)

Technology self-efficacy is defined as individuals' judgments of their ability to carry out certain behavior. Self-efficacy does not refer to the skills one has; however, it refers to an individual's judgment about being able to do something (Kaur & Solomon, 2021). Venkatesh and Davis (1996) provided an empirical foundation for the notion that self-efficacy influences perceived ease of use. They argued that, in the absence of experience, end users judge a technology's ease of use on the basis of their own knowledge and skills (Ullah et al., 2021; Jiang et al., 2021; Hong et al., 2021). They concluded that users perceive a technology as easy to use if they can use it without help or with only a little help from others. Computer self-efficacy was shown to be an explanatory feature of perceived ease of use (PEOU) to use technology in TAM2 and TAM3 by Venkatesh (2000) and Venkatesh and Bala (2008), respectively. In this research, technology self-efficacy is defined as the degree of confidence or ability of real estate agents has in using ICT in practices without or with little help from others. Increasing the technology self-efficacy level among the real estate agents leads to high acceptance of ICT. Therefore, this research proposed the following hypotheses:

H1: TSE has a direct positive influence on real estate agents' PEOU of ICT.

2.12.2 Facilitating Conditions (FC)

Facilitating conditions or perception of external control is defined by Venkatesh & Bala, 2008 as the consumers' perceptions of the resources and support available to perform a behaviour. Facilitating conditions, such as network connectivity, hardware, and user support, have a significant impact on technology adoption and use (Sepasgozar et al., 2018). Because ICT is highly interconnected, it requires technical resources to enable its use. Previous research found that there is a significant relationship between facilitating condition and behavioural intent to use the technology (Adegoke et al., 2020). Teo (2010) supported the path of facilitating conditions towards perceived usefulness (PU) and Lu et al. (2003) argued that facilitating conditions influence both perceived ease of use (PEOU) and perceived usefulness (PU). From the perspective of this research, facilitating conditions emphasize the availability of the technical infrastructure and the awareness of real estate agents about the resources available to support the use of ICT in the real estate industry. Therefore, this research proposed the following hypotheses:

H2: FC has a direct positive influence on real estate agents' PU of ICT.
H3: FC has a direct positive influence on real estate agents' PEOU of ICT.

2.12.3 Innovativeness (INNO)

Innovativeness is a personality trait that refers to a person's willingness to try new things, especially new technologies (Hu et al., 2019). People with high levels of innovativeness are often early adopters of new technologies and are eager to learn about and experiment with them. They are also more likely to be open to new technologies and enjoy the experience of learning them (Wang et al., 2019). Their willingness to learn, understand, and use new technologies increases their adoption of technology. In addition, innovative

individuals tend to be more open to new ideas and creative in general (Cao & Shao, 2021). This is also confirmed by the fact that innovativeness has been found to be a major factor influencing perceived ease of use (PEOU) intention to use technology (Hong et al, 2019). In this research, innovativeness refers to the motivation and interest of real estate agents to use ICT in practice. Therefore, this research proposed the following hypotheses:

H4: INNO has a direct positive influence on real estate agents' PEOU of ICT.

2.12.4 Trust (TRU)

According to Aldossari & Sidorawa, 2018 trust is considered to be a key factor in successful customer relationships, especially in situations where there is a high level of uncertainty and the possibility of opportunistic behavior. From the consumer's point of view, trust is the willingness to rely on them based on the belief that they are trustworthy (Akram et al., 2021). This belief is formed based on the consumer's expectations of the provider's trustworthiness, which is why it is important to consider this aspect when studying trust. In the application of this research, the role of trust is important in the application of ICT by real estate agents, especially in the context of data security and privacy (Taherdoost, 2018). Real estate agents handle a lot of sensitive data, such as property listings, buyer information, and financial data. This data is valuable to real estate agents, but it also raises concerns about privacy and security. Therefore, real estate agents need to trust the ICT they use to ensure that their data is safe and secure. A previous research (Hu et al., 2019) has found that users' trust has a significant impact on their behavior intention (BI) toward the adoption of Fintech services. This means that the more trust a user has in a technology, the more likely they are to adopt and use it. Therefore, this research proposed the following hypotheses:

H5: TRU has a direct positive influence on real estate agents' BI of ICT.

2.12.5 Perceived Enjoyment (ENJ)

Perceived enjoyment, or hedonic motivation, is the extent to which people find using technology to be enjoyable, regardless of any practical benefits it may offer (Venkatesh & Bala 2008). The perceived enjoyment is a significant predictor of the intention to use innovative products. In the present research context, enjoyment is considered as how enjoyable real estate agents use a particular ICT, excluding any performance consequences resulting from the ICT use. Previous research conduct by Do et al., 2020; Park & Park, 2020 discovered that when user interaction with technology more smoothly, the user experiences a feeling of enjoyment induce a flow state or so focused and engaged in an activity that they lose track of time and become completely absorbed in the moment. They found that perceived ease of use (PEOU) and perceived usefulness (PU) was a significant predictor of user to use the ICT. Hence, the following hypothesis is proposed:

H6: ENJ has a direct positive influence on real estate agents' PU of ICT.
H7: ENJ has a direct positive influence on real estate agents' PEOU of ICT.

2.12.6 Social Influence (SI)

Social Influence is also known as subjective norm and is defined as the level at which an individual perceives that the most significant people think he should or should not use a system (Venkatesh & Davis, 2000). Meanwhile, (Fishbein & Ajzen, 1975) defined social influence as the degree to which an individual perceives that people who are important to him or her think he or she should (or should not) perform a behavior in question. Abdullah & Ward's, 2016 analysis of 107 TAM papers covering the last 10 years concluded that SI

is classified as the most commonly used and one of the most influential determinants of attitudes and intention. In most studies, a relationship between SI and PEOU is not hypothesized (Adegoke & Oladokun, 2020 & Al-Sabawi et al., 2021) and in a few examples that test this relationship, such as Altay & Okumus, 2021 results have been insignificant but have positive significant on perceived usefulness (PU). Aldossari & Sidorawa, 2018 and Venkatesh & Davis, 2000 on his research revealed that social influence associated with IoT has a positive impact on behavior intention (BI) toward IoT technologies. In this research context, social influence is defined as an estate agent's perception that most people who are important to him think he should or should not use ICT for his job. Therefore, this research proposed the following hypotheses:

H8: SI has a direct positive influence on real estate agents' PU of ICT.
H9: SI has a direct positive influence on real estate agents' BI of ICT.
H10: SI has a direct negative influence on real estate agents' PEOU of ICT.

2.12.7 Perceived Cost (PC)

Price or cost factor is one of the reasons that could slow down the development of e-commerce. The cost factor may consist of the initial purchase price, ongoing usage cost, maintenance cost, and upgrade cost (Sepasgozar et al., 2018). In the Malaysian context, (Al-Tmeemy et al., 2012; Aldossari & Sidorawa, 2018) argue that cost is one of the major barriers to the adoption of standards and digital technologies. Similarly, Low et al., 2020 argue that perceived cost and trust are positively associated with consumer behavior intention (BI) to use ICT in Malaysia. In this research, perceived cost is defined as the extent to which real estate agents perceive that using ICT is costly. Therefore, this research proposed the following hypotheses:

H11: PC has a direct positive influence on real estate agents' BI of ICT.

2.12.8 Service Quality (SERQ)

Service quality is a method for service providers to provide excellent and exemplary service to customers to differentiate themselves from competitors. Client satisfaction and service quality are closely related (Kaur & Solomon, 2021; Do et al., 2020). When clients have a positive experience with service quality provided by sellers, they are more likely to be satisfied with the overall service quality (Low et al., 2020). This is because technology services can help businesses to provide a more personalized, efficient, and convenient customer experience. Similarly, (Khan & Zhang, 2021) defined it as the beginning to the end of the transaction, including information search, website navigation, order, user service interactions, delivery, and satisfaction with the ordered product. In previous research, (Ullah et al., 2021; Sepasgozar et al., 2018) revealed that service quality positively significant perceived usefulness (PU) and perceived ease of use (PEOU) to use the ICT. Thus, in the context of this research, service quality refers to the process whereby the real estate agent is provided with a fast, safe, reliable, and immersive environment to conduct their transactions and business using the ICT. Therefore, this research proposed the following hypotheses:

H12: SERQ has a direct positive influence on real estate agents' PU of ICT.

H13: SERQ has a direct positive influence on real estate agents' PEOU of ICT.

2.12.9 Information Quality (INQ)

In general, information quality comprises factors that incline users to utilise technology due to their information reliability and consistency (Low et al.,2020). Al-Sabawi et al., 2021 has defined information quality is an outcome of communication behaviors within an organization that reflects the degree to which employees have access to the information requisite for their responsibilities. Meanwhile, Park & Park, 2020 has define information quality refers to the degree to which technology's content is timely, accurate, transparent and complete. The purpose of using technology in practice is to extend social interactions and improve people's lives by allowing engagement more effectively online with clients, colleagues, friends, and coworkers. Information quality is affecting perceived usefulness (PU) and perceived ease of use (PEOU) to accept and use the technology (Dieck et al., 2015; Ullah et al., 2021). Thus, in this context of research information quality refer to where real estate agents having access to accurate and up-to-date information quality about properties using ICT, real estate agents can help their clients make informed decisions about the properties they are interested in. Real estate agents who can provide their clients with high-quality information have a competitive advantage. Therefore, this research proposed the following hypotheses:

H14: INQ has a direct positive influence on real estate agents' PU of ICT.

H15: INQ has a direct positive influence on real estate agents' PEOU of ICT.

2.13 Variables of the Technology Acceptance Model

2.13.1 Perceived Usefulness (PU)

Perceived usefulness (PU) is a central construct in the Technology Acceptance Model (TAM) (Davis, 1989). Its significance has been highlighted in various technology adoption models, including the TAM (Davis et al., 1989), TAM2 (Venkatesh & Davis, 2000), the model of PEOU determinants (Venkatesh, 2000), and TAM3 (Venkatesh & Bala, 2008). Perceived usefulness can be defined as the degree to which an individual believes that utilizing the technology would improve his or her performance (Davis, 1986). In this research, PU refers to the extent to which real estate agents think that using ICT would improve their performance. Compared to other constructs, the meaning of PU is similar to the performance expectancy construct in the UTAUT (Venkatesh et al.,2003) and the UTAUT2 (Venkatesh et al.,2012). Perceived usefulness was assumed to be a direct antecedent to BI in various models, such as the TAM, the TAM2, the model of PEOU determinants, and the TAM3. Furthermore, it was found (Davis, 1993) that PU is a direct determinant of behavior intention (BI) to accept and use the technology. In comparison to PEOU, PU has a stronger influence on user intention and behavior (Davis, 1989). This finding is supported by numerous studies on technology acceptance in real estate (Taherdoost, 2018; Sepasgozar et al., 2019; Guhr et al., 2020; Park & Park, 2021; Al-Husamiyah & Al-Bashayreh, 2021; Ullah et al., 2021). In this research's context, real estate agents anticipate that the perceived usefulness of ICT will enhance their job productivity and performance. Therefore, this research proposed the following hypotheses:

H16: PU has a direct positive influence on real estate agents' BI of ICT

2.13.2 Perceived Ease of Use (PEOU)

Perceived ease of use is a key construct in the TAM (Davis, 1989). Perceived ease of use can be defined as the extent to which an individual believes that utilizing the technology would not require significant effort (Davis, 1986). In the context of this research, PEOU refers to the extent to which real estate agents think that using ICT would be easy. In line with the TAM (Davis, 1989), real estate agents perceive ICT as easy to use, they are more likely to use the technology. Furthermore, PEOU was postulated to be an antecedent to PU and BI in various technology models, such as the TAM, the TAM2, the model of PEOU determinants, and the TAM3. Compared to other constructs, the meaning of PEOU is similar to the effort expectancy construct in the UTAUT (Venkatesh et al., 2003) and the UTAUT2 (Venkatesh et al., 2012). Several studies have supported the influence of PEOU on PU. For example, using the TAM, Al-Husamiyaha & Al-Bashayreha (2021) explored factors influencing smart home service acceptance and found a positive relationship between PEOU and PU on users' intention to use such services. Similarly, Chatterjee et al. (2021) confirmed that PEOU affects PU in the context of social media marketing adoption for sustainable business growth. Other studies (e.g., Gross et al., 2020; Shuhaiber & Mashal, 2019) have also demonstrated this relationship. Therefore, this research proposed the following hypotheses:

H17: PEOU has a direct positive influence on real estate agents' PU of ICT.

On the other hand, a research by Ullah et al., 2021 exploring the user perceptions of real estate online platforms has found that perceived ease of use (PEOU) affects the behavior intention (BI) of the user to use real estate online platforms. A research by Park & Park, 2020 on factors of the technology acceptance model for Construction IT also revealed the positive significance of the PEOU affect on behavioral intention (BI) to use the IT system.

Altay & Okumus, 2021 confirmed a direct relationship between PEOU and BI to investigate the acceptance of trip-planning apps in Turkey by their citizen. Therefore, this research proposed the following hypotheses:

H18: PEOU has a direct positive influence on real estate agents' BI of ICT.

2.13.3 Behavioral Intention (BI)

The significance of BI arises from various theories and models, such as TRA (Fishbein & Ajzen, 1975), TPB (Ajzen, 1985), the TAM (Davis et al., 1989), the TAM2 (Venkatesh & Davis, 2000), the model of PEOU determinants (Venkatesh, 2000), and the TAM3 (Venkatesh & Bala, 2008). Behavioral intention can be defined as an individual's aim or plan to perform the behavior (Fishbein & Ajzen, 1975). In the context of this research, BI refers to the real estate agents' aim or plan to use ICT in practice. According to technology-acceptance theories, including TRA, TPB, the TAM, TAM2, TAM3, and the model of PEOU determinants, BI is the only predictor of acceptance (ACC) and provides evidence of the person's willingness to use the technology. In the TAM (Davis, Bagozzi, & Warshaw, 1989), the actual use of a technology is influenced by a person's intention to use this technology, which is predicted by PEOU and PU. In the context of technology in the real estate field, (Dieck & Jung, 2015; Ullah et al.,2019; Park & Park, 2020; Al-Husamiyah & Al-Bashayreh, 2021) found that the relationship between BI and Acceptance (ACC) is the strongest of the relationships in their model. In this research, it is expected

that the real estate agents' behavioral intention to use ICT contributes to their acceptance of the ICT. Therefore, this research proposed the following hypotheses:

H19: BI has a direct positive influence on real estate agents' ACC of ICT.

2.14 Research Conceptual Model

A conceptual model is the plan of the researcher on how the research problem will have to be addressed and explored through the research. It is founded on a theoretical model after the researcher has conducted a careful review of the literature on theories and has a clear picture of the variables of the research. The conceptual model of this research is depicted in Figure 2.17 and includes two main parts. The first part consists of external variables that might influence real estate agents use of ICT. According to Davis et al., 1989, those variables are the external variables of the TAM, which precede the perceived ease of use and perceived usefulness constructs. For this research, the nine variables proposed based on the most frequent variables used in previous studies in the field of real estate, were integrated into the model: TSE, FC, INNO, TRU, ENJ, SI, PC, SERQ, and INQ. The second part of the model comprises the four constructs of the TAM: perceived usefulness (PU), perceived ease of use (PEOU), behavioral intention (BI), and acceptance (ACC). The conceptual model will be tested using a method of survey. The findings of the research can be used to improve the design and implementation of ICT acceptance for real estate agents and increase the likelihood of ICT adoption in the industry.

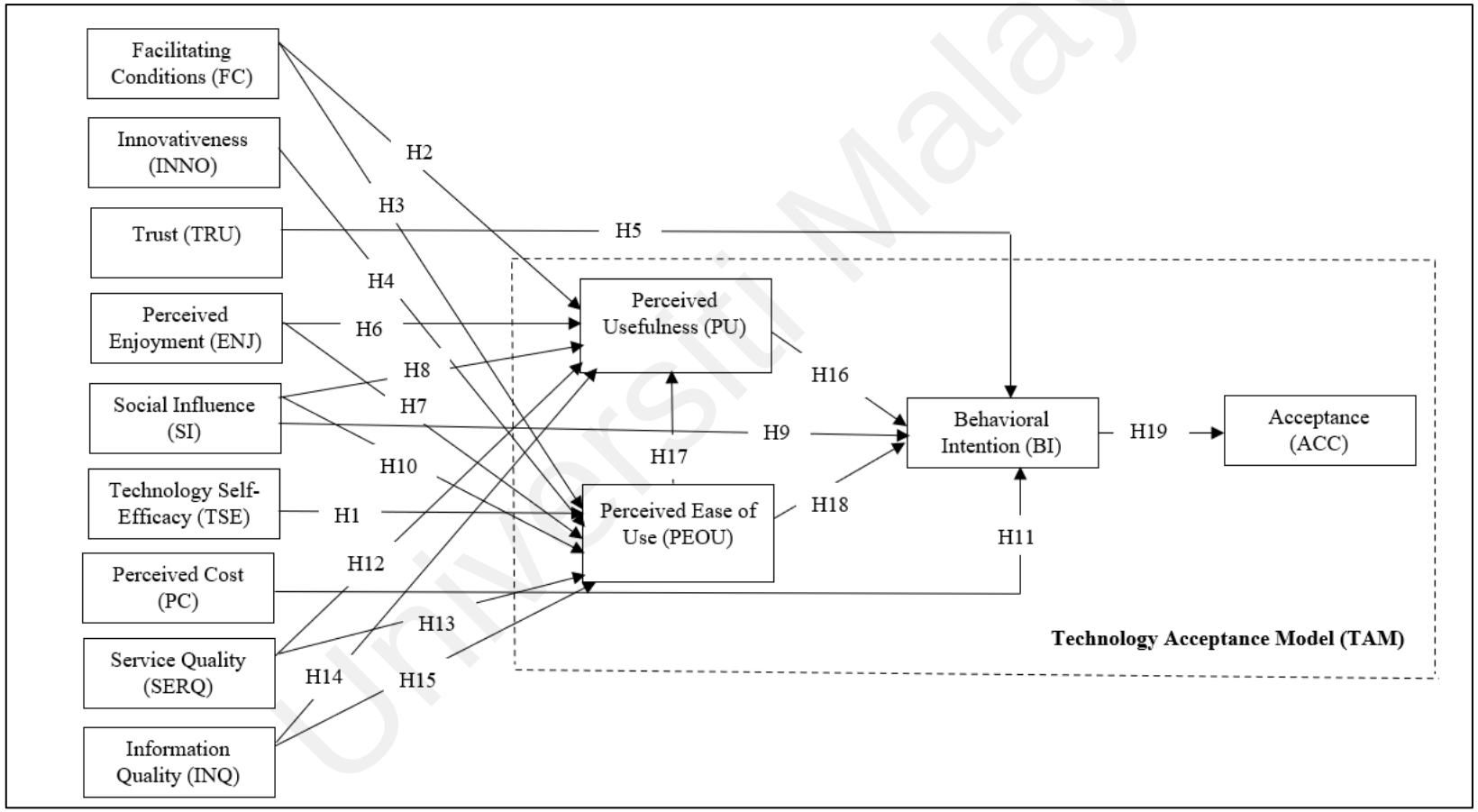


Figure 2.17: The proposed conceptual model
Source: Researcher, 2022

2.15 Chapter Summary

This chapter provides a comprehensive literature review, starting with an overview of the current real estate market, emphasizing the transformative role of ICT in industry practices. It highlights how technological advancements have significantly impacted the operations and efficiency of real estate agents. The focus then shifts to the Klang Valley in Malaysia, analyzing the regional market dynamics and underscoring the economic performance of the real estate sector. The chapter illustrates how ICT tools have become integral to the growth and development of real estate in this area

Next, the chapter focus into the real estate agent profession in Malaysia, offering insights into the different types of agents and their roles within the industry. It explores the practical aspects of real estate agent activities, detailing how they handle sub-sale and new properties, as well as rental and lease management. This section bridges the gap between theoretical understanding and real-world application by demonstrating how ICT tools are employed in these activities.

The chapter then analyzes the typology of technology in real estate, describing various technological tools used by agents. This includes cloud computing, drones, virtual and augmented reality, online platforms, social media, and mobile applications. It provides a comprehensive overview of the range of tools available and their specific applications in the real estate context.

The core of the chapter examines the development of technology acceptance theories and their extensions, establishing a theoretical framework for understanding the factors that influence ICT acceptance among real estate agents. It justifies the selection of the

Technology Acceptance Model (TAM) as the guiding theory for the research, emphasizing its relevance and applicability to the real estate context.

Finally, the chapter extensively discusses the factors influencing ICT acceptance, including Technology Self-Efficacy, Trust, Perceived Enjoyment, Social Influence, and more. It concludes by presenting a conceptual model that integrates the reviewed theories and factors, serving as the basis for the empirical investigation in this research. This conceptual model aims to provide a comprehensive understanding of ICT adoption in the real estate sector, particularly within the Malaysian context. The following chapter will explain how the research will be conducted to answer the research objectives of this research.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

Research methodology refers to the theory of how research should be conducted, including the theoretical and philosophical assumptions upon which research is based (Saunders et al., 2019). Research methodology also involves the format of data collection and techniques of data analysis that researchers propose in research (Creswell, 2014). Therefore, this chapter presents a methodological outline of this research which explains the process and methods applied to achieve the research objective and aim. The procedure involved will be explained using the research onion (Saunders et al., 2019) including philosophy, approach to theory development, methodological choice, strategies, time horizon, and techniques and procedures.

3.2 Research Design

Research design is the overall structure and orientation of an investigation which consists of the techniques or procedures for collecting and analyzing data to answer research questions and eventually achieve the research objective (Bell et al., 2022). Research design should be consistent with the research philosophy and comprise judgment on the strategies, sampling choice, data collection, and data analysis (Saunders et al., 2019).

They also mentioned that to design research, the researcher must have a clear picture of their research purpose, which has a clear link with the research question. Besides that, the process of answering the research question would be influenced by research philosophy and approach (Saunders et al., 2019). The selection of a research design in a study is influenced by several key factors, primarily centered around the research question and

practical considerations. Quantitative research design in the social sciences is characterized by its systematic approach to data collection and numerical data measurement, aiming to quantify social phenomena and establish relationships between variables. This methodology typically involves large sample sizes to enable generalization of findings to broader populations, and it often employs control groups to minimize bias and enhance the reliability of results (Price & Lovell, 2018).

Key features of a robust quantitative research design include neutrality, reliability, validity, and the ability to generalize findings, which are essential for producing accurate and unbiased insights. Quantitative research designs are organized in a hierarchy of evidence, ranging from descriptive designs like cross-sectional studies to more rigorous experimental designs such as randomized controlled trials (RCTs), which are considered the gold standard for testing causal relationships (Price & Lovell, 2018). The design process involves careful consideration of sampling methods, ensuring both internal and external validity, which are crucial for the applicability of the study's findings to other settings (Saunders et al., 2019).

Additionally, quantitative research often utilizes primary data collection methods, such as surveys and questionnaires, which are particularly prevalent in fields like economics and finance. The methodology is underpinned by a positivist paradigm, emphasizing measurement, causality, generalization, and replication, although it faces criticism for potentially oversimplifying the complexity of social phenomena (Bell et al., 2022). Despite these criticisms, quantitative research remains a preferred approach for many researchers due to its ability to provide clear, measurable insights into social behaviors and attitudes, thereby contributing significantly to the development of knowledge in the social sciences (Turyahikayo, 2021). Figure 3.1 depicts the quantitative research design of this research.

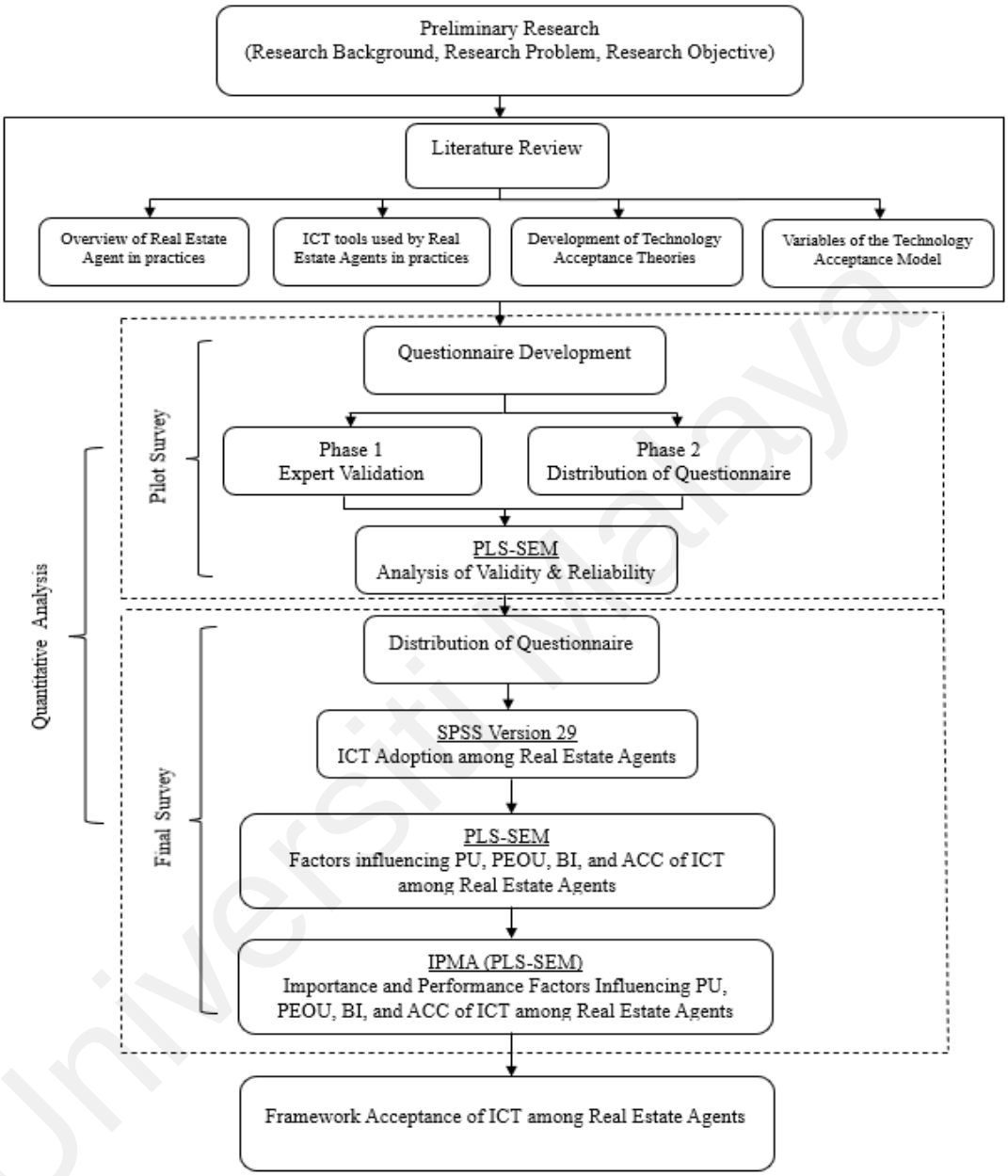


Figure 3.1: Research Design of This Research.
Source: Researcher, 2022

3.3 Research Philosophy

Research philosophy is a foundational aspect of academic inquiry that encompasses the underlying beliefs and assumptions about the nature of knowledge, reality, and the methods used to acquire understanding. Researchers must articulate their philosophical stance as it influences the design, methodology, and interpretation of their research findings. The evolution of research philosophy has been shaped by various philosophical paradigms, including positivism, interpretivism, pragmatism, and realism, each offering distinct perspectives on how knowledge is constructed and understood. Positivism, for instance, is rooted in the belief that knowledge is objective and can be measured quantitatively, often through empirical observation and statistical analysis (Saunders et al., 2019).

Interpretivism, on the other hand, posits that reality is socially constructed and subjective, advocating for qualitative methods that explore the meanings and interpretations individuals ascribe to their experiences. This paradigm is valuable in understanding the socio-cultural contexts and the nuanced nature of human behavior, though it faces criticism for potential biases and the challenge of generalizability (Junjie & Yingxin, 2022). Pragmatism bridges the gap between positivism and interpretivism by focusing on the practical application of research findings and the value of actions that lead to desired outcomes. It is action-oriented and flexible, allowing researchers to use both qualitative and quantitative methods as needed, though it may sometimes prioritize personal over organizational values (Turyahikayo, 2021). Realism, particularly critical realism, acknowledges the existence of an objective reality while recognizing that our understanding of it is mediated by social and cultural contexts. It seeks to integrate

empirical rigor with interpretive depth, making it suitable for interdisciplinary research that requires a comprehensive understanding of complex issues (Collis & Hussey, 2009). This research adopted **positivism** because it is a research philosophy that emphasizes the use of objective methods to collect and analyse data. Positivists believe that there is a single, objective reality that can be understood through scientific inquiry. Positivism researches to understand patterns in human activities and to make predictions using methods to identify, measure, and state accurately relationships among the variables being studied in a phenomenon. Positivist research forms a hypothesis about the relationship between variables in the study and tests the relationship on subjects randomly selected from a target population. The result obtained from the sample, after undergoing rigorous statistical analysis, will then be generalised to all subjects in that population (Sauders et al., 2019).

The positivist research process begins with the identification of a research problem. The researcher then develops a research question or hypothesis. The research question or hypothesis is a statement about the relationship between two or more variables. The researcher then collects data to test the research question or hypothesis. The data is collected using objective methods, such as surveys, experiments, and observations. The data is then analyzed using statistical analysis. The results of the analysis are used to conclude the research question or hypothesis.

3.4 Research Approach

According to Saunders et al. (2019), there are three primary approaches to theory development: abduction, deduction, and induction. This research adopted a **deductive approach**, specifically testing existing theory. From a positivist perspective, research often leans towards deductive reasoning (Holden & Lynch, 2004). More precisely, this

research followed the hypothetico-deductive method, a seven-step research process that involves: 1. identifying a broad problem area, 2. defining the problem statement, 3. hypotheses development, 4. determining measures, 5. data collection, 6. data analysis, and 7. data interpretation (Bougie & Sekaran, 2019).

3.5 Methodological Choice

Johnson & Christensen, (2019) categorized methodological choices into three major options namely; 1. mono method, 2. multiple-method and 3. mixed method. Each option can be further classified into quantitative and qualitative mono-methods, quantitative and qualitative multiple-methods, as well as simple and complex mixed methods. In the context of this research, **a mono-method quantitative** is considered adequate to answer the posited research questions and fulfill the proposed research objectives. Mono method means using a single data collection technique and corresponding analysis procedures.

3.6 Purpose of Research

Studies that aim to establish causal relationships between variables can be called explanatory research (Johnson & Christensen, 2019). **Explanatory research** is used for this research because it is a type of research that aims to understand the relationships between variables.

3.7 Research Strategy

Quantitative research can be conducted using three primary strategies: experiments, archival research, and surveys (Creswell & Creswell, 2018). This research employed a survey strategy with a **mono-method data collection approach**. Surveys are often

associated with deductive research and are common in business and management research (Saunders et al., 2019). They are also widely considered quantitative and positivistic (De Vaus, 2002), aligning with this research's philosophical stance and theory development approach. Survey data can be utilized to suggest potential explanations for relationships between variables and to construct models of these relationships, which directly reflects the purpose of this research.

3.8 Time Horizon

The time horizon of a research research refers to its timeframe, which is determined by the research objectives. There are two primary time horizons: cross-sectional and longitudinal studies (Saunders et al., 2019). A cross-sectional research involves collecting data at a single point in time to answer research questions. In contrast, a longitudinal research collects data from the same sample at multiple time points to examine changes or developments over an extended period (Bryman, 2012; Sekaran & Bougie, 2016).

This research employed a **cross-sectional design**, collecting data from respondents at one specific point in time. This approach was chosen because the research questions focused on causal relationships, where the element of time change was deemed irrelevant and unlikely to significantly affect the findings (Chua, 2014; Creswell & Creswell, 2018). Additionally, cross-sectional surveys are often preferred as they facilitate the collection of representative samples, meaning the sample closely resembles the characteristics of the larger population, thus enhancing the generalizability of the results.

3.9 Unit of Analysis

The unit of analysis refers to the "what" or "who" being studied to answer the research questions. It can include individuals, groups (e.g., families, friendship groups), organizations (e.g., corporations, companies), countries, or technologies (Johnson & Christensen, 2019; Saunders et al., 2019).

In this explanatory research, the unit of analysis is **individual real estate agents** working in Klang Valley, Malaysia. The data was gathered from various professionals in the real estate sector, including registered valuers, registered estate agents, probationary valuers, probationary estate agents, and real estate negotiators.

3.10 Population and Sampling

The population can be defined as the target group that is going to be studied or entire group which will be studied (Piaw, 2020). The population for this research is registered valuers, registered estate agents, probationary valuers, probationary estate agents, and real estate negotiators. The active numbers of population in Klang Valley according to the Board of Valuers, Appraisers, Estate Agents and Property Managers (BOVAEP), in the year 2022, in Table 3.1:

Table 3.1: Total Registered Valuers, Registered Estate Agents, Probationary Valuers, Probationary Estate Agents, and Real Estate Negotiators In Klang Valley, Malaysia. Source: BOVAEP, 2022

Designation	Total Number
Registered Valuers	57
Registered Estate Agents	275
Probationary Valuers	314
Probationary Estate Agents	431

Real Estate Negotiators	4,213
Total	5,290

The number of respondents in the population of 5,290 is difficult to achieve. Thus, random sampling is important as the sample chosen randomly from a population will represent the population being studied. Sampling is the process of selecting a number of subjects from a population as research respondents (Piaw, 2020). Sampling is done to make sure that the subjects selected as samples should represent as close as possible to the characteristics of all subjects in the population as a whole (Awang, 2012). This research referred to Krejcie and Morgan (1970) to identify the number of samples.

To get the accurate number of samplings, the following formula was applied:

$s = X^2 NP(1-P) \div d^2 (N-1) + X^2 P (1- P)$

where;

s = sample size.

X^2 = at 95% confidence level with 1 degree of freedom the chi-square value is 3.841.

P = the population proportion is assumed to be 0.5 (the maximum sample size).

d = at 95% confidence level, the margin of error is 0.05.

N = total population.

$s = X^2 NP(1-P) \div d^2 (N-1) + X^2 P(1- P)$

$s = 3.841*5290*0.5*0.5 \div ((0.05)^2* (5290-1)) + (3.841*0.5*0.5)$

$s = 5{,}079.7225 \div 13.2225 + 0.96025$

$s = 5{,}079.7225 \div 14.18275$

$s = 358.2$

s = 358 respondents

The sample required for this research from the population of 5,290 is 358 respondents.

3.11 Sampling and Actual Data Collection Procedure

This research employed probability sampling, specifically a simple random sampling technique. Probability sampling involves randomly selecting a sample that is representative of the research population (Awang, 2012). Random sampling ensures that all subjects have equal chances of being selected as respondents (Piaw, 2020). In this research, simple random sampling ensures that every real estate agent in Klang Valley has an equal chance of being selected, reducing the risk of bias in the sample. The sample size for this research was 358 respondents.

However, to ensure result reliability, this research will collect a larger sample size, exceeding the 358 respondents. Therefore, the data collection process has been carefully planned to obtain a representative sample of respondents from selected firms in the 14 major cities of the Klang Valley: Gombak, Selayang, Setapak, Shah Alam, Klang, Petaling Jaya, Subang Jaya, Damansara, Puchong, Kuala Lumpur City Centre, Mont Kiara, Ampang, Bangsar, and Putrajaya. A random sampling procedure will select three firms from each city, with ten respondents targeted from each chosen firm. This will result in a total of 400 respondents, exceeding the required sample size of 358 by 17%. This surplus serves as a contingency in case some samples are incomplete or unresponsive.

This research employed a self-administered questionnaire, wherein respondents answered a set of questions independently. The questionnaires were distributed personally by the researcher, who visited the offices of the respondents. This method involved the researcher traveling to various firms in the 14 major cities of the Klang Valley, ensuring direct interaction with the respondents and accurate delivery of the questionnaires.

The survey was shared with respondents via a QR code, sent through WhatsApp, and hardcopy surveys were available for those who preferred them. Data collection occurred over four months, from September 1 to December 31, 2022. Respondents who completed the survey on the spot received a token of appreciation, while others answered during their free time. In total, 412 surveys were collected. Twelve surveys were removed due to incomplete responses. No rejections occurred during the data collection process, as the researcher, acting in their capacity as a lecturer, received full cooperation from all respondents.

3.12 Instrumentation

Instrumentation refers to instruments and procedures used in collecting data in a research (Fraenkel et al., 2012). Thus, this section narrates the following procedures:

1. Design and development of the survey questionnaires
2. Pre-testing the survey questionnaires, and
3. Data collection of actual survey

3.12.1 Questionnaire Development

This study used a self-administered questionnaire as the instrument for data collection. The self-administered questionnaire is a survey instrument in which each respondent reads and answers the same set of questions in a pre-determined order without the presence of the researcher (Saunders et al., 2016). A survey strategy using a self-administered questionnaire is popular as it enables the collection of standardized data from a sizeable population in a highly economical way, allowing easy comparison (Saunders et al., 2016). It is relatively inexpensive and can be administered by the researcher alone (or with only a few assistants) (Fraenkel et al., 2012). A single researcher can administer this type of survey at a very low cost while covering a wide geographical area (Neuman, 2014).

To serve as an effective data collection instrument, a self-administered questionnaire needs to be carefully designed. This is especially important when the response rate, reliability, and validity of the data is affected by the design of questionnaires (Saunders et al., 2016). Hence, various aspects were considered in designing the questionnaires including choice of words, sequence of the questions and the scale selection. The

questionnaire form was designed into six separate sections (Section 1 to Section 6). Each section was intended to measure a specific content (variable) that is either adapted or developed from several related studies. This design technique is called "proximal separation" and was recommended by Podsakoff, MacKenzie, and Podsakoff (2012) to prevent the possibility of common method bias (CMB) occurrence.

Meanwhile, survey methodologists recommended five to seven scale points for either Likert or interval-type scales to capture more valid and reliable respondents' perceptions compared to shorter or longer points (Krosnick & Fabrigar, 1997; Meyers, Gamst, & Guarino, 2017). Table 3.2 summarised of questionnaire design.

Table 3.2: Questionnaire Design

Section	Configuration	Indicators	Measurement units
1	Respondent's background	Gender, Age, Education level, Professional qualification, Professional license number, Years of practices, Location of agency's office, Size of agency	Categorical Scale & Ordinal Scale
2	ICT Instrument	12 questions	5 Likert scale: (5) Every time to (1) Never
3	Factors influence acceptance of ICT	9 construct & 45 item	5 Likert scale: (5) Strongly agree to (1) Strongly disagree
4	Attitude	3 construct and 15 item	5 Likert scale: (5) Strongly agree to (1) Strongly disagree
5	Acceptance of ICT	1 construct and 3 item	5 Likert scale: (5) Strongly agree to (1) Strongly disagree
6	Suggestion, motivates and prevent from using ICT	3 questions	Open-ended question

3.12.2 Expert Validation

Evaluations by a panel of experts are intended to produce evidence of content validity. Content validity refers to the degree to which an instrument logically appears to measure an intended variable (Fraenkel et al., 2012). As advocated in the literature (Carpenter,

2018; Fisher, 2020), this study nominated individuals who would be appropriate "experts." Three experts were chosen from academia, and two were chosen from industry (see Table 3.3). The feedback provided by both groups of experts is summarized in Table 3.4. The following criteria were used for the selection of experts:

For Academician

1. Participants must have at least 5 years of experience in conducting research in the field of real estate practices.
2. Participants must have expertise in survey methodology and be able to offer credible advice on collecting accurate data to answer the research questions.

For Industry Expert

1. Participants must have more than 15 years of working experience in the industry.
2. Participants must be registered valuers or registered estate agents.

Table 3.3: Member of the Panel of Experts

Name	Position of Expert
Academician	
DAF	Senior lecturer at Universiti Malaya (UM)
DHI	Senior lecturer at Universiti Teknologi Mara (UiTM)
DZM	Senior lecturer at Universiti Teknologi Malaysia (UTM)
Industrial Expert	
SAC	A Registered Valuer, Estate Agent and Property Manager with more than 15 years in real estate industry.
SSA	A Registered Valuer, Estate Agent and Property Manager with more than 15 years in real estate industry.

Table 3.4: Summaries of Comments and Suggestion from Experts

Section	Expert comment
General information	● Request respondent to fill in his age instead of researcher grouping it like 18-24, 25-34, 35-44, 45-54, 55-64, and 65 and above. ● Please specify the district in Selangor that is considered part of the Klang Valley area. ● It is important to thank survey respondents at the end of the survey. ● If possible, please include professional licenses to ensure that the research is answered by the correct respondent.
ICT instrument	● All are appropriate and covering the ICT instrument ● Suggest adding a section below to ask respondents what limits them from using ICT.
Factors influence acceptance of ICT	● Grouping variable into three categories: factors, attitude and acceptance ● Change SI (6.1) to change “friends” to “colleagues” ● Change SI (6.5) to change “company” to “organization”
Attitude	● BI (3.2) to change “assume” to “predict”
Acceptance of ICT	● Appropriate questions
Suggestion	● Question 2 to change “encourage” to “motivates” ● To add another question “what prevents you from using ICT”

3.12.3 Pilot Study

A pilot study was conducted to determine the clarity of the questionnaires and to test the internal reliability of the measures. Pilot data for this research were collected using self-administered questionnaires distributed to 12 Real Estate Agencies and Valuation Firms in Klang Valley. The survey ran for 30 days, from July 10 to August 10, 2022. Emory and Cooper (1991) suggest that 25 to 100 respondents are appropriate for a pilot research. Of the surveys sent, 92 were returned after close follow-up. Five questionnaires were removed from further analysis due to incomplete responses. A copy of the pilot survey is enclosed in Appendix A.

3.12.3.1 Pilot Study Result

In this research, the instrument is a crucial data collection tool. A pilot study is necessary to evaluate the instrument's coherence and respondents' comprehension of each indicator to prevent collecting meaningless data. Additionally, it shows that the instrument is dependable and valid in the context of the research. The next subtopic will go into a detail on the data analysis method. Smart-PLS will be used for data analysis in the pilot research, which will only include measurement model analysis to assess the instrument's reliability and validity. The researcher will make a decision about whether to revise or retain the indicators for the actual data collection based on the outcomes of the pilot research. Therefore, significant statistical evidence is required to support the justification.

1) Respondents Background

The result in Table 3.5 reveals, the majority of the respondents are male (60.07%), while a smaller percentage are female (37.93%). Generation Y (43-57 years old) and Generation

Z (10-27 years old) each account for a substantial portion of the respondents, with 40.23% and 37.93%, respectively. Notably, Generation X (43-57 years old) is also represented at 18.39%. However, the Silent Generation and Baby Boomers are not represented in this sample. These findings suggest a diverse range of age groups participating, with a significant presence of younger generations.

In terms of professional qualifications, the respondents hold various qualifications in the real estate field. Probationary Valuers and Real Estate Negotiators each constitute 29.89% of the respondents, while Registered Valuers, Estate Agents & Property Managers account for 10.34%. Registered Estate Agents and Probationary Estate Agents represent 8.05% and 21.84%, respectively.

Regarding their years of experience in the real estate field, the data reveals that those with between 5-10 years of experience make up the largest group at 39.07%. Approximately 32.18% have less than 5 years of experience, and 28.75% have more than 10 years of experience. Additionally, the majority of respondents (55.56%) work in agencies with more than 30 personnel. Smaller percentages work in agencies with 1-10, 11-20, or 21-30 personnel, at 18.52%, 11.11%, and 14.81%, respectively.

Furthermore, respondents have varying educational backgrounds. A significant proportion (43.68%) hold a diploma, while 31.04% have a bachelor's degree. Approximately 17.24% possess a master's degree, and 4.60% hold a Ph.D. Notably, no respondents reported having only a high school education, while a small percentage (3.44%) hold an SPM qualification. Lastly, the respondents' offices are located in different areas, with the majority in Kuala Lumpur (44.44%) and Selangor (48.15%). A smaller percentage of offices are situated in Putrajaya (7.41%).

Table 3.5: Results of Respondent's Background

Respondent profile	Response percent	Responses
Gender		
Female	37.93%	33
Male	60.07%	54
Answered	100.00%	87
Age		
The Silent Generation (77-97 years old)	0%	0
Baby Boomer (58-76 years old)	3.45%	3
Generation X (43-57 years old)	18.39%	16
Generation Y (43-57 years old)	40.23%	35
Generation Z (10-27 years old)	37.93%	33
Answered	100.00%	87
Professional qualification		
Registered Valuer, Estate Agent & Property Manager	10.34%	9
Registered Estate Agent	8.05%	7
Probationary Valuer	29.89%	26
Probationary Estate Agent	21.84%	19
Real Estate Negotiator	29.89%	26
Answered	100.00%	87
Years of practices		
Less than 5 years	32.18%	28
Between 5- 10 years	39.07%	34
More than 10 years	28.75%	25
Answered	100.00%	87
Agency size		
1 – 10 personnel	18.52	16
11 – 20 personnel	11.11%	10
21 – 30 personnel	14.81%	13
More than 30 personnel	55.56%	48
Answered	100.00%	87

Table 3.5, Continued

Respondent profile	Response percent	Responses
Qualification level		
High School	0.0%	0
SPM	3.44%	3
STPM	0.0%	0
Diploma	43.68%	38
Bachelor's Degree	31.04%	27
Master's Degree	17.24%	15
PhD	4.60%	4
Answered	100.00%	87
Location of office		
Kuala Lumpur	44.44%	12
Selangor	48.15%	13
Putrajaya	7.41%	2
Answered	100.00%	87

2) ICT used in practices

The result in Table 3.6 reveals distinct patterns in the usage of ICT tools among the 87 real estate agents surveyed. Mobile instant messaging (89.66%), real estate agents' websites (81.61%), and social media (72.41%) emerged as the most frequently used ICT tools, with the majority of agents using them regularly. This suggests that these tools play a crucial role in real estate agents' daily operations and communication strategies.

Third-party websites (52.87%), and mobile mortgage calculator apps (31.03%) were also used frequently by a significant portion of the agents. These findings highlight the importance of these tools in facilitating property searches, providing mortgage information, and connecting with potential clients.

In contrast, drones (2.30%), virtual reality (2.30%), augmented reality (0%), robotic process automation (RPA) (0%), and metaverse real estate (0%) were used less frequently use to never used, with a majority of agents using them rarely or never. This suggests that these technologies may not be as essential for the daily activities or professional endeavors of real estate agents.

The findings indicate that certain ICT tools, such as mobile instant messaging, social media, real estate agents' websites, third-party websites, and mobile map apps, are more widely used than others, potentially reflecting their perceived importance or relevance in the real estate industry. These tools enable agents to connect with potential clients, showcase their properties, and streamline their business processes. While drones, virtual reality, augmented reality, robotic process automation, and metaverse real estate may not be as prevalent in current real estate practices, their potential benefits should not be overlooked. As technology continues to evolve, it is possible that these tools may gain wider adoption in the real estate industry in the future.

Table 3.6: Results of ICT used by the Respondents

Type of ICT	Never		Rarely, in less than 30% of the chances when I could have		Occasionally, in about 50% of the chances when I could have		Frequently, in about 70% of the chances when I could have		Everytime		Total	Mean	Std. Deviation
	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency			
Clouds	2.30%	2	2.30%	2	4.6%	4	42.53%	37	48.28%	42	87	4.45	0.803
Drones	21.84%	19	19.54%	17	37.9%	33	18.39%	16	2.30%	2	87	2.48	1.077
Virtual Reality	82.76%	72	11.49%	10	2.3%	2	1.15%	1	2.30%	2	87	1.09	0.291
Augmented Reality	89.66%	78	6.90%	6	3.4%	3	0.00%	0	0.00%	0	87	1.06	0.234
Real Estate Agent's website	3.45%	3	2.30%	2	1.1%	1	11.49%	10	81.61%	71	87	4.79	0.631
Third-party website	1.15%	1	8.05%	7	19.5%	17	18.39%	16	52.87%	46	87	4.26	1.062
Mobile Instant Messaging	3.45%	3	0.00%	0	0.0%	0	6.90%	6	89.66%	78	87	4.95	0.211
Social Media	0.00%	0	1.15%	1	2.3%	2	24.14%	21	72.41%	63	87	4.77	0.543
Mobile Video Apps	5.75%	5	20.69%	18	28.7%	25	20.69%	18	24.14%	21	87	3.99	1.136
Mobile Mortgage Calculator Apps	8.05%	7	16.09%	14	13.8%	12	31.03%	27	31.03%	27	87	3.98	1.131
Robotic Process Automation (RPA)	100.00%	87	0.00%	0	0.0%	0	0.00%	0	0.00%	0	87	1.01	0.107
Metaverse Real Estate	100.00%	87	0.00%	0	0.0%	0	0.00%	0	0.00%	0	87	1.01	0.107

3) Measurement Model Analysis

The pilot study's outcomes were assessed using the Smart-PLS tool, chosen for its suitability in analyzing non-parametric data, particularly in the context of two distinct phases: the examination of the measurement model and the structural model. However, it is important to note that the primary objective of the pilot study was to evaluate the reliability and validity of the research instrument, focusing on metrics such as Cronbach's Alpha, Composite Reliability, and Average Variance Extracted. As a result, the secondary phase of structural model analysis was deemed unnecessary at this juncture. The measurement model analysis for this research involves Outer loadings, Reliability testing (Indicator and Internal Consistency) and Validity testing (Convergent and Discriminant).

Outer loadings are important to test at this stage as to quantify the strength of the relationship between each observed indicator and its respective latent construct. Outer loadings are usually presented in the measurement model, and they help determine how well the observed variables represent the latent construct. High outer loadings indicate that an indicator is a good representation of the construct, while low loadings suggest that the indicator may not be a strong representation of the construct. (Hair et al., 2017) recommended that the indicators' reliability is achieved when the outer loading of each indicator is above 0.7.

Table 3.7: Results of Reliability and Validity of Indicators

Indicators	Outer loadings >0.7	Cronbach's alpha >0.7	Composite reliability >0.7	Average variance extracted (AVE) >0.5
ACC1	0.934	0.943	0.964	0.898
ACC2	0.967			
ACC3	0.942			
BI1	0.957	0.921	0.944	0.811
BI2	0.957			
BI3	0.764			
BI4	0.909			
ENJ1	0.888	0.9	0.927	0.719
ENJ2	0.916			
ENJ3	0.912			
ENJ4	0.795			
ENJ6	0.710			
FC1	0.834	0.806	0.886	0.721
FC2	0.892			
FC3	0.819			
INNO1	0.931	0.937	0.952	0.798
INNO2	0.917			
INNO3	0.873			
INNO4	0.860			
INNO5	0.882			
INQ1	0.822	0.903	0.928	0.722
INQ2	0.869			
INQ3	0.836			
INQ4	0.891			
INQ5	0.828			
PEOU1	0.767	0.877	0.911	0.671
PEOU3	0.800			
PEOU4	0.841			
PEOU5	0.890			
PEOU6	0.793			

Table 3.7, Continued

Indicators	Outer loadings >0.7	Cronbach's alpha >0.7	Composite reliability >0.7	Average variance extracted (AVE) >0.5
PU1	0.903	0.951	0.962	0.835
PU2	0.927			
PU3	0.942			
PU4	0.923			
PU5	0.872			
SERQ1	0.912	0.933	0.948	0.752
SERQ2	0.886			
SERQ4	0.950			
SERQ5	0.865			
SERQ6	0.822			
SERQ7	0.756			
TRU1	0.954	0.93	0.955	0.877
TRU2	0.894			
TRU3	0.959			
TSE2	0.765	0.796	0.867	0.621
TSE3	0.792			
TSE4	0.875			
TSE5	0.712			

Using the PLS algorithm with 5,000 iterations, the results presented in Table 3.7 demonstrate that all indicators are reliable, except for the constructs FC4, SI1, SI2, SI3, SI4, SI5, TSE1, TSE6, ENJ5, PC1, PC2, PC3, PEOU2, SERQ3, SERQ8, which were deleted because the factor loading indicators were less than 0.7. As a result, 11 constructs were used for the final survey (see Figure 3.2). A copy of final survey was enclosed in Appendix B.

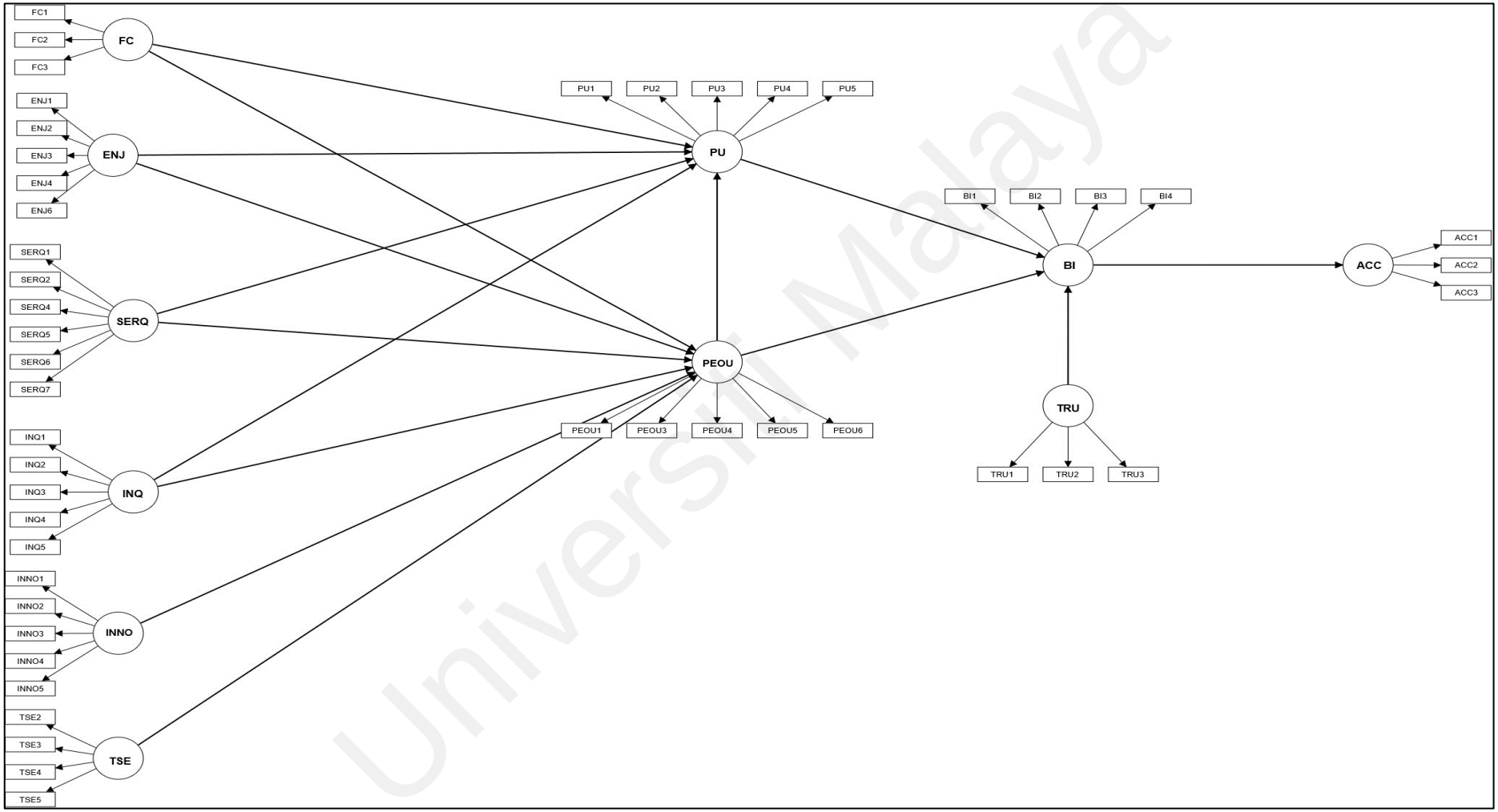


Figure 3.2: Constructs Used for Final Survey

3.13 Data Analysis Techniques

There are two types of data analysis techniques used in the present research. The first technique used was descriptive statistics to describe the basic characteristics of the research data in a meaningful manner. In addition, partial least square structural equation modelling (PLS-SEM) was used to answer all posited research questions.

3.13.1 Descriptive Statistics

Descriptive statistics, such as frequencies, the mean, and the standard deviation, are general types of simple statistics used to describe basic patterns in the research dataset (Sekaran & Bougie, 2016). To describe respondents' demographics using numerical indices, frequency analysis was employed for this research using IBM SPSS version 26. In addition, descriptive analysis was performed to compute basic central tendency indices such as mean and standard deviation for every variable observed in the present research.

3.13.2 Partial Least Squares Structural Equation Modelling

Structural equation modelling is an extension of the first-generation multivariate analysis techniques, such as regression, factor analysis, and discriminant analysis, and allows a simultaneous testing of relationships between independent and dependent variables (Hair et al., 2010; Ramayah et al., 2018). The approach can be applied through one of two methods: First, covariance-based structural equation modelling (CB-SEM) using software packages such as AMOS and LISREL; and second, PLS-SEM (or PLS path modelling) using software packages such as SmartPLS and PLS-Graph. Although both

methods share the same primary objective – to examine the relationships between constructs – they differ statistically when testing the measurement model (Sarstedt, Hair, Ringle, Thiele, & Gudergan, 2016). The CB-SEM approach estimates the variance-covariance matrix; whereas, PLS-SEM explains the variance of an unobserved dependent variable (Henseler, Hubona, & Ray, 2017; Hair, Hult, Ringle, & Sarstedt, 2017; Hair, Ringle, & Sarstedt, 2011). It is evident from Table 3.8 that the weaknesses of CB-SEM are the strengths of PLS-SEM, and vice versa. Therefore, researchers should not perceive the two techniques as being competitive, but as complementary (Hair, Ringle, & Sarstedt, 2011).

Table 3.8: The Differences between CB-SEM and PLS-SEM
Source: Hair et al., 2017

Criteria	CB-SEM	PLS-SEM
Research goal	Confirm or compare theories	Develop or extend an existing theory or identify key drivers
Formative indicators	Difficult to examine	Supported
Sample size	Large sample size	Relatively small sample size
Data distribution	Normal distribution assumed	Normal distribution not assumed
Complex model	Supported	Perform better
Recursive model	Supported	Not supported

Following other studies (Ullah et al., 2021; Adegoke & Oladokun, 2020; Taherdoost, 2018; Sepasgozar et al., 2019; Park & Park; 2020, Do et al., 2020; Akram et al., 2021) utilizing the PLS-SEM technique using SmartPLS to analyse the collected data for the following reasons.

1. *Widely adopted*: PLS-SEM has been widely employed in many fields, such as marketing (Miandari et al., 2021; Apasrawirote & Yawised, 2022), tourism

(Dick & Jung, 2015; Altay & Okumus, 2021), social sciences (Vertijika, 2020 & Puspita & Kusumawati, 2019; Chawla & Josi, 2021), and education (Yu Mo et al., 2021; Al-Sabawti et al., 2018; Ngabiyanto et al., 2021; Jing et al., 2021).

2. *Research objective*: CB-SEM is more convenient when the primary objective of the research is to confirm a pre-developed theory, compare theories, or test goodness-of-fit criteria; whereas, PLS-SEM is more convenient when the primary objective of the research is to extend an existing theory or identify key drivers (Hair et al., 2017; Lowry & Gaskin, 2014; Hair et al., 2012), which is the objective of this research.
3. *Focused model*: The model developed for this research is considered a 'focused model' because the number of independent variables is twice the number of dependent variables, which is more appropriate for the prediction goal of PLS-SEM (Hair, Sarstedt, Ringle, & Mena, 2012). However, an 'unfocused model', in which the number of dependent variables is twice the number of independent variables, is more appropriate for the confirmation goal of CB-SEM (Hair, Sarstedt, Ringle, & Mena, 2012).

To summarize, neither of the two techniques (CB-SEM and PLS-SEM) is superior, and the selection of the appropriate method is dependent on the aim of the research (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014; Hair, Sarstedt, Ringle, & Mena, 2012; Sarstedt, Ringle, & Hair, 2017). Nevertheless, when the sample is large (such as N=250) and a proper number of measures is used, both techniques produce similar results (Hair, Hult, Ringle, & Sarstedt, 2017). Several empirical studies (Nam, Kim, & Jin, 2018; Amaro, Abrantes, & Seabra, 2015) support this argument. The studies compared the two techniques and demonstrated that they produce similar results. Therefore, PLS-SEM is no less important than CB-SEM if properly used (Hair, Ringle, & Sarstedt, 2011.

3.14 Chapter Summary

In this chapter, the methodology used for this research were described. This research was conducted based on a positivist research paradigm that employed quantitative measures to collect empirical data from the target population. A survey researched method and online surveys were found to be most appropriate for this investigation. This chapter explained the target population and the sampling size sufficient for this research and justified the selection of the cluster-sampling technique. An online survey was developed, validate by expert, and test for pilot. Finally, this chapter discussed the selection of the PLS-SEM technique using SmartPLS for data analysis. Having established the research methodology, the next chapter preliminarily analyses the data collected from respondents.

CHAPTER 4: DATA ANALYSIS

4.1 Introduction

This chapter presents the results of the quantitative data in this research. The data analysis and results for each of the research's objectives will be discussed in this chapter. The data analysis for objective one will be conducted using SPSS and Smart-PLS for objectives two, three, and four. In terms of the structure, the chapter begins by covering the preliminary examination of data, including missing data, outliers, and normality. The response rate calculation and non-response bias test are conducted next. The following section presents the profile of respondents, including gender, age, professional qualifications, years of practice, and the frequency of ICT use. Finally, the descriptive statistics of the constructs and the important performance map analysis are shown.

4.2 Data Preliminary Examination

Data screening and cleaning are crucial in quantitative research, particularly when using Structural Equation Modeling (SEM) for analysis (Hair et al., 2021). As Ball (2019) notes, collected data should be examined for errors and incomplete responses. While corrective actions may not always be necessary, this examination ensures the accuracy of multivariate analysis results. Hair et al. (2021) emphasize the importance of inspecting issues like missing data, suspicious response patterns, outliers, and normality of data distribution. Therefore, before proceeding with PLS-SEM analysis, these primary data issues were examined using Smart PLS.

4.3 Missing Data

Missing data is a common problem in behavioral (Schlomer et al., 2010), marketing (Sarstedt & Mooi, 2019), and social science studies (Hair et al., 2021). It occurs when participants leave questionnaire items unanswered (Bougie & Sekaran, 2019) and can reduce the available data for analysis, potentially leading to biased results (Hair et al., 2021). This is particularly problematic when using Structural Equation Modeling (SEM), as it's not designed to handle incomplete data. For instance, the Bootstrapping function in SmartPLS, used to examine relationships between constructs, cannot be computed with missing data. Initially, 412 surveys were collected. After removing 12 surveys with incomplete responses, the remaining 400 surveys will be further analyzed in the next section, which will address the issue of outliers.

4.4 Outlier Cases

A typical example of unreasonable answers is outliers, which occurs when one response is excessively different from other responses (Bougie & Sekaran, 2019). Hair et al. (2021) define outliers as cases with unusual values (either extremely high or low) that distinguish them from the rest of the data. Outliers can be classified into three types: univariate, bivariate, and multivariate (Denis & Wiley, 2021). Given the use of multivariate analysis in this research to test the hypotheses, the focus was on identifying multivariate outliers.

Mahalanobis distance (D^2) values are commonly employed to detect significant multivariate outliers (Ghorbani, 2019), and were computed in this research using IBM SPSS version 26. As a rule of thumb, a case is considered a multivariate outlier if its Mahalanobis distance probability is less than 0.001. In other words, a higher D^2 value indicates a greater likelihood of a case being an outlier.

The results presented in Table 4.1 reveal that no cases in the research data exhibited Mahalanobis values exceeding the critical chi-square value. Therefore, no significant outliers were detected. This is not unusual, particularly when samples are carefully selected using specific control criteria. In this research, the sample exclusively consisted of real estate agents. Consequently, no samples were removed, and all 400 samples in the dataset proceeded to the next screening procedure.

Table 4.1: Summary of Outlier's Detections

No	Case Number	Mahalanobis Distance (D^2)
1	311	14.79
2	200	13.458
3	92	10.726
4	76	10.003
5	235	9.559
6	393	9.009
7	67	8.277
8	84	7.842
9	366	7.876
10	296	6.828

4.5 Normality of Data Distribution

The Kolmogorov-Smirnov test was employed to assess data normality in this research (refer Table 4.2). Initially, skewness and kurtosis values were examined and found to be within the acceptable threshold of ±1, as suggested by Hair et al. (2021). However, a significance value greater than 0.05 is typically indicative of normal data (Khatun, 2021). In this case, all constructs (TSE, FC, ENJ, TRU, SERQ, INQ, INNO, PU, PEOU, BI) exhibited significance values of 0.000, strongly suggesting non-normal distributions.

This conclusion of non-normality is further supported by the fact that while all constructs had skewness and kurtosis values within the acceptable threshold, their significance values were less than 0.05. These findings are crucial in guiding the choice of appropriate data analysis methods, as different datasets require specific techniques. Given the non-normal distribution of the data, SEM-PLS is recommended for further analysis.

Table 4.2: Normality Test of Kolmogorov-Smirnov

	Kolmogorov-Smirnov				
Constructs	**Skewness**	**Kurtosis**	**Statistic**	**df**	**Sig.**
TSE	-1.169	2.229	0.283	400	0.000
FC	-0.928	2.022	0.274	400	0.000
ENJ	-1.047	2.301	0.276	400	0.000
TRU	-0.575	0.37	0.208	400	0.000
SERQ	-0.789	4.3485	0.200	400	0.000
INQ	-0.04	0.139	0.137	400	0.000
INNO	-0.629	0.92	0.189	400	0.000
PU	-0.717	0.924	0.177	400	0.000
PEOU	-0.925	1.851	0.223	400	0.000
BI	-0.928	3.167	0.223	400	0.000

4.6 Common Method Bias

Common method bias (CMB) or common method variance (CMV) refers to a bias that often attributed to the measurement method rather than to the construct of interest (Yao & Xu, 2021). Addressing the threat of CMB is compulsory when the data is collected via self-administered questionnaire. Common method bias (CMB) is a type of bias that can occur in research studies when the same method is used to measure all of the variables in the research. CMB can lead to inflated correlations between the variables, which can lead to incorrect conclusions about the relationships between the variables. For example, when respondents answer questions in a way that they think is socially desirable, rather than

answering honestly. Or, a respondent may be more likely to agree with statements about their own positive qualities, even if they are not actually true. The common method bias was assessed through Variance Inflation Factor (VIF) values of the inner model. In the context of research all the VIF values are lower than 3.33, the model can be considered free from the common method bias (Podsakoff et al., 2003). Table 4.3 revealed none of the latent variables under research demonstrates VIF value greater than 3.3. Thus, it is evident the CMB is not a threat to this research.

Table 4.3: Full Collinearity Test Results

CONSTRUCT	ACC	BI	PEOU	PU
ACC				
BI	1			
ENJ			2.369	2.168
FC			1.946	1.916
INNO			2.278	
INQ			2.206	1.974
PEOU		1.442		1.782
PU		1.867		
SERQ			2.509	2.457
TRU		1.813		
TSE			1.619	

4.7 Descriptive Respondent Profile

During data collection, the researcher has obtained the profile data of respondents, including gender, age, education level, professional qualification, years of experience in the real estate agency industry, location of the agency's office, and the size of the agency's office. The demographic information of the respondents is presented in the following subsections.

4.7.1 Gender

The participants were asked to select their gender either (1) male or (2) female. The results in Table 4.4 show that male accounted for 57.25 per cent of the total 400 respondents, while female accounted for 42.75 per cent.

Table 4.4: Gender Groups of Respondents

Gender	Frequency	Percent
Male	229	57.25
Female	171	42.75
Total	**400**	**100**

4.7.2 Age

Age was measured using a ratio scale, and participants were asked to indicate their age. The respondents' ages are presented in Table 4.5. The results indicate that Generation Y (28-42 years old) was the most well-represented, accounting for 43 percent of the total respondents, followed by Generation Z (18-27 years old) at 33.5 percent, Generation X (43-57 years old) at 21.25 percent, and the Baby Boomer Generation (58-76 years old) at 2.25 percent. There were no recorded responses for individuals the Silent Generation, aged 77 years and above.

Table 4.5: Age Groups of Respondents

Age Group	Frequency	Percent
The Silent Generation (77-97 years old)	0	0
Baby Boomer (58-76 years old)	9	2.25
Generation X (43-57 years old)	85	21.25
Generation Y (28-42 years old)	172	43
Generation Z (10-27 years old)	134	33.40
Total	**400**	**100**

4.7.3 Education level

The education level was labeled using an ordinal scale, and respondents were asked to select the highest education level they had graduated from. The result is presented in Table 4.6. Most of the respondents, 56 percent, had a Diploma, 33.5 percent had a Bachelor's Degree, 5 percent had a Master's Degree, 2.75 percent had an SPM, 2.25 percent had an STPM, followed by 0.25 percent for both a PhD and completing High School.

Table 4.6: Education Level of Respondents

Education level	Frequency	Percent
High School	1	0.25
Sijil Pelajaran Malaysia (SPM)	11	2.75
Sijil Tinggi Pelajaran Malysia (STPM)	9	2.25
Diploma	224	56
Bachelor’s Degree	134	33.5
Master’s Degree	20	5
Doctor of Philosophy (PhD)	1	0.25
Total	**400**	**100**

4.7.4 Professional qualification

In terms of professional qualifications, Table 4.7 reveals that 62.25 percent of the total respondents are Real Estate Negotiators, 20 percent are Probationary Estate Agents, 8 percent are Registered Estate Agents. Additionally, 5.25 percent of the respondents are Probationary Valuers, and finally, 4.5 percent are Registered Valuers, Estate Agents, and Property Managers.

Table 4.7: Professional Qualification of Respondents

Professional Qualification	Frequency	Percent
Registered Valuer, Estate Agents, and Property Managers	18	4.5
Registered Estate Agent	32	8
Probationary Valuer	21	5.25
Probationary Estate Agent	80	20
Real Estate Negotiator	249	62.25
Total	**400**	**100**

4.7.5 Years of practices

The years of practice in the real estate agent field were measured using a ratio scale, and respondents were asked to enter the number of years they have been practicing. The results are presented in Table 4.8, which shows that 235 respondents, or 58.75 percent, had working experience of fewer than 5 years. Additionally, 25 percent of respondents had between 5 and 10 years of experience, while 16.25 percent had more than 10 years of working experience.

Table 4.8: Years of Practices of Respondents

Years of practices	Frequency	Percent
Less than 5 years	235	58.75
Between 5- 10 years	100	25
More than 10 years	65	16.25
Total	**400**	**100**

4.7.6 Location of Office

The respondents were asked to indicate the location of their office in the Klang Valley. The results are presented in Table 4.9, which shows that 56.5 percent of respondents work in Selangor, followed by 39 percent working in Kuala Lumpur, and 4.5 percent of respondents working in Putrajaya. None of the respondents work outside the Klang Valley.

Table 4.9: The Location of The Respondents' Offices

Location	Frequency	Percent
Kuala Lumpur	156	39
Selangor (District of Petaling, Klang, Gombak or Hulu Langat)	226	56.5
Putrajaya	18	4.5
Other than above	0	0
Total	**400**	**100**

4.7.7 Agency size

In terms of agency size, the results in Table 4.10 show that 242 respondents, or 60.5 percent, work at agencies with more than 30 personnel. Additionally, 23.5 percent of respondents work at agencies with 21 to 30 personnel, followed by 11.25 percent of

respondents working at agencies with 11 to 20 personnel, and 4.75 percent of respondents working at agencies with 1 to 10 personnel.

Table 4.10: The Agency Size of the Respondents

Agency size	Frequency	Percent
1-10 personnel	19	4.75
11-20 personnel	45	11.25
21-30 personnel	94	23.5
More than 30 personnel	242	60.5
Total	**400**	**100**

4.8 Descriptive ICT Used in Practices

This data analysis focuses on the responses of 400 real estate agents regarding their frequency of usage of various Information and Communication Technology (ICT) tools in their daily practices. Respondents indicated their usage frequency, ranging from 'Never' to 'Every time,' for a range of ICT tools, including clouds, drones, mobile applications, real estate online platforms, social media, third-party websites, virtual reality, augmented reality, metaverse real estate, mobile instant messaging, and mobile application.

The results in Table 4.11 reveal that the most frequently used ICT tools by real estate agents are Mobile Instant Messaging (68.50%), Social Media (56.50%), and Real Estate Agent's Website (53.50%). Conversely, tools like Virtual Reality (4%), Augmented Reality (3.5%), Robotic Process Automation (RPA) (3.25%), and Metaverse Real Estate (3.25%) are rarely used.

Examining the mean scores of these ICT tools provides insights into their overall usage patterns. Tools with higher mean scores are used more frequently. Mobile Instant

Messaging (4.82), Real Estate Agent's Website (4.67), and Social Media (4.64) have the highest mean scores, indicating strong adoption. In contrast, 'Robotic Process Automation (RPA) (1.02) and Virtual Reality (1.25) have the lowest mean scores, reflecting infrequent use.

The findings from this data analysis suggest that real estate agents predominantly utilize mobile instant messaging, mobile map apps, social media, and real estate agent websites in their daily practices. These tools facilitate communication, marketing, and property listings, contributing to the efficiency of real estate operations. However, advanced technologies like Virtual Reality, Augmented Reality, Robotic Process Automation, and Metaverse Real Estate have limited adoption among real estate agents, with minimal to no usage.

Table 4.11: Result of ICT used by Respondents

Type of ICT	Never		Rarely, in less than 30% of the chances when I could have		Occasionally, in about 50% of the chances when I could have		Frequently, in about 70% of the chances when I could have		Every time		Total	Mean	Std. Deviation
	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency			
Clouds	3.00%	12	5.75%	23	15.0%	60	42.75%	171	33.50%	134	400	4.37	0.830
Drones	22.00%	88	17.25%	69	36.5%	146	19.00%	76	5.25%	21	400	2.58	1.123
Virtual Reality	62.00%	248	11.50%	46	12.5%	50	10.00%	40	4.00%	16	400	1.25	0.677
Augmented Reality	66.50%	266	8.25%	33	11.5%	46	10.25%	41	3.50%	14	400	1.21	0.660
Real Estate Agent's website	2.00%	8	5.25%	21	12.0%	48	27.25%	109	53.50%	214	400	4.67	0.783
Third-party website	2.00%	8	6.75%	27	22.3%	89	32.50%	130	36.50%	146	400	4.17	1.081
Mobile Instant Messaging	0.75%	3	2.25%	9	7.8%	31	20.75%	83	68.50%	274	400	4.82	0.545
Social Media	1.25%	5	3.75%	15	13.0%	52	25.50%	102	56.50%	226	400	4.64	0.753
Mobile Video Apps	8.50%	34	9.00%	36	24.5%	98	32.50%	130	25.50%	102	400	3.93	1.108
Mobile Mortgage Calculator Apps	5.75%	23	8.75%	35	24.8%	99	35.75%	143	25.00%	100	400	3.89	1.155
Robotic Process Automation (RPA)	73.25%	293	3.25%	13	10.3%	41	10.00%	40	3.25%	13	400	1.02	0.212
Metaverse Real Estate	73.25%	293	2.75%	11	11.5%	46	9.25%	37	3.25%	13	400	1.03	0.254

4.9 Measurement Model Analysis

The measurement model, also known as the outer model, represents the relationships between constructs and their indicators (Henseler & Sarstedt, 2013; Benitez et al., 2019). Essentially, it describes how constructs are measured using specific indicators (Ringle et al., 2018). If the measurement model fails to meet the minimum requirements of reliability and validity, any subsequent evaluation of the structural model becomes meaningless.

Researchers like Ringle et al. (2018) and Hair et al. (2021) offer guidelines for evaluating and reporting measurement models in PLS-SEM, typically including assessments of indicator reliability, construct reliability, convergent validity, and discriminant validity. Table 4.12 summarizes the specific criteria used in this research's measurement model evaluation. Review studies on PLS-SEM consistently highlight the importance of reporting these criteria (Ringle et al., 2018; Ali et al., 2018; Hair et al., 2021).

Based on these guidelines, the results of the reliability and validity assessments for the measures used in this research are presented in the following subsections.

Table 4.12: Criteria of Measurement Model Assessment

Validity Type	Criteria	Guidelines	References
Indicator reliability	Loadings	Loading ≥ 0.7	(Chin, 1998)
Construct reliability	Cronbach's alpha (CA)	CA ≥ 0.7	(Cronbach, 1951)
	Composite reliability (CR)	CR ≥ 0.7	(Hair, Hult, Ringle, & Sarstedt, 2017)
Discriminant validity	Cross loadings	loading > its cross loadings on the other constructs	(Chin, 1998)
	Fornell-Larcker criterion	√AVE > correlation with other constructs	(Fornell & Larcker, 1981)
	Heterotrait-Monotrait Ratio (HTMT)	Constructs' correlation ≤ 0.90	(Henseler, Ringle, & Sarstedt, 2015)

4.9.1 Indicator Reliability

The reliability of indicators in a partial least squares structural equation model (PLS-SEM) is typically assessed using outer loadings (Hair et al., 2021). High outer loadings indicate a strong degree of similarity among the indicators of a given construct (Hair et al., 2021). Researchers generally recommend a threshold of 0.7 or higher for outer loadings to ensure adequate indicator reliability (Vinzi & Al, 2010; Henseler et al., 2009; Hair et al., 2021).

Using the PLS algorithm with 5,000 iterations, the initial results (Table 4.13) revealed that six indicators (INQ2, INQ3, INQ5, PEOU1, TSE4, and TSE5) did not meet this reliability threshold. Consequently, these indicators were removed from the model. After this removal, a subsequent analysis showed that INQ1, TSE2, and TSE3 also exhibited

insufficient reliability, with Cronbach's alpha values below 0.7. These indicators were then also removed, resulting in a total of ten indicators not meeting the recommended reliability threshold.

Table 4.13: Results of Measurement Model Assessment (Before)

Construct	Indicators	Outer loadings >0.7	Cronbach's alpha >0.7	Composite reliability >0.7	Average variance extracted >0.5
TSE	TSE2	0.774	0.469	0.790	0.653
	TSE3	0.755			
	TSE4	0.481			
	TSE5	0.589			
FC	FC1	0.843	0.791	0.878	0.705
	FC2	0.849			
	FC3	0.827			
INNO	INNO1	0.812	0.900	0.926	0.715
	INNO2	0.888			
	INNO3	0.847			
	INNO4	0.817			
	INNO5	0.861			
TRU	TRU1	0.881	0.863	0.916	0.785
	TRU2	0.884			
	TRU3	0.893			
ENJ	ENJ1	0.863	0.889	0.918	0.693
	ENJ2	0.869			
	ENJ3	0.862			
	ENJ4	0.806			
	ENJ6	0.759			

Table 4.13, Continued

Construct	Indicators	Outer loadings >0.7	Cronbach's alpha >0.7	Composite reliability >0.7	Average variance extracted >0.5
SERQ	SERQ1	0.788	0.899	0.922	0.664
	SERQ2	0.832			
	SERQ4	0.843			
	SERQ5	0.837			
	SERQ6	0.832			
	SERQ7	0.756			
INQ	INQ1	0.746	0.900	0.926	0.715
	INQ2	0.098			
	INQ3	0.620			
	INQ4	0.775			
	INQ5	0.627			
PU	PU1	0.840	0.920	0.940	0.758
	PU2	0.895			
	PU3	0.888			
	PU4	0.873			
	PU5	0.856			
PEOU	PEOU1	0.693	0.862	0.906	0.707
	PEOU3	0.821			
	PEOU4	0.849			
	PEOU5	0.848			
	PEOU6	0.807			
BI	BI1	0.868	0.905	0.933	0.777
	BI2	0.902			
	BI3	0.877			
	BI4	0.880			
ACC	ACC1	0.897	0.892	0.933	0.822
	ACC2	0.922			
	ACC3	0.900			

The revised measurement model assessment, following the removal of ten unreliable indicators, is presented in Table 4.14. Figure 4.1 illustrates this revised model, which

includes 13 constructs: FC, INNO, TRU, ENJ, SI, DISC PCC, SERQ, INS, PU, PEOU, BI, and ACC.

Table 4.14: Results of Measurement Model Assessment (After)

Construct	Indicators	Outer loadings >0.7	Cronbach's alpha >0.7	Composite reliability >0.7	Average variance extracted >0.5
FC	FC1	0.842	0.791	0.878	0.705
	FC2	0.85			
	FC3	0.827			
INNO	INNO1	0.809	0.900	0.926	0.715
	INNO2	0.889			
	INNO3	0.847			
	INNO4	0.82			
	INNO5	0.86			
TRU	TRU1	0.881	0.863	0.916	0.785
	TRU2	0.884			
	TRU3	0.893			
ENJ	ENJ1	0.862	0.889	0.918	0.693
	ENJ2	0.87			
	ENJ3	0.862			
	ENJ4	0.806			
	ENJ6	0.757			
SERQ	SERQ1	0.787	0.899	0.922	0.664
	SERQ2	0.832			
	SERQ4	0.844			
	SERQ5	0.837			
	SERQ6	0.832			
	SERQ7	0.755			
PU	PU1	0.84	0.92	0.94	0.758
	PU2	0.895			
	PU3	0.888			
	PU4	0.873			
	PU5	0.856			

Table 4.14, Continued

Construct	Indicators	Outer loadings >0.7	Cronbach's alpha >0.7	Composite reliability >0.7	Average variance extracted >0.5
PEOU	PEOU1	0.693	0.862	0.906	0.707
	PEOU3	0.821			
	PEOU4	0.849			
	PEOU5	0.848			
	PEOU6	0.807			
BI	BI1	0.868	0.905	0.933	0.777
	BI2	0.902			
	BI3	0.877			
	BI4	0.880			
ACC	ACC1	0.897	0.892	0.933	0.822
	ACC2	0.922			
	ACC3	0.900			

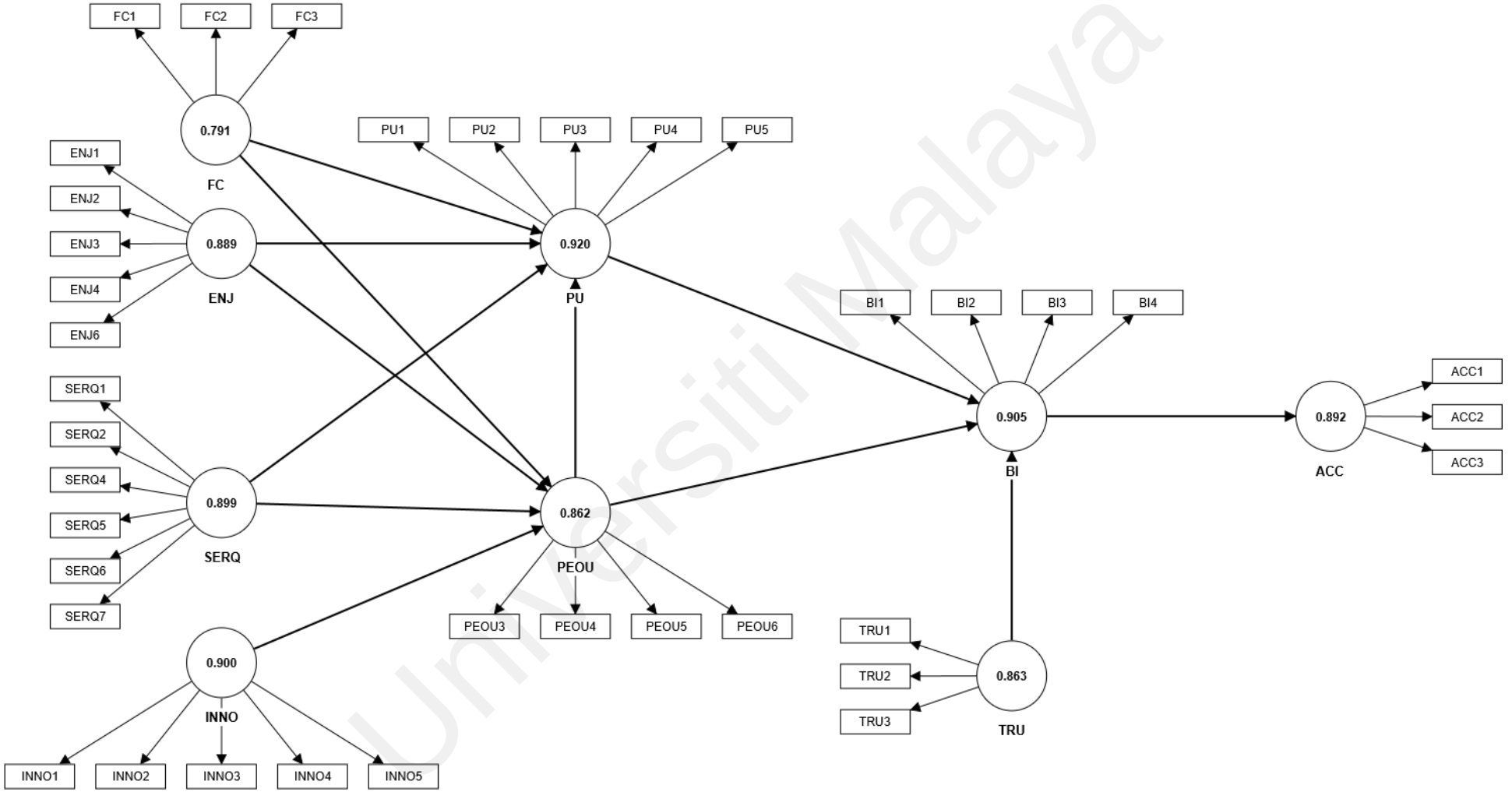


Figure 4.1: Measurement Model.
Note. Values inside constructs= AVE. Values on arrows = factor loadings

4.9.2 Construct Reliability

Assessing measurement model reliability is crucial, as its absence can lead to biased results in the structural model evaluation (Hair et al., 2012). Reliability refers to the internal consistency of indicators and their ability to produce consistent results under similar conditions (Suryani & Tentama, 2020). Traditionally, social science studies use Cronbach's alpha (CA) to measure internal consistency reliability (Cronbach, 1951).

However, a review of PLS-SEM studies in top marketing journals (Hair et al., 2012) found that both Cronbach's alpha and composite reliability (CR) are commonly used to assess indicator reliability. While CA tends to underestimate reliability, CR tends to overestimate it (Hair et al., 2021). Moreover, CA values can increase simply by adding more indicators. Therefore, researchers are advised to report both CA (lower values) and CR (higher values) (Hair et al., 2017; Sarstedt et al., 2019).

Reliability coefficients range from 0 to 1, with values closer to 1 indicating higher reliability. While the acceptable threshold varies, a value of 0.7 generally signifies acceptable reliability, and 0.8 indicates good reliability (Sarstedt et al., 2019). Hair et al. (2012) suggest that values between 0.6 and 0.7 are suitable for exploratory research, while Hair et al. (2017) consider 0.7 to 0.9 appropriate.

In this research, the reliability test results, calculated using both Cronbach's alpha and composite reliability, are presented in Table 4.14. The Cronbach's alpha values range from 0.791 to 0.920, while composite reliability values range from 0.878 to 0.933. These findings strongly support the high reliability of the constructs.

4.9.3 Convergent Validity

Convergent validity refers to the extent to which an indicator is positively correlated with other indicators in the same construct (Bougie & Sekaran, 2019). In the view of Cheah et al. (2018), convergent validity means that indicators present the same constructs. Convergent validity is achieved when the outer loading of each indicator is above 0.7 and the average variance extracted (AVE) of each construct is 0.5 or above (Hair et al., 2014; Sarstedt et al., 2022). The AVE refers to the grand mean of the squared loadings of the indicators of a construct (Hair et al., 2017; Sarstedt; Sarstedt et al., 2022). When the AVE of a construct is 0.5 or above, more than half of the variance of the construct's measures is explained. Table 4.14 shows that AVE values exceed 0.5 demonstrating the convergent reliability of the constructs.

4.9.4 Discriminant Validity

Discriminant validity means that a construct is different from other constructs in the model and captures the intended variable (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014). In other words, each construct should have more correlation with its indicators or items than with the indicators of the other constructs (Hair et al., 2014). Three options to assess discriminant validity which include; 1. cross-loadings, 2. Fornell-Larcker criterion, and 3. hetereotrait-monotrait (HTMT) ratio. However, recent criticism on the limitation of cross-loadings approach and Fornell-Larcker criterion to reliably assess discriminant validity under several circumstances motivates Hair et al. (2017) to propose HTMT ratio as an alternative assessment. HTMT is the ratio between mean of all items' correlations across constructs measuring different constructs and the mean of the average items' correlations measuring the same construct (Henseler & Sarstedt, 2013). On that account,

the present research reported discriminant validity assessment using HTMT ratio (see Table 4.15).

Table 4.15: Results of HTMT Discriminant Validity

	ACC	BI	ENJ	FC	INNO	PEOU	PU	SERQ	TRU
ACC									
BI	0.788								
ENJ	0.554	0.560							
FC	0.599	0.575	0.747						
INNO	0.626	0.608	0.656	0.670					
PEOU	0.589	0.615	0.670	0.692	0.704				
PU	0.734	0.809	0.597	0.595	0.669	0.579			
SERQ	0.675	0.761	0.660	0.615	0.709	0.573	0.791		
TRU	0.660	0.648	0.641	0.684	0.720	0.579	0.722	0.803	

HTMT represents the estimate for the construct's correlation with the other constructs, that should be smaller than one (Afthanorhan et al., 2021). A correlation closer to one shows a lack of discriminant validity. Henseler et al. (2015) suggested a threshold of 0.90 when the constructs are conceptually similar and 0.85 when the constructs are conceptually different. The results of HTMT assessment in Table 4.15 range between 0.554 and 0.863, indicating the discriminant validity of the construct.

4.9.5 Confirmatory Tetrad Analysis (CTA)- PLS

Confirmatory Tetrad Analysis for PLS-SEM (CTA-PLS) is a statistical technique that helps researchers determine whether a construct should be modeled as reflective or formative in a PLS-SEM model. Reflective constructs have indicators caused by the construct itself, while formative constructs have indicators that cause the construct. CTA-

PLS allows for empirical testing of the measurement model, preventing misspecification (Hair et al., 2017).

If any of a construct's tetrads is significantly different from zero (at $t > 1.96$, $p < 0.05$), the null hypothesis is rejected, suggesting a formative rather than a reflective measurement model (Hair et al., 2019). Simply put, if 80% of the items in a construct result in a p-value greater than 0.05, it's reflective. Conversely, if 80% results in a p-value less than 0.05, it's formative. In this research, CTA-PLS was conducted to confirm the correct specification of the measurement model as reflective (see Table 4.16).

Table 4.16: CTA-PLS results

Tetrads (τ)	Residual Value	T value	P value	CI low	CI up
ENJ1,ENJ2,ENJ3,ENJ4	0.000	0.001	0.999	-0.014	0.014
ENJ1,ENJ2,ENJ4,ENJ3	0.007	1.068	0.286	-0.006	0.020
ENJ1,ENJ2,ENJ3,ENJ6	-0.008	1.025	0.305	-0.024	0.007
ENJ1,ENJ3,ENJ6,ENJ2	0.010	1.308	0.191	-0.005	0.025
ENJ1,ENJ3,ENJ4,ENJ6	0.047	2.731	0.006	0.014	0.082
INNO1,INNO2,INNO3,INNO4	-0.013	0.877	0.380	-0.041	0.016
INNO1,INNO2,INNO4,INNO3	0.001	0.084	0.933	-0.026	0.028
INNO1,INNO2,INNO3,INNO5	-0.008	0.708	0.479	-0.029	0.014
INNO1,INNO3,INNO5,INNO2	-0.014	0.944	0.345	-0.042	0.014
INNO1,INNO3,INNO4,INNO5	0.023	2.345	0.019	0.004	0.043
SERQ1,SERQ2,SERQ4,SERQ5	0.022	2.650	0.008	0.006	0.038
SERQ1,SERQ2,SERQ5,SERQ4	0.001	0.117	0.907	-0.018	0.021
SERQ1,SERQ2,SERQ4,SERQ6	0.017	2.085	0.037	0.001	0.033
SERQ1,SERQ4,SERQ6,SERQ2	-0.007	1.019	0.308	-0.021	0.007
SERQ1,SERQ2,SERQ4,SERQ7	0.016	1.789	0.074	-0.001	0.034
SERQ1,SERQ2,SERQ5,SERQ6	0.005	0.477	0.633	-0.016	0.027
SERQ1,SERQ2,SERQ6,SERQ7	0.033	2.936	0.003	0.011	0.055
SERQ1,SERQ4,SERQ5,SERQ7	-0.009	0.942	0.346	-0.028	0.010

Table 4.16, Continued

Tetrads (τ)	Residual Value	T value	P value	CI low	CI up
SERQ1,SERQ4,SERQ7,SERQ6	-0.002	0.161	0.872	-0.023	0.019
PU1, PU2,PU3,PU4	0.001	0.073	0.942	-0.015	0.016
PU1,PU2,PU4,PU3	0.012	1.455	0.146	-0.004	0.028
PU1,PU2,PU3,PU5	-0.001	0.104	0.917	-0.014	0.012
PU1,PU3,PU5,PU2	0.006	1.049	0.294	-0.006	0.019
PU1,PU3,PU4,PU5	0.025	2.316	0.021	0.004	0.046
PEOU3,PEOU4,PEOU5,PEOU6	0.003	0.266	0.790	-0.019	0.026
PEOU3,PEOU4,PEOU6,PEOU5	0.008	0.697	0.486	-0.015	0.032
BI1,BI2,BI3,BI4	0.001	0.153	0.879	-0.016	0.019
BI1,BI2,BI4,BI3	0.017	1.900	0.057	0.000	0.034

Note. CI = Confidence interval

As a result, no significant tetrad was produced in the measurement mode. Thus, the CTA-PLS test for this research is approved as reflective for all constructs. The next section therefore proceeds with the structural model evaluation.

4.10 Structural Model Analysis

The structural model, also known as the inner model, refers to the relationships between the constructs themselves (Hair et al., 2014; Hair et al., 2019), and its assessment includes evaluating the relationships between the constructs in the model (Henseler & Sarstedt, 2013). Researchers (Henseler & Sarstedt, 2013; Hair et al., 2014; Hair et al., 2021) provided guidelines for evaluating and reporting the structural model, including collinearity, path coefficients, coefficient of determination (R^2), and cross-validated redundancy (Q^2). Table 4.17 summarises the criteria used for evaluating the structural model in this research. Review studies on PLS-SEM (Ringle et al., 2012; Hair et al., 2012; Ringle et al.,2018; Ali et al.,2018) found that researchers usually report those criteria when examining the structural model.

Table 4.17: Criteria of Structural Model Assessment

Criteria	Guidelines	References
Collinearity	VIF < 5 or tolerance > 2	(Hair, Ringle, & Sarstedt, 2011; Hair, Hult, Ringle, & Sarstedt, 2017)
Path coefficients	Use bootstrapping with 10,000 sub samples Significance: $p \leq 0.05$ Sign: one-tailed option	(Hair, Hollingsworth, Randolph, & Chong, 2017; Hair, Hult, Ringle, & Sarstedt, 2017)
Coefficient of determination (R^2)	Weak effect: $R^2 = 0.19$ Moderate effect: $R^2 = 0.33$ High effect: $R^2 = 0.67$	(Chin, 1998)
Cross-validated redundancy (Q^2)	Use blindfolding $Q^2 > 0$	(Chin, 1998)

Given those criteria and guidelines, the results of those assessments are presented in the following subsections.

4.10.1 Collinearity Statistics

Collinearity statistics refer to the measures and methods used to detect and address the issue of collinearity, or multicollinearity, in statistical models, particularly in regression analyses. Collinearity occurs when two or more predictor variables in a regression model are highly correlated, which can lead to several problems, such as inflated standard errors, biased parameter estimates, and difficulties in determining the individual effect of each predictor on the dependent variable (Dalal, 2023) (Upendra et al., 2023). Common diagnostic tools for detecting multicollinearity include the Variance Inflation Factor (VIF), which quantifies how much the variance of an estimated regression coefficient increases due to collinearity, and the condition index, which assesses the sensitivity of the regression coefficients to changes in the data (Kim, 2019) (Schreiber-Gregory, 2018). A VIF value exceeding 5 or 10 is often considered indicative of problematic multicollinearity (Schreiber-Gregory, 2018). Other methods include examining the

correlation matrix for large correlation coefficients and using eigenvalues from the correlation matrix to calculate condition numbers (Schreiber-Gregory, 2018). Remedies for multicollinearity include data reduction techniques like principal component analysis, ridge regression, which introduces bias to reduce variance, and the exclusion of collinear variables (Upendra et al., 2023) (Schreiber-Gregory, 2018). Table 4.18 shows that all VIF values are below the cut-off point providing evidence that the collinearity of independent constructs is not critical.

Table 4.18: Results of VIF Values

Constructs	ACC	BI	PEOU	PU
ACC				
BI	1			
ENJ			2.061	2.136
FC			1.858	1.901
INNO			2.015	
PEOU		1.472		1.772
PU		1.87		
SERQ			1.94	1.681
TRU		1.827		

4.10.2 Model's exploratory power (R^2)

The R^2 represents the variance explained in each of the endogenous constructs and is a measure of the model's explanatory power. In other words, it means how much change in the dependent variable can be accounted by one of more independent variable(s). R^2 interprets the combined effect of predictor variables on dependent variable (Ramayah et al., 2018), and is therefore a measure of the model's in-sample predictive power (Ringle et al., 2012). Generally, R^2 values of 0.75, 0.50, and 0.25 are classified as substantial, moderate, and weak respectively (Hair et al., 2014).

For this research, ACC demonstrated a substantial explanatory power at $R^2 = 0.5$ (moderate), which implying that behavioral intention (BI) had explained 50% of variance in acceptance of ICT. On the other hand, BI had explanatory power at $R^2 = 0.6$ (moderate), and PEOU had explanatory power at $R^2 = 0.5$ (moderate) and lastly, PU had explanatory power at $R^2 = 0.6$ (moderate). The result of this research shows that R^2 for all the endogenous constructs is 0.50 and above, this shows that the model explanatory power is moderate in value (see Table 4.19).

Table 4.19: Result of Model's Exploratory Power (R^2)

Endogenous	R-square	R-square adjusted
ACC	0.5	0.5
BI	0.6	0.6
PEOU	0.5	0.5
PU	0.6	0.6

4.10.3 Predictors' effect sizes (f^2)

The f^2 value is calculated to assess the extent to which an independent variable contributes to the variance explained in the dependent variable. The concept of effect size (f^2) in the context of Partial Least Squares (PLS) path modeling is for understanding the impact of exogenous variables (independent variables) on endogenous variables (dependent variables). In PLS-SEM, the effect size is used to estimate the extent to which an exogenous variable contributes to the R^2 value of an endogenous variable. The R^2 value, in turn, represents the proportion of variance in the endogenous variable that can be explained by the exogenous variables linked to it in the model. The impact of the predicted variable is high at the structural level if f^2 are 0.02, 0.15, and 0.35, representing small, medium, and large effects respectively (Cohen, 1988). The model's f^2 effect size

shows how much an exogenous latent variable contributes to an exogenous latent variable's R^2 value.

Table 4.20 showed Behavioral Intention contributed large effects on Acceptance ($f^2 < 0.35$). Meanwhile, Trust and Perceived Ease of Use contributed small effects on Behavioural Intention ($f^2 < 0.15$) but Perceived Usefulness contributed large effects on Behavioral Intention ($f^2 < 0.35$). Meanwhile, Facilitating Conditions, Perceived Enjoyment and Service Quality had a small effect on Perceived Ease of Use ($f^2 < 0.15$) but Innovativeness had a large effect on it ($f^2 < 0.35$). Lastly, Perceived Enjoyment, Facilitating Conditions, and Perceived Ease of Use had small effects on Perceived Usefulness but Service Quality had a large effect on it. Thus, these results hinted that there might be significant relationships between these variables. However, confirmation regarding the significance of the relationships between the variables being studied will be discussed in detail later in Table 4.22. This interpretation aids in determining which variables have the most substantial impact on the model's outcomes, guiding both theoretical implications and practical applications of the research findings.

Table 4.20: Results of Effect Sizes (f^2)

Relationship	Effect Size	
	f-square	**Magnitude**
Behavioural Intention → Acceptance	1.008	large
Perceived Enjoyment → Perceived Ease of Use	0.052	small
Perceived Enjoyment → Perceived Usefulness	0.006	small
Facilitating Conditions → Perceived Ease of Use	0.047	small
Facilitating Conditions → Perceived Usefulness	0.01	small
Innovativeness → Perceived Ease of Use	0.115	large
Perceived Ease of Use → Behavioural	0.066	small

Intention		
Perceived Ease of Use → Perceived Usefulness	0.026	small
Perceived Usefulness → Behavioural Intention	0.413	large
Service Quality → Perceived Ease of Use	0.002	small
Service Quality → Perceived Usefulness	0.418	large
Trust → Behavioural Intention	0.017	small

4.10.4 Model's predictive accuracy (Q^2)

The measure of structural model predictive accuracy, also known as the model's predictive relevance, is assessed using a metric called Q^2 (Geisser, 1975; Stone, 1974). Q^2 evaluates the model's ability to accurately predict data not used during model development, commonly referred to as out-of-sample prediction, in combination with its in-sample explanatory power during the estimation of model parameters (Sarstedt et al., 2017; Shmueli et al., 2016).

In the SmartPLS software, the Q^2 value is computed using the blindfolding procedure, a resampling technique that systematically deletes and predicts each data point for the indicators within the reflective measurement model of the endogenous construct (Ramayah et al., 2018). In general, a Q^2 value should be greater than zero ($Q^2 > 0$) to indicate acceptable predictive accuracy for a specific endogenous construct (Fornell & Cha, 1994; Hair et al., 2017).

However, recent guidelines introduced by Hair et al., 2019 categorize Q^2 values as small if they fall between 0.1 and 0.249, medium between 0.25 and 0.499, and large if they are 0.50 or higher. As a result, in Table 4.21, most endogenous constructs in this structural model demonstrated acceptable predictive accuracy at $Q^2 = 0.476$ (medium) for Perceived Ease of Use, $Q^2 = 0.487$ (medium) for Behavioural Intention, and $Q^2 = 0.394$ (medium)

for Acceptance. Meanwhile, Perceived Usefulness indicates higher acceptable predictive accuracy at $Q^2 = 0.548$ (higher). Hence, this result implied that predicted relationships between independent variables with mediators and dependent variables were accurate and relevant.

Table 4.21: Results of Q^2 predict

Endogenous	Q^2predict	RMSE	MAE
ACC	0.394	0.785	0.634
BI	0.487	0.725	0.555
PEOU	0.476	0.731	0.52
PU	0.548	0.677	0.515

Note. ACC = Acceptance, BI = Behavioural Intention, PEOU = Perceived Ease of Use, PU = Perceived Usefulness, RMSE = Root Mean Square Error, MAE = Mean Absolute Error

4.10.5 Path Coefficients

Path coefficients refer to the estimates of the relationships between the model's constructs (Hair et al., 2019). When assessing the PLS path, studies should report path coefficients beside the significance level, t-value, and p-value (Hair et al., 2012). Ringle et al. (2012) reviewed studies that used PLS-SEM and were published in MIS Quarterly between 1992 and 2011 and concluded that the majority of studies had reported path coefficients, significance level, t-value, and p-value when examining the structural model. Therefore, the hypotheses were tested by examining the path coefficient (standard beta, t-values and p-values), coefficient of determination (R^2), effect size (f^2) and other predictive relevance (Q^2 predict). The model employed a bootstrapping technique with 5000 samples. The result is presented in Table 4.22.

The results of hypothesis and direct relationship testing are showing that;

1. H2 evaluates whether facilitating conditions (FC) significantly and positively affects perceived usefulness (PU) of ICT. The results revealed that FC has an insignificant and negatively impact on PU ($\beta = 0.093$ $t = 1.918$, $p = 0.055$). Hence, H2 was rejected.
2. H3 evaluates whether facilitating conditions (FC) significantly and positively affects perceived ease of use (PEOU) of ICT. The results revealed that FC has a significant and positive impact on PEOU ($\beta = 0.211$, $t = 3.575$, $p < 0.001$). Hence, H3 was accepted.
3. H4 evaluates whether innovativeness (INNO) significantly and positively affects perceived ease of use (PEOU) of ICT. The results revealed that INNO has a significant and positive impact on PEOU ($\beta = 0.342$, $t = 6.769$, $p < 0.001$). Hence, H4 was accepted.
4. H5 evaluates whether trust (TRU) significantly and positively affects behavioural intention (BI) of ICT. The results revealed that TRU has a significant and positive impact on BI ($\beta = 0.112$, $t = 2.581$, $p < 0.001$). Hence, H5 was accepted.
5. H6 evaluates whether perceived enjoyment (ENJ) significantly and positively affects perceived usefulness (PU) of ICT. The results revealed that ENJ has an insignificant and negatively impact on PU ($\beta = 0.073$ $t = 1.371$, $p = 0.171$). Hence, H7 was rejected.
6. H7 evaluates whether perceived enjoyment (ENJ) significantly and positively affects perceived ease of use (PEOU) of ICT. The results revealed that ENJ has a significant impact on PEOU ($\beta = 0.233$, $t = 3.679$, < 0.001). Hence, H7 was accepted.
7. H12 evaluates whether service quality (SERQ) significantly and positively affects perceived usefulness (PU) of ICT. The results revealed that SERQ has

a significant and positive impact on PU (β = 0.555, t = 12.419, p < 0.001). Hence, H12 was accepted.

8. H13 evaluates whether service quality (SERQ) significantly and positively affects perceived ease of use (PEOU) of ICT. The results revealed that SERQ has an insignificant and negatively impact on PEOU (β = 0.042, t = 0.810, p = 0.418). Hence, H13 was rejected.
9. H16 evaluates whether perceived usefulness (PU) significantly and positively affects behavioural intention (BI) of ICT. The results revealed that PU has a significant and positive impact on BI (β = 0.563, t = 12.308, p < 0.001). Hence, H16 was accepted.
10. H17 evaluates whether perceived ease of use (PEOU) significantly and positively affects perceived usefulness (PU) of ICT. The results revealed that PEOU has a significant and positive impact on PU (β = 0.143, t = 2.913, p < 0.001). Hence, H17 was accepted.
11. H18 evaluates whether perceived ease of use (PEOU) significantly and positively affects behavioural intention (BI) of ICT. The results revealed that PEOU has a significant and positive impact on BI (β = 0.200, t = 5.109, p < 0.001). Hence, H18 was accepted.
12. H19 evaluates whether behavioural intention (BI) significantly and positively affects acceptance (ACC) of ICT. The results revealed that BI has a significant and positive impact on ACC (β = 0.709, t = 19.356, p < 0.001). Hence, H19 was accepted.

Table 4.22: Result of Path Coefficients

H#	Paths	Coefficients (β)	Standard deviation (STDEV)	t-value	p-value	Decision
H2	FC →PU	0.093	0.049	1.918	0.055	Reject
H3	FC →PEOU	0.211	0.059	3.575	0.000	Supported
H4	INNO → PEOU	0.342	0.051	6.769	0.000	Supported
H5	TRU → BI	0.112	0.043	2.581	0.010	Supported
H6	ENJ → PU	0.073	0.053	1.371	0.171	Reject
H7	ENJ → PEOU	0.233	0.063	3.679	0.000	Supported
H12	SERQ → PU	0.555	0.045	12.419	0.000	Supported
H13	SERQ → PEOU	0.042	0.052	0.810	0.418	Reject
H16	PU → BI	0.563	0.046	12.308	0.000	Supported
H17	PEOU → PU	0.143	0.049	2.913	0.004	Supported
H18	PEOU → BI	0.200	0.039	5.109	0.000	Supported
H19	BI → ACC	0.709	0.037	19.356	0.000	Supported

4.10.6 Importance-Performance Map Analysis (IPMA)

Importance-Performance Map Analysis (IPMA) is a technique used in Structural Equation Modeling (SEM) and Partial Least Squares (PLS) path modeling to evaluate and visualize the importance and performance of constructs or variables within a research model. It aids researchers in assessing the significance of different factors in explaining specific outcomes or behaviors (Hair et al., 2017). The graphical representation provided by IPMA allows for easy identification of critical areas requiring attention (Hair et al., 2017), thus facilitating further explanation and discussion of findings for managerial implications (Ramayah et al., 2018).

The following presents the IPMA results concerning the importance and performance of factors related to Perceived Usefulness, Perceived Ease of Use, Behavioral Intention, and Acceptance of ICT.

i) Perceived Usefulness (PU)

Based on the IPMA results in Table 4.23, SERQ (service quality) is the most important predictor variable of performance, followed by PEOU (perceived ease of use), FC (facilitating conditions), ENJ (perceived enjoyment), and INNO (innovativeness).

- ENJ: Moderately important (0.106) with a good performance score of 74.806.
- FC: Relatively more important (0.123) with a performance score of 71.734.
- INNO: Less important (0.049) with a good performance score of 74.534.
- PEOU: Highly important (0.143) with a decent performance score of 73.685.
- SERQ: Extremely important (0.561) with the highest performance score of 77.775.

Table 4.23: Result of IPMA (Perceived Usefulness)

Predictor Variables	Importance	Performance
ENJ	0.106	74.806
FC	0.123	71.734
INNO	0.049	74.534
PEOU	0.143	73.685
SERQ	0.561	77.775

The Importance-Performance Map Analysis (IPMA) results in Figure 4.2 will be based on their placement in the four quadrants:

1. Top-Right Quadrant (High Importance, High Performance):
    - Predictor Variable: SERQ (Service Quality)
    - Analysis: Service Quality occupies the top-right quadrant with a high importance score of 0.561 and a performance score of 77.775. The strategic priority here is to maintain and potentially leverage the success of Service Quality, given its critical importance and high performance.
2. Top-Left Quadrant (Low Importance, High Performance):
    - Predictor Variables: INNO (Innovativeness), ENJ (Enjoyment), FC (Facilitating Conditions), and PEOU (Perceived Ease of Use)
    - Analysis: Despite having lower importance scores (ranging from 0.049 to 0.143), these variables exhibit high performance scores (ranging from 71.734 to 74.806). The strategic priority involves assessing whether the resources allocated to these variables align with their perceived importance. Consideration may be given to optimizing resource allocation or reallocating efforts to areas with higher importance.

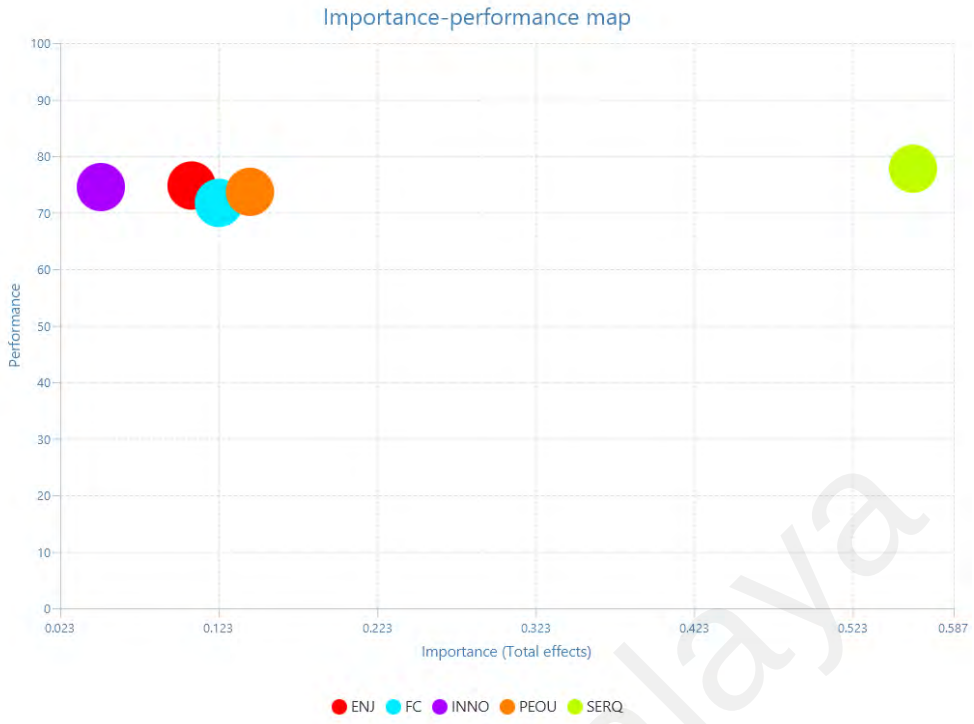


Figure 4.2: Importance-Performance Map Perceived Usefulness (PU)

ii) Perceived Ease of Use (PEOU)

Based on the IPMA results of PEOU in Table 4.24, INNO (Innovativeness) emerges as the most important predictor variable of performance, followed by ENJ (Perceived Enjoyment), FC (Facilitating Conditions), and SERQ (Service Quality).

- Highest Importance: Innovation (INNO) stands out as the most important predictor variable with an importance score of 0.342.
- Highest Performance: Service Quality (SERQ) exhibits the highest performance with a score of 77.775.
- Balanced Performance: Perceived Enjoyment (ENJ) and Innovativeness (INNO) demonstrate a relatively balanced performance, with scores of 74.806 and 74.534, respectively.
- Moderate Importance, Decent Performance: Perceived Enjoyment (ENJ) and Facilitating Conditions (FC) show similar importance values (0.233 and

0.211, respectively) and moderate performance scores (74.806 and 71.734, respectively).

- Lowest Importance: Service Quality (SERQ) has the lowest importance score among the predictor variables, but it compensates with the highest performance score.

Table 4.24: Result of IPMA Perceived Ease of Use (PEOU)

Predictor Variables	Importance	Performance
ENJ	0.233	74.806
FC	0.211	71.734
INNO	0.342	74.534
SERQ	0.042	77.775

The IPMA results in Figure 4.3 show that all predictor variables (ENJ, FC, INNO, SERQ) exhibit significant correlations with the predicted performance; however, the importance and performance of each predictor variable vary. The top-right quadrant of the IPMA map represents constructs that are both important and high-performing. In this case, INNO (innovativeness) falls into the top-right quadrant, signifying that INNO is one of the most crucial predictors of performance, and that the product or service currently provides a high level of service quality to customers.

On the other hand, the top-left quadrant of the IPMA map traditionally represents constructs that are less important but high-performing. However, in this case, SERQ falls into the top-left quadrant, indicating that these constructs are less crucial as predictors of performance; however, the product or service is currently performing at a high level.

1. Top-Right Quadrant (High Importance, High Performance):
    - Predictor Variable: INNO (Innovativeness)
    - Analysis: Innovativeness positioned in the top-right quadrant with a high importance score of 0.342 and a performance score of 74.534. The strategic priority here is to continue fostering and leveraging innovation, as it is both highly important and performing well.
2. Top-Left Quadrant (Low Importance, High Performance):
    - Predictor Variables: ENJ (Perceived Enjoyment) and FC (Facilitating Conditions) and Service Quality (SERQ).
    - Analysis: While these variables have lower importance scores (0.233 and 0.211, respectively), their high-performance scores (74.806 and 71.734, respectively) suggest that they are performing well despite being perceived as less crucial. The strategic priority involves assessing whether the resources allocated to these variables align with their perceived importance. Consideration may be given to optimizing resource allocation or reallocating efforts to areas with higher importance.

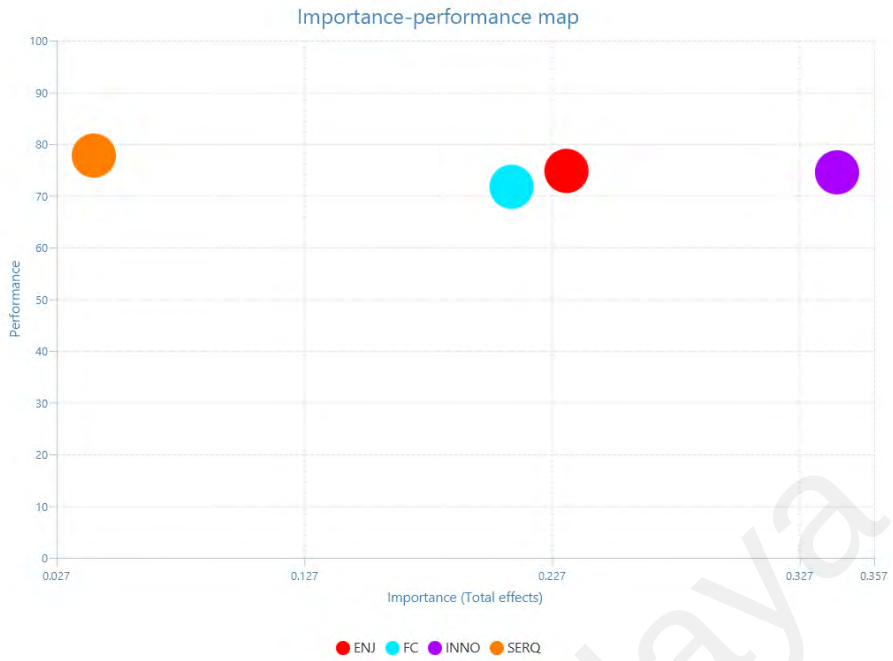


Figure 4.3: Importance-Performance Map Perceived Ease of Use (PEOU)

iii) Behavioral Intention (BI)

Based on the IPMA results of BI in Table 4.25, Perceived Usefulness (PU) emerges as the most important predictor variable of performance. It is followed by Service Quality (SERQ), Perceived Ease of Use (PEOU), Perceived Enjoyment (ENJ), Facilitating Conditions (FC), Innovativeness (INNO), and Trust (TRU).

- Perceived Usefulness (PU): Stands out as the most important predictor variable with an impressive importance score of 0.563. Furthermore, it exhibits the highest performance with a score of 81.002, indicating its crucial role and exceptional effectiveness in predicting overall performance.
- Service Quality (SERQ): Also noteworthy, with a substantial importance score of 0.324 and a high-performance score of 77.775. This suggests that Service Quality significantly contributes to the predicted performance and is currently delivering a high level of service to customers.

- Perceived Ease of Use (PEOU): Demonstrates a high importance score of 0.28, signaling its substantial impact, coupled with a respectable performance score of 73.685. This indicates a positive correlation between Perceived Ease of Use and the predicted performance.
- Perceived Enjoyment (ENJ), Facilitating Conditions (FC), Innovativeness (INNO), and Trust (TRU): While still contributing to the model, these variables have comparatively lower importance scores. Perceived Enjoyment (ENJ) and Facilitating Conditions (FC) share similar importance values (0.106 and 0.112, respectively), and their performance scores are 74.806 and 71.734, respectively. Innovativeness (INNO) has a slightly lower importance (0.096) with a performance score of 74.534. Trust (TRU) mirrors the importance of FC with a performance score of 76.024.

Table 4.25: Result of IPMA Behavioral Intention (BI)

Predictor Variables	Importance	Performance
ENJ	0.106	74.806
FC	0.112	71.734
INNO	0.096	74.534
PEOU	0.28	73.685
PU	0.563	81.002
SERQ	0.324	77.775
TRU	0.112	76.024

The Importance-Performance Map (BI) is presented in Figure 4.4, with the X-Axis (Horizontal) representing Importance and the Y-Axis (Vertical) representing Performance. The results revealed:

- PU (Perceived Usefulness): High Importance, High Performance; this construct occupies the top-right quadrant of the map.
- ENJ, FC, INNO, and TRU: Low Importance, High Performance; these constructs are found in the top-left quadrant, signifying that they are not considered crucial but are performing at a high level.

IPMA is a valuable tool for understanding the relative significance and effectiveness of different constructs in your research model. It helps researchers focus on the most critical factors for achieving their research objectives.

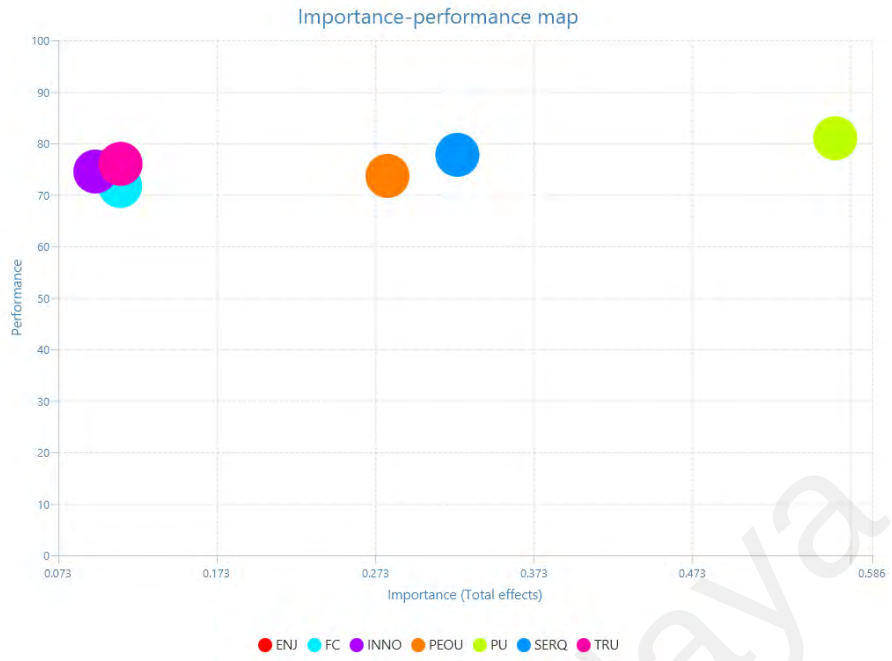


Figure 4.4: Importance-Performance Map Behavioral Intention (BI)

iv) Acceptance (ACC)

Based on the IPMA results of ACC in Table 4.26, Behavioral Intention (BI) emerges as the most important predictor variable of performance. It is followed by Perceived Usefulness (PU), Service Quality (SERQ), Perceived Ease of Use (PEOU), Innovativeness (INNO) Facilitating Conditions (FC), Trust (TRU), and Perceived Enjoyment (ENJ).

- BI (Behavioural Intention): This variable stands out with the highest importance score of 0.709, reflecting its significant role in predicting performance. Its performance score is 80.448, reinforcing its effectiveness in contributing to the overall outcome.
- PU (Perceived Usefulness): While not as high in importance as BI, PU has a substantial importance score of 0.399 and the highest performance score of 81.002. This suggests that PU is a crucial predictor with exceptional

effectiveness in influencing performance.

- SERQ (Service Quality): With an importance score of 0.23 and a performance score of 77.775, SERQ is a notable predictor, contributing significantly to the predicted performance.
- PEOU (Perceived Ease of Use): While having a moderate importance score of 0.199, PEOU demonstrates a respectable performance score of 73.685, indicating a positive correlation between perceived ease of use and the predicted performance.
- ENJ (Perceived Enjoyment), FC (Facilitating Conditions), INNO (Innovativeness), and TRU (Trust): These variables, while contributing to the model, have comparatively lower importance scores. Their performance scores range from 71.734 to 74.806, indicating a moderate impact on the predicted performance.

Table 4.26: Result of IPMA Acceptance (ACC)

Predictor Variables	Importance	Performance
BI	0.709	80.448
ENJ	0.075	74.806
FC	0.079	71.734
INNO	0.068	74.534
PEOU	0.199	73.685
PU	0.399	81.002
SERQ	0.23	77.775
TRU	0.079	76.024

The Importance-Performance Map (ACC) is presented in Figure 4.5, with the X-Axis (Horizontal) representing Importance and the Y-Axis (Vertical) representing Performance. The results revealed:

1. Top-Right Quadrant (High Importance, High Performance):

   Predictor Variable: BI (Behavioural Intention)

   - Analysis: Behavioural Intention, positioned in the bottom-right quadrant with a high importance score of 0.709 but a performance score of 80.448. Behavioural Intention is positioned in the top-right quadrant. This quadrant signifies a strength that can be leveraged for optimization and further enhancement.

   Predictor Variable: PU (Perceived Usefulness)

   - Analysis: Given its moderate importance and high performance (importance score of 0.399 and performance score of 81.002), Perceived Usefulness is positioned in the middle-right quadrant, indicates that it is less important, but high performance. Thus, the attention should be focus on high score of important constructs.

2. Top-Left Quadrant (Low Importance, High Performance):

   Predictor Variables: ENJ (Perceived Enjoyment), FC (Facilitating Conditions), INNO (Innovativeness), PEOU (Perceived Ease of Use), and SERQ (Service Quality) and TRU (Trust)

   - Analysis: Although these predictor variables have a lower importance, their high-performance scores (ranging from 71.734 to 76.024) suggest that they are performing well despite being perceived as less crucial. The strategic priority in this quadrant involves assessing whether the resources allocated to these variables align with their perceived importance. It may be an opportunity to reallocate efforts to other variables with higher importance.

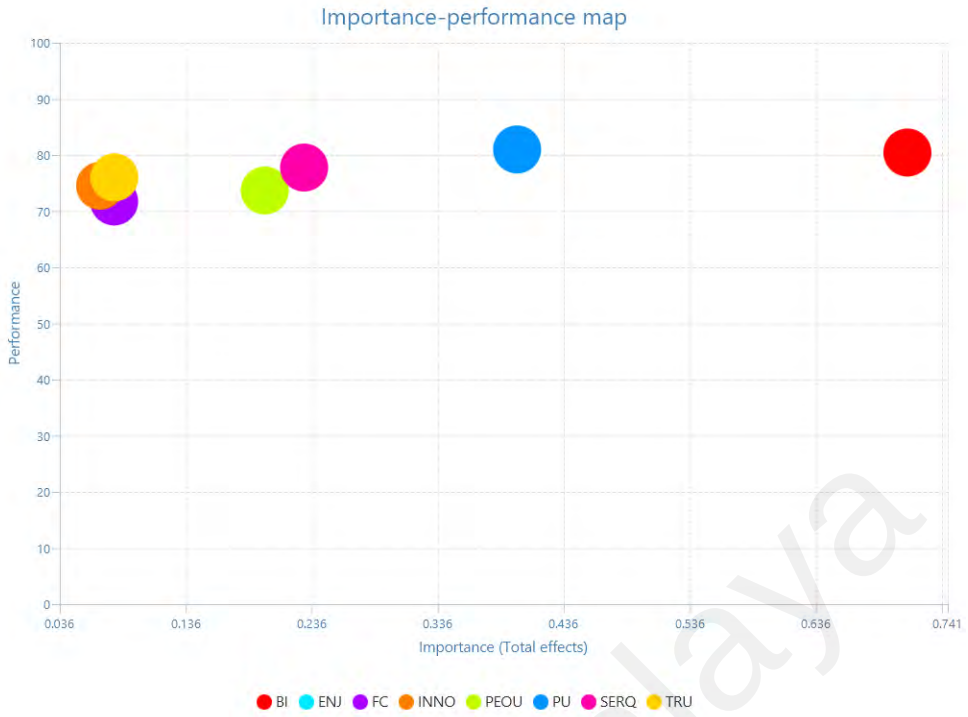


Figure 4.5: Importance-Performance Map Acceptance (ACC)

4.11 Chapter Summary

This chapter presents a pivotal examination of the acceptance of Information and Communication Technology (ICT) among real estate agents. This chapter is significant for its empirical validation and extension of the Technology Acceptance Model (TAM) in the real estate context. The research's findings offer robust empirical support for the TAM. It demonstrates that the TAM constructs of Perceived Usefulness (PU), Perceived Ease of Use (PEOU), and Behavioral Intention (BI) are significant predictors of ICT acceptance among real estate agents. This validation reinforces the TAM as a reliable model for understanding technology acceptance in the real estate sector.

Furthermore, the research innovatively extends the TAM by incorporating five new constructs: Service Quality (SERQ), Facilitating Conditions (FC), Innovativeness (INNO), Trust (TRU), and Perceived Enjoyment (ENJ). These additions provide a more

nuanced understanding of the factors influencing ICT adoption among real estate agents. Chapter 4, therefore, makes a significant contribution to the body of knowledge on ICT acceptance in real estate. It not only validates and expands an established theoretical model but also offers actionable insights for industry practitioners seeking to enhance ICT adoption among real estate professionals.

CHAPTER 5: FINDINGS & DISCUSSION

5.1 Introduction

This chapter primarily presented the findings of the present research in line with the proposed hypotheses and research objectives. These findings will then be compared and contrasted to those of previous studies presented in the literature review.

5.2 Discussion of the Research Findings

Based on the formulated problem statement, four research questions were posed as guidelines to ensure the achievement of the objectives of this research. The answers to these research questions were derived from the verified hypotheses discussed in the earlier chapter. Successfully addressing each research question signifies the successful accomplishment of the proposed research objectives in this research. Consequently, the findings obtained from this research were systematically discussed in accordance with the order of the research questions.

5.2.1 Findings on the ICT tools used by real estate agents in practice

Descriptive statistics using SPSS 29 were employed to answer the research questions and fulfill the research objective. As shown in Table 5.1, the ICT tools that real estate agents most frequently use are Mobile Instant Messaging, Social Media, and Real estate Agent's websites, indicating a significant preference for communication and social interaction technologies. This highlights the importance of accessibility and instant communication in real estate transactions. The changing trends in technology make Mobile Instant Messaging important for accessibility and instant communication in real estate

transactions. The findings of this research align with the ICT usage reported by the National Association of Realtors (NAR) in the US in 2022. According to NAR, 92% of real estate agents use smartphones for contacting clients and making business referrals, and 80% access social media for real estate purposes. Real estate agents in the US utilize smartphones not only for personal use but also for conducting business, thereby enhancing responsiveness and efficiency. Additionally, almost all buyers (96%) used online tools during their property search process. Conversely, tools such as Virtual Reality, Augmented Reality, Robotic Process Automation (RPA), and Metaverse Real Estate are seldom used, as indicated by the results. This observation is consistent with Hofmann et al. (2019), who noted that RPA tools, for example, are still relatively new in the market. Real estate agents may not be fully aware of the capabilities, features, and potential applications of these tools within the industry. This lack of awareness can lead to hesitation in investing time and resources into learning and implementing them.

Table 5.1: Ranking of the ICT tools used

Rank	Type of ICT	Percentage Used
1	Mobile Instant Messaging	68.50%
2	Social Media	56.50%
3	Real Estate Agent's website	53.50%
4	Third-party website	36.50%
5	Clouds	33.50%
6	Mobile Video Apps	25.50%
7	Mobile Mortgage Calculator Apps	25.00%
8	Drones	5.25%
9	Virtual Reality	4.00%
10	Augmented Reality	3.50%
11	Robotic Process Automation (RPA)	3.25%
12	Metaverse Real Estate	3.25%

5.2.2 Discussion of Findings and Recommendations for Enhancing ICT Tool Usage

This research's findings highlight the need to improve ICT tool usage among real estate agents. Three key recommendations emerge:

1. **Promote the use of ICT tools:** This could involve highlighting the benefits of ICT adoption through workshops, seminars, or online resources.

2. **Provide comprehensive training:** Agents require training on effectively utilizing various ICT tools relevant to their daily tasks.

3. **Incorporate ICT into real estate curricula and foster industry collaboration:** Integrating ICT training into educational programs and encouraging collaboration between educational institutions and the real estate industry can ensure agents are well-equipped with the necessary digital skills.

The following sections will elaborate on these recommendations.

5.2.2.1 Promoting the Use of ICT Tools among Real Estate Agents

Based on the analysis of the survey results, the level of acceptance and use of Information and Communication Technology (ICT) by real estate agents in practice can be improved by promoting the benefits of ICT. This can be done through the development and promotion of user-friendly ICT tools and platforms tailored to the specific needs of real estate agents, as suggested by Adedamola et al. (2021). These tools and platforms should be easy to use, even for those with limited technical skills. Examples include real estate agent websites, third-party websites, mobile apps, and social media platforms.

Additionally, showcasing the benefits of integrating ICT into real estate practices through testimonials can be effective. Real estate agents must recognize the clear advantages of ICT before they are willing to adopt it. Testimonials from real estate agents who have successfully used ICT tools and platforms can demonstrate real-world benefits and satisfaction. Such testimonials can highlight specific advantages, including lead generation, increased sales, improved customer service, and streamlined business operations.

5.2.2.2 Provide Comprehensive Training

In addition to promoting the benefits of ICT, it is crucial to provide comprehensive training and support to real estate agents on ICT usage. This can be accomplished through various means, including in-person workshops, online courses, and one-on-one support. In agreement with (Babatunde & Ajayi, 2018 & Zamiri & Esmaeili, 2024), the training should cover both fundamental ICT use and more advanced topics, such as utilizing ICT for marketing, communication, and business management. Furthermore, training programs should be developed to educate agents about the practical benefits and applications of advanced ICT tools like drones, virtual reality, and augmented reality. Collaborations with technology providers can facilitate hands-on training sessions, workshops, and webinars to enhance agents' proficiency in using these tools effectively. Personalized support should also be available for agents requiring individual assistance.

5.2.2.3 Incorporate ICT into the Curriculum and Fostering Industry Collaboration

To improve the use of ICT in real estate practice, Academic institutions should include modules or courses in their real estate programs covering the practical applications of

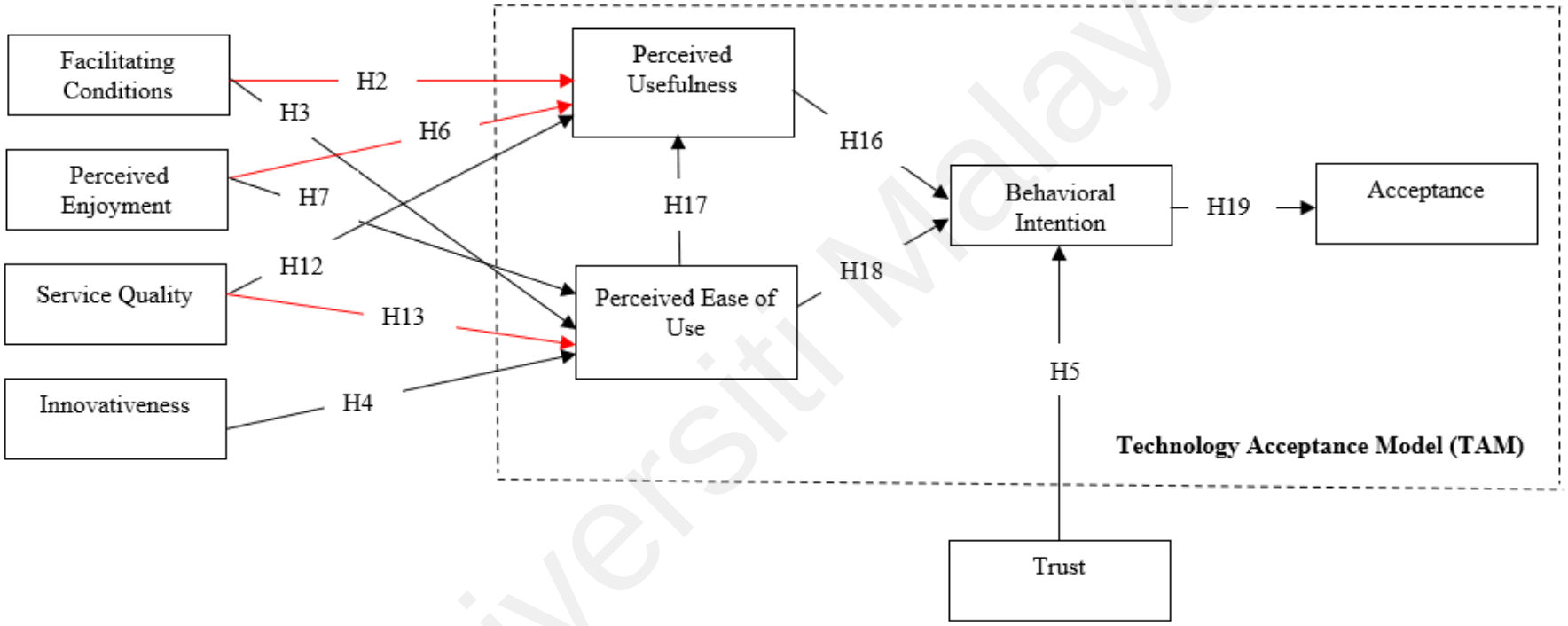
highly adopted ICT tools, ensuring that students are well-prepared for the technology-driven demands of the real estate industry. The goal is to ensure that students graduate with a skill set that aligns with the technology-driven nature of the real estate sector. This is supported by Mustafa (2019), by fostering connections between academic institutions and industry, students are afforded opportunities to gain hands-on experience. This hands-on experience is crucial for developing practical skills that directly align with the needs of the real estate industry. The collaboration between academia and industry becomes a two-way street, benefiting both parties. Beyond individual skill development, such collaborations have the potential to drive innovation and contribute to economic growth in the context of Malaysia. As students engage with industry practices and challenges, they become key contributors to innovative solutions, fostering a culture of creativity and advancement. This, in turn, can have positive implications for the economic landscape of the country**.** Besides that**,** partner with the industrial sector to develop and promote ICT tools and platforms for real estate agents. Foster collaboration between academia and the real estate industry through forums, conferences, and partnerships. This will create a platform for knowledge exchange, ensuring that academic programs stay relevant to industry needs.

5.2.3 Factors Influencing Perceived Usefulness, Perceived Ease of Use, Behavioral Intention, and Acceptance of ICT among Real Estate Agents: A Discussion of Findings

The results were analyzed using inferential statistics based on the structural equation model. According to the findings of this research, service quality, facilitating conditions, innovativeness, perceived enjoyment, trust, perceived usefulness, perceived ease of use, and behavioral intention, all influence the acceptance of ICT. However, some constructs in this research did not support the hypotheses formulated in Chapter 2. Figure 5.1

illustrates the relationships between these constructs. The following sections discuss the findings related to this research.

Figure 5.1: Relationship Between Constructs



Notes
Arrow in Black: Significant
Arrow in Red: Not Significant

5.2.4 Discussion of the Findings in Relation to the Hypotheses.

5.2.4.1 H2: Facilitating Conditions Not Significantly Influence Real Estate Agents Perceived Usefulness of ICT

The path from Facilitating Conditions to Perceived Usefulness is statistically significant (p-value = 0.055) and Coefficient (β): 0.093, indicating that FC does not significantly influence PU. The real estate agents in the research might not have had adequate access to the necessary resources, training, or support to fully utilise ICT tools. If they lack proper infrastructure or guidance, the potential benefits of ICT may not be realized, thus not influencing their perception of its usefulness. The result contradicts the previous research Lu et al., 2003 argued that facilitating condition influence perceived usefulness. However, it aligns with more recent work by Rumangkit et al. (2023), who suggest that the direct influence of facilitating conditions on perceived usefulness may be limited, especially in situations where technology use is mandated or when other factors, such as perceived ease of use, are more salient. In addition, real estate agents have varying levels of technological competence and comfort with new tools. Some agents may be good at adapting to and utilizing the ICT, while others may struggle or resist change. This variability in individual characteristics can overshadow the impact of facilitating conditions on perceived usefulness.

5.2.4.2 H3: Facilitating Conditions Significantly Influence Real Estate Agents Perceived Ease of Use of ICT

The path from Facilitating Conditions (FC) to Perceived Ease of Use (PEOU) is statistically significant (p-value = 0.000) and Coefficient (β): 0.211, indicating that FC has a significant positive influence on PEOU. When measuring the acceptance of ICT, facilitating conditions is important as it encompasses factors like the user-friendliness of the ICT tools, training, and technical support. These resources are essential for real estate agents to effectively learn, use, and integrate ICT tools into their workflows. Real estate agents might face practical hurdles in adopting and utilizing new technologies without adequate access. In addition, regularly offering training sessions not just on basic usage but also on advanced features and troubleshooting can keep agents engaged and ensure they're getting the most out of the technology. Therefore, the statement highlights that Venkatesh et al., 2012, identified individuals' perceptions of facilitating conditions as a key factor influencing their acceptance and use of technology. This means that even if a technology is objectively perceived ease of use (PEOU) people's perception of the resources and support available to them can significantly impact their willingness to adopt and utilize it effectively. Understanding this concept is important for anyone involved in technology implementation, especially in fields like real estate. By addressing facilitating conditions and ensuring adequate resources and support, organizations can create a more positive environment for technology adoption and maximize its potential benefits for their real estate agents and clients.

5.2.4.3 H4: Innovativeness Significantly Influence Real Estate Agents Perceived Ease of Use of ICT

The path from innovativeness (INNO) to Perceived Ease of Use (PEOU) is statistically significant (p-value = 0.000), and Coefficient (β): 0.342 indicating that innovativeness has a significant positive influence on perceived ease of use. Innovativeness is when individual's openness to trying new things and embracing change. Real estate agents high in innovativeness are more open to experimenting with new tools and software. They are less likely to feel disoriented by new features or interfaces, leading to a smoother user experience and a higher perceived ease of use. This research's results support the findings of Hong et al. (2019). They found that innovativeness significantly influences the perceived ease of use, to use technology.

5.2.4.4 H5: Trust Significantly Influence Real Estate Agents Behavioral Intention of ICT

The path from Trust (TRU) to Behavioural Intention (BI) is statistically significant (p-value = 0.010) and Coefficient (β): 0.112, indicating that TRU has a significant positive influence on BI. This result implies that trust has a positive attitude towards the potential benefits of ICT. Real estate agents who trust the ICT tools are stronger and believe it can help them improve their work, generate more leads, close more deals, and ultimately achieve their goals. This positive perception motivates them to actively engage with the technology and utilize its full potential. In the application of this research, the role of trust is important in the acceptance of ICT by real estate agents. Therefore, real estate agents need to trust the ICT they use to ensure that their data is safe and secure (Taherdoost, 2018). Previous studies (Hu et al., 2019) have found that users' trust has a significant impact on their behavior intention (BI) toward the adoption of the technology. This means

that the more trust a real estate agent has in technology, the more likely they are to adopt and use it.

5.2.4.5 H6: Perceived Enjoyment Not Significantly Influence Real Estate Agents Perceived Usefulness of ICT

The path from Perceived Enjoyment (ENJ) to Perceived Usefulness (PU) is not statistically significant (p-value = 0.171, β = 0.073), indicating that ENJ does not significantly influence PU in this research. This finding contradicts previous research (Do et al., 2020; Park & Park, 2020) that found a positive relationship between ENJ and PU. One possible explanation for this discrepancy is that real estate agents may prioritize the practical applications and effectiveness of ICT tools over the enjoyment factor. Even if they find a tool enjoyable to use, if it does not help them achieve their goals (e.g., generating leads, closing deals), they might not consider it truly useful. Real estate agents often have a task-oriented mindset, focusing on achieving specific outcomes. While enjoyment might make using ICT tools more pleasant, it might not be the primary driver of their perception of usefulness if the tool does not directly contribute to their work objectives.

5.2.4.6 H7: Perceived Enjoyment Significantly Influence Real Estate Agents Perceived Ease of Use of ICT

The path from Perceived Enjoyment (ENJ) to Perceived Ease of Use (PEOU) is statistically significant (p-value = 0.000), and Coefficient (β): 0.233 indicating that ENJ significantly influences PEOU. When real estate agent finds using ICT enjoyable, it becomes less of a mental struggle. Activities are completed with greater flow and less effort, resulting in a perception of the technology being easier to use. Besides that, real

estate agents who find ICT intrinsically enjoyable are more likely to seek out opportunities to use it, explore its features, and experiment with different functionalities. This active engagement further enhances their understanding and skills, ultimately leading to a perception of increased ease of use. Besides that (Adegoke & Oladokun,2020), agreed that the enjoyment derived from the use of the technology is maximized with the use of innovative products, hence, the likelihood that they dedicate their time to the use of such innovation. Wang et al., 2020 also found that perceived enjoyment affects perceived ease of use (PEOU).

5.2.4.7 H12: Service Quality Significantly Influence Real Estate Agents Perceived Usefulness of ICT

The path from Service Quality (SERQ) to Perceived Usefulness (PU) is highly statistically significant (p-value = 0.000) and Coefficient (β): 0.555, indicating that SERQ has a substantial positive influence on PU. In the context of ICT, service quality refers to the overall quality of the technology services being provided. This includes aspects like reliability, responsiveness, assurance, empathy, and tangibles associated with the technology. For real estate agents, this would encompass the quality of software, platforms, and tech support they use in their daily operations. Besides that, when ICT is reliable and consistent, real estate agents are more likely to view the technology as beneficial in their work. For instance, a dependable property listing database that is regularly updated and rarely has downtime will be seen as more useful. The perceived usefulness of ICT, influenced by high service quality, directly impacts on real estate agent's decision to adopt and continually use the technology. Real estate agents are more likely to integrate and depend on ICT in their daily operations if they find it useful, which is significantly determined by the quality of service provided. The finding of this research supports the results from Ullah et al. (2021) and Sepasgozar et al. (2018). Their research

revealed that service quality significantly influences perceived usefulness (PU) in ICT usage. This significance arises because technological services can help businesses provide a more personalized, efficient, and convenient customer experience. High service quality often leads to better feedback from users, which can be used to further improve the ICT services, creating a positive feedback loop. As services improve and better meet the needs of real estate agents, their perceived usefulness of the technology increases.

5.2.4.8 H13: Service Quality Not Significantly Influence Real Estate Agents Perceived Ease of Use of ICT

The path from Service Quality (SERQ) to Perceived Ease of Use (PEOU) is not statistically significant (p-value = 0.418, $\beta = 0.042$), indicating that SERQ does not significantly influence PEOU in this research. This finding contradicts previous research (Ullah et al., 2021; Sepasgozar et al., 2019) that found a positive relationship between SERQ and PEOU. One possible explanation is that perceived ease of use is often influenced by the inherent design and user interface of the ICT tool itself. Even with excellent service quality, if the tool is inherently complex or poorly designed, real estate agents might still find it difficult to use. It's possible that the ICT tools in this research improved service quality (e.g., quicker response times) but were not user-friendly, negatively impacting the perceived ease of use.

5.2.4.9 H16: Perceived Usefulness Significantly Influence Real Estate Agents Behavioral Intention of ICT

The path from PU to BI is highly statistically significant (p-value = 0.000) and Coefficient (β):0.563, indicating that PU has a substantial positive influence on BI. PU is defined as the degree to which a person believes that using a particular system or technology will enhance their job performance. In the case of real estate agents, this would involve beliefs about how ICT tools (like virtual tour technologies, Robotic Process Automation, etc.) can improve their work efficiency, client interaction, and sales outcomes. Behavioral Intention refers to the measure of the likelihood of a person employing a particular technology or system. When real estate agents perceive ICT as useful, they are more likely to have a strong intention to use it. This is because they anticipate that the use of such technology will lead to positive outcomes in their work, such as better client management, more effective marketing, easier access to property listings, and overall better sales performance. Many studies in the acceptance of technology in real estate field (Taherdoost, 2018; Sepasgozar et al., 2019; Guhr et al., 2020; Park & Park, 2021; Al-Husamiyah & Al-Bashayreh, 2021; Ullah et al., 2021) supported the same result. In the context of this research, real estate agents expect the benefit from using ICT perceived usefulness improve their job productivity and job performance. Real estate agents who find ICT tools useful believe that these tools help them provide better service to their clients. This could be through faster communication, better data analysis, or more effective marketing of properties. This improved service quality is likely to lead to increased client satisfaction and business success.

5.2.4.10 H17: Perceived Ease of Use Significantly Influence Real Estate Agents Perceived Usefulness of ICT

Analysis: The path from PEOU to PU is statistically significant (p-value = 0.004) and Coefficient (β): 0.143, indicating that PEOU has a positive influence on PU. PEOU refers to the degree to which real estate agents believe that using a particular ICT tool will be free of effort. It encompasses aspects like the user-friendliness of the technology, the ease of learning how to use it, and the level of technical expertise required to operate it effectively. Meanwhile, PU in this context, is the extent to which real estate agents believe that using the ICT will enhance their job performance. This includes improving efficiency, increasing productivity, providing better client service, and generally making their work as real estate agents more effective. PEOU influences PU if an ICT tool is easy to learn and use, real estate agents are more likely to perceive it as beneficial. This is because they can quickly integrate it into their daily work routines. With easy-to-use ICT tools, real estate agents can spend less time grappling with technology and more time on core activities like client interaction, property viewing, and closing deals. This shift in focus directly enhances their perception of the usefulness of the technology. The influence of PEOU on PU was suggested by various studies. Using the TAM, Al-Husamiyaha & Al-Bashayreha (2021) in their research to explore the factors that influence smart home services acceptance among users asserted a positive relationship between PEOU and PU on users' intention to use smart home services. With the same model of research, (Chatterjee et al., 2021) revealed that the adoption of social media marketing for sustainable business growth is confirmed that PEOU affects PU. In summary, when ICT tools are perceived as easy to use, real estate agents are more likely to engage with them, integrate them into their work practices, and discover their benefits. This positive experience with the ease of using the technology directly enhances its perceived

usefulness, as real estate agents can more readily recognize and appreciate how the technology can improve their job performance.

5.2.4.11 H18: Perceived Ease of Use Significantly Influence Real Estate Agents Behavioral Intention of ICT

The path from PEOU to BI is highly statistically significant (p-value = 0.000) and the Coefficient (β): 0.200, suggesting that PEOU has a substantial positive influence on BI. PEOU refers to the degree to which real estate agents believe that using a specific ICT tool will be effortless. It encompasses the user-friendliness of the application, the simplicity of the interface, the ease of learning how to use it, and the level of technical expertise required. Meanwhile, BI in this context is the likelihood or propensity of real estate agents to employ ICT in their professional activities. It reflects their willingness to embrace and consistently use these technological tools in their work. If ICT tools are perceived as easy to use, real estate agents are more likely to have the intention to use them. When technology is user-friendly, agents are more inclined to experiment with it. This experimentation can lead to discovering efficient ways to integrate the tool into their work processes, thereby reinforcing their intention to use it. Perceived ease of use builds confidence among agents in their ability to handle the technology. This comfort level makes them more open to adopting new technologies as they feel more capable of mastering them. The result of this research supports the hypotheses from the previous research by Ullah et al., 2021 on exploring the user perceptions of real estate online platforms has found that perceived ease of use (PEOU) affects the behavior intention (BI) of the user to use real estate online platforms. Besides that, a research by Park & Park, 2020 on factors of the technology acceptance model for Construction IT also revealed the positive significant of PEOU affect behavioral intention (BI) to use the IT system. In conclusion, when real estate agents perceive ICT as easy to use, they are more likely to

form a positive intention to adopt and regularly use the technology. This is because an easy-to-use tool reduces the effort and time required to learn and operate it, increases confidence in its use, and generally leads to a more favorable technology adoption experience.

5.2.4.12 H19: Behavioral Intention Significantly Influence Real Estate Agents Acceptance of ICT

The path from Behavioral Intention (BI) to Acceptance (ACC) is highly statistically significant (p-value = 0.000) and Coefficient (β):0.709, indicating that BI has a significant positive influence on ACC. Behavior Intention refers to the degree of mental commitment or willingness of real estate agents to use ICT in their professional activities. BI encompasses the agents' plans, goals, and preparedness to engage with and utilize various technological tools in their work. Meanwhile, acceptance in this context signifies the actual adoption and consistent use of ICT by real estate agents. It goes beyond mere willingness or intention; it is the realization of that intention into practical, ongoing use of technology in their daily operations. The findings of this research show that Behavioral Intention is often the precursor to actual behavior. When real estate agents have a strong intention to use ICT, it's more likely they will take the necessary steps to learn, adapt, and integrate these technologies into their work routines. Besides that, when real estate agents with strong behavioral intentions start using ICT, they can influence their peers through demonstration and positive word-of-mouth. This social influence can further drive collective acceptance in their professional community. The finding of this research aligns with previous studies by Dieck & Jung, 2015; Ullah et al.,2019; Park & Park, 2020; Al-Husamiyah & Al-Bashayreh, 2021, found that the relationship between BI and Acceptance (ACC) is the strongest of the relationships in their model. A strong intention

to use ICT often translates into actual usage, as real estate agents are more likely to invest in, commit to, and persist in using the technology.

5.2.5 Findings on the importance and performance factors affecting Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Behavioral Intention (BI), and Acceptance (ACC) of ICT among Real Estate Agents

Importance-performance map analysis (IPMA) using SmartPLS was applied in this research. The discussion of findings will be broken down into importance scores and performance scores. These scores help identify which factors are deemed most critical (importance) and how well these factors are currently being addressed (performance) in the context of ICT use in real estate. The findings revealed that Service Quality is the most important factor affecting Perceived Usefulness, while Perceived Enjoyment is the most important factor affecting Perceived Ease of Use. Furthermore, Perceived Usefulness is the most influential factor affecting Behavioral Intention, and ultimately, Behavioral Intention is the most important factor affecting the Acceptance of ICT.

5.2.6 Discussion of Findings in Relation to the Importance-Performance Map Analysis (IPMA)

The section below will discuss the Importance-Performance Map Analysis (IPMA) of the four constructs: Perceived Usefulness, Perceived Ease of Use, Behavioral Intention, and Acceptance of ICT.

5.2.6.1 Importance Factors Affecting the Perceived Usefulness (PU) of ICT among Real Estate Agents in Malaysia.

Service Quality (SERQ) emerges as the most critical factor influencing the perceived usefulness of ICT among real estate agents in Malaysia, with an importance score of 0.561. This finding aligns with previous research by Ullah et al. (2021) and Sepasgozar et al. (2018), which revealed that service quality significantly influences perceived usefulness. This highlights that service quality plays a crucial role in shaping real estate agents' perceptions of ICT tools' usefulness. When real estate agents perceive the services associated with ICT tools to be of high quality, they are more likely to find those tools useful and valuable in their daily work. This is because technology services can help businesses to provide a more personalized, efficient, and convenient customer experience. It is essential to focus on providing high-quality services that meet their specific needs and expectations. To promote ICT adoption, it is essential to focus on providing high-quality services that meet real estate agents' specific needs and expectations. This could involve: ensuring the reliability and stability of ICT tools and platforms, offering training and resources to help real estate agents learn how to use ICT tools effectively, communicating clearly about the benefits and value of ICT tools for real estate agents, and building trust by addressing concerns about data security and privacy.

Perceived Ease of Use (PEOU), with a moderate importance score of 0.143, indicates that the ease of use of ICT tools moderately influences their perceived usefulness. This is logical, as tools that are easier to use can be more readily integrated into daily tasks. The importance score of 0.123 for Facilitating Conditions (FC) places it slightly above Perceived Enjoyment (ENJ) in significance. This suggests that factors like the availability of resources, support, and infrastructure for effective ICT use are considered somewhat important by real estate agents. Perceived Enjoyment (ENJ), with an importance score of

0.106, is seen as relatively less important compared to other predictors. This indicates that while the enjoyment derived from using ICT tools is recognized, it is not a primary concern for the real estate agents. Practical considerations and work efficiency seem to take precedence over perceived enjoyment. Lastly, Innovativeness (INNO), with the lowest importance score of 0.049, is perceived as the least critical factor. This might suggest that real estate agents care more about whether a tool is practical and reliable, and helps them do their job, rather than whether it's the newest, most cutting-edge technology.

5.2.6.2 Performance Factors Affecting the Perceived Usefulness (PU) of ICT among Real Estate Agents in Malaysia.

The performance scores, ranging from 71.734 to 77.775, indicate that all predictor variables are perceived to perform well. Service Quality, with the highest score of 77.775, further emphasizes its importance and its strong contribution to perceived usefulness. This demonstrates that service quality is not only considered essential but also meets real estate agents' expectations in practice. The analysis reveals a clear hierarchy of factors influencing the perceived usefulness of ICT among Malaysian real estate agents. Service quality is the most crucial factor, significantly impacting agents' perceptions. This is followed by perceived ease of use, facilitating conditions, enjoyment, and innovativeness. The performance scores suggest that current ICT services generally meet real estate agents' needs, particularly regarding service quality. To enhance the perceived usefulness of ICT, stakeholders should prioritize maintaining high service quality while also addressing other factors based on their importance and performance.

5.2.6.3 Importance Factors Affecting the Perceived Ease of Use (PEOU) of ICT among Real Estate Agents in Malaysia.

With the highest importance score of 0.342, Innovativeness (INNO) emerges as the most critical factor influencing PEOU. It's interesting to note that while service quality is the most critical factor influencing perceived usefulness, it is the least critical factor influencing perceived ease of use. This suggests that real estate agents may view these two concepts differently.

When it comes to perceived usefulness, real estate agents prioritize the quality of services associated with ICT tools, such as reliability, responsiveness, and assurance. They want to be confident that the ICT tools will help them achieve their work objectives effectively and efficiently.

However, when it comes to perceived ease of use, real estate agents prioritize factors such as innovativeness, enjoyment, and facilitating conditions. They want ICT tools that are easy to learn, fun to use, and supported by adequate resources and infrastructure to integrate into their daily practice.

This contrast highlights the multi-faceted nature of technology acceptance. This aligns with research by Wang et al. (2019) and Cao & Shao (2021), who found that innovativeness is a major factor influencing perceived ease of use (PEOU) and the intention to use technology. People with high levels of innovativeness are often early adopters of new technologies and are eager to learn about and experiment with them. They are also more likely to be open to new technologies and enjoy the experience of learning them. While service quality is essential for ensuring that ICT tools are perceived

as useful, other factors, such as innovativeness and enjoyment, are also important for ensuring that these tools are perceived as easy to use.

Following innovativeness, perceived enjoyment is the second most important factor for ease of use with an importance score of 0.233. This indicates that the extent to which real estate agents find using ICT enjoyable significantly impacts their perception of its ease of use. Enjoyable ICT tools are likely easier to use because they motivate real estate agents to engage with the technology more frequently and with less resistance. Facilitating Conditions (FC), assigned an importance score of 0.211, are also significant but slightly less so than Innovativeness (INNO) and Perceived Enjoyment (ENJ). This suggests that while support and resources for using ICT are important, they are not as critical as the innovation and enjoyment aspects of ICT tools The lowest importance score of 0.042 for Service Quality (SERQ) suggests that, compared to the other factors, the quality of services related to ICT (such as customer support and reliability) is considered the least important in influencing its perceived ease of use. This may indicate that as long as ICT tools are innovative, enjoyable, and supported by facilitating conditions, their service quality is of relatively minor concern in determining their ease of use (PEOU).

5.2.6.4 Performance Factors Affecting the Perceived Ease of Use (PEOU) of ICT among Real Estate Agents in Malaysia.

INNO and ENJ, both demonstrate strong performance scores of 74.534 and 74.806, respectively. These high scores indicate that current ICT tools are perceived as innovative and enjoyable by real estate agents, aligning well with their importance in influencing PEOU. Meanwhile, FC shows a moderate performance score of 71.734, suggesting that while the facilitating conditions are somewhat effective, there may be room for improvement in resources and support systems to better facilitate the ease of use of ICT

tools. Finally, SERQ exhibits the highest performance score of 77.775. This suggests that the service quality related to ICT is performing very well in practice, even though it is not seen as a crucial factor for its ease of use.

The analysis reveals that for real estate agents in Malaysia, the perceived ease of use of ICT is most strongly influenced by its innovativeness and the enjoyment users derive from it. These factors not only rank highest in importance but also show strong performance, indicating that current ICT solutions are meeting these needs effectively. However, there is an interesting contrast with facilitating conditions, which, despite their significant role, show a lower performance score, pointing to potential areas for enhancement.

Service quality's low importance yet high performance may suggest that real estate agents take high service quality as a given or that improvements in other areas might yield more significant impacts on the perceived ease of use. It underscores an opportunity to allocate resources more efficiently, perhaps by focusing on bolstering facilitating conditions or enhancing the innovative aspects of ICT tools to further ease their use.

Overall, these findings offer valuable insights for ICT providers and real estate agents in Malaysia. Emphasizing the development and communication of innovative features and ensuring ICT tools are enjoyable to use could further enhance their ease of use. Additionally, improving facilitating conditions by providing more comprehensive training and resources could address the moderate performance in this area, potentially leading to higher overall satisfaction with ICT among real estate agents.

5.2.6.5 Importance Factors Affecting the Behavioral Intention (BI) of ICT among Real Estate Agents in Malaysia.

With an importance score of 0.563, Perceived Usefulness (PU) is identified as the most critical factor influencing Behavioral Intention (BI). This underscores the principle that if ICT tools are perceived as enhancing work efficiency or providing significant benefits, real estate agents are more likely to use them. Service Quality (SERQ), with a substantial importance score of 0.324, indicates that the quality of ICT-related services (including reliability, responsiveness, and assurance) plays a significant role in shaping real estate agents' intentions to use ICT. High service quality likely enhances users' confidence in ICT tools, contributing to their behavioral intention. Perceived Ease of Use (PEOU), a moderately important predictor with a score of 0.28, suggests that the ease with which real estate agents can use ICT also influences their BI. Tools that are user-friendly and easy to navigate are more likely to be adopted. Trust (TRU), holding a moderate importance score of 0.112, indicates that real estate agents' trust in ICT tools (regarding security, privacy, and reliability) moderately influences their intention to use these technologies. Finally, Enjoyment (ENJ), Facilitating Conditions (FC), and Innovativeness (INNO) have relatively lower importance scores (0.106, 0.112, and 0.096, respectively), suggesting that while these factors contribute to BI, they are not as pivotal as PU, SERQ, or PEOU.

5.2.6.6 Performance Factors Affecting the Behavioral Intention (BI) of ICT among Real Estate Agents in Malaysia.

Perceived Usefulness (PU) has the highest performance score (81.002), underscoring the critical role of ICT tools in predicting real estate agents' behavioral intention to adopt ICT. This high score suggests that real estate agents find significant value and usefulness

in ICT, strongly influencing real estate agent's willingness to use it. Similarly, Service Quality (SERQ) has a high-performance score of 77.775, indicating that ICT-related services are perceived positively and play a substantial role in determining real estate agents' behavioral intention (BI) toward ICT usage. Moreover, the Perceived Ease of Use (PEOU) achieves a performance score of 73.685, reflecting satisfactory ease of use, which corresponds with its moderate importance in influencing behavioral intention. This suggests that the real estate agents find ICT tools reasonably user-friendly, contributing to their overall intention to use them. Trust (TRU) also shows a commendable performance score of 76.024, revealing a general trust among agents in ICT tools' security, reliability, and privacy, further supporting their intention to use these technologies.

Lastly, the factors of Enjoyment (ENJ), Facilitating Conditions (FC), and Innovativeness (INNO) display performance scores ranging from 71.734 to 75.534. While these scores suggest decent to good performance, they also highlight potential areas for improvement. Given their roles in influencing BI, enhancing these aspects could further bolster real estate agents' intentions towards ICT adoption, complementing the strengths observed in PU, SERQ, PEOU, and TRU.

The analysis highlights the paramount importance of Perceived Usefulness (PU) and Service Quality (SERQ) in influencing the behavioral intention of real estate agents towards ICT use in Malaysia. These findings suggest that efforts to improve Behavioral Intention (BI) should prioritize enhancing the usefulness and service quality of ICT tools. Given the high-performance scores for Perceived Usefulness (PU) and Service Quality (SERQ), it appears that current ICT offerings are largely meeting these needs.

However, the moderate importance of Perceived Ease of Use (PEOU) and Trust (TRU), alongside their performance scores, suggests that while these factors are being addressed satisfactorily, there remains room for improvement. Enhancing ease of use and building trust through improved security and privacy features could further strengthen real estate agents' intentions to use ICT.

While Perceived Enjoyment (ENJ), Facilitating Conditions (FC), and Innovativeness (INNO) are relatively less critical to Behavioral Intention (BI), they still contribute to the overall intention to use ICT. Innovations that make ICT tools more enjoyable, accessible, and use, and supported by facilitating conditions, could complement efforts to improve PU, SERQ, PEOU, and TRU. This creates a comprehensive approach to boosting BI among real estate agents in Malaysia.

5.2.6.7 Importance Factors Affecting the Acceptance (ACC) of ICT among Real Estate Agents in Malaysia.

Behavioral Intention (BI) is identified as the most critical factor with an exceptionally high importance score of 0.709. This score emphasizes that the intention to use ICT, driven by attitudes and perceived norms, is the strongest predictor of ICT acceptance among real estate agents. It underscores the psychological readiness or willingness of agents to integrate ICT into their professional practices. Perceived Usefulness (PU) follows as the second most important factor with a score of 0.399, highlighting that the practical benefits and enhancements in job performance offered by ICT significantly influence its acceptance. This finding aligns with technology acceptance models, where usefulness is a key determinant of technology adoption. Service Quality (SERQ), with an importance score of 0.23, indicates that the quality of services related to ICT (including reliability, user support, and functionality) also plays a substantial role in its acceptance.

High service quality likely contributes to a positive perception of ICT, fostering its adoption. Trust (TRU) holds a lesser importance score of 0.079, suggesting that while trust in ICT (encompassing aspects like security, privacy, and reliability) influences acceptance, it is considered less critical compared to BI, PU, and SERQ. Lastly, ENJ (Perceived Enjoyment), FC (Facilitating Conditions), and INNO (Innovativeness) have lower importance scores, indicating they are less critical in the acceptance of ICT.

5.2.6.8 Performance Factors Affecting the Acceptance (ACC) of ICT among Real Estate Agents in Malaysia.

The strong performance score of 81.002 for Perceived Usefulness (PU) indicates that real estate agents find ICT tools highly useful, positively influencing their acceptance and usage. Meanwhile, Behavioral Intention (BI) exhibits the highest performance score of 80.448, suggesting a strong inclination towards adopting ICT among agents, reflecting positive perceptions and attitudes towards its use. Furthermore, Service Quality (SERQ) and Trust (TRU) show high-performance scores of 77.775 and 76.024, respectively. This reflects that service quality is perceived as satisfactory and that there is a good level of trust in ICT among agents. These aspects are performing well, aligning with their importance in influencing ICT acceptance.

Perceived Ease of Use (PEOU) presents a decent performance score of 73.685, indicating that ICT tools are considered relatively easy to use. However, there might be room for improvement to further enhance the user experience. Perceived Enjoyment (ENJ), Facilitating Conditions (FC), and Innovativeness (INNO) exhibit performance scores ranging from 71.734 to 74.534. While these scores suggest decent performance, their relatively lower importance in affecting acceptance may indicate areas where enhancements could be made. Strategies could focus on either increasing the perceived

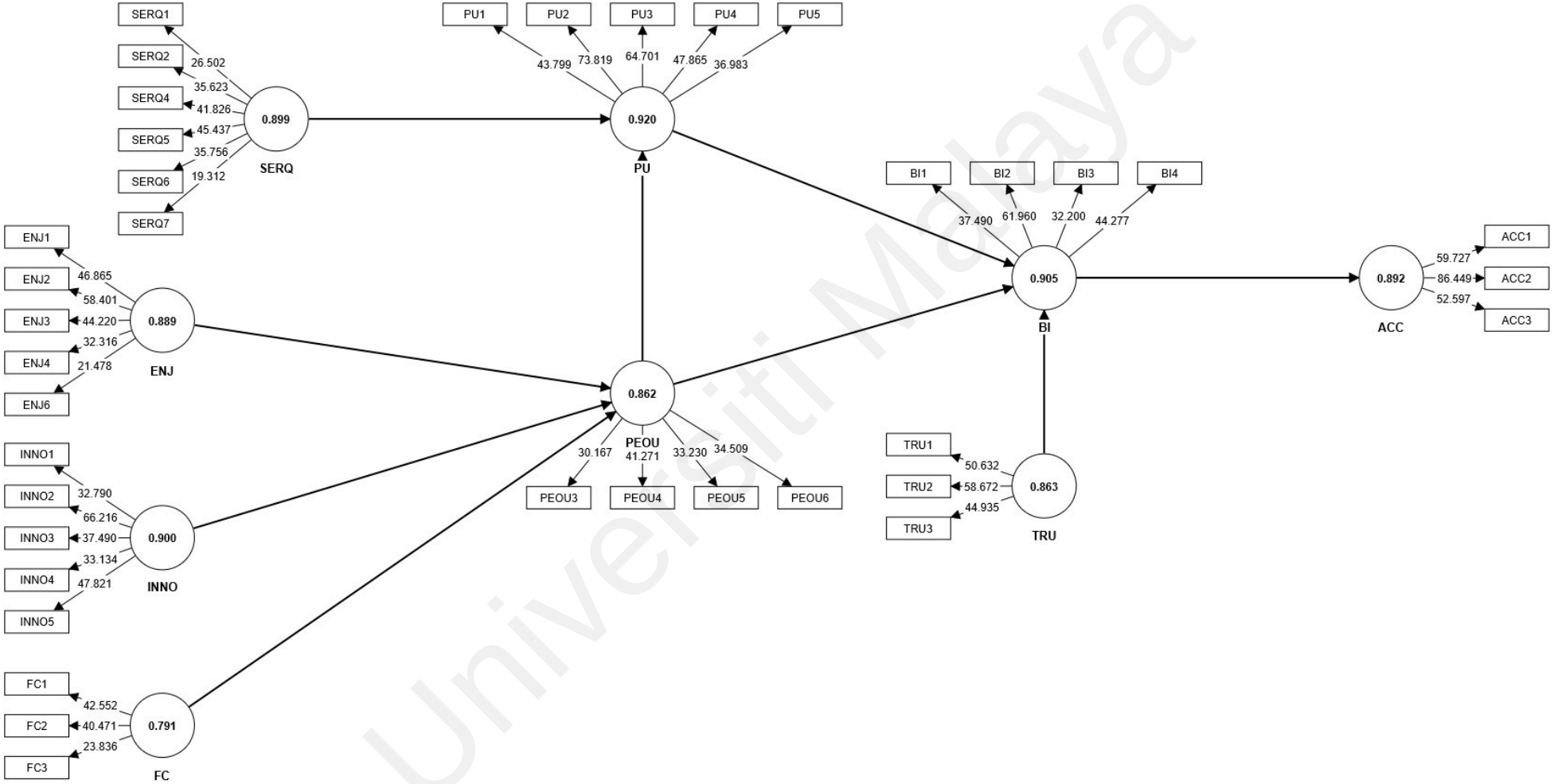
importance of these factors or improving their performance to further encourage ICT acceptance.

The findings highlight that Behavioral Intention and Perceived Usefulness are the most significant factors influencing ICT acceptance among real estate agents in Malaysia, with both demonstrating strong performance. This suggests that efforts to enhance ICT acceptance should focus on reinforcing these aspects, particularly through strategies that bolster real estate agents' intentions to use ICT and clearly articulate the usefulness of ICT in their professional activities.

Service Quality also plays a crucial role in acceptance, as evidenced by its high performance. Trust, while less critical than other factors, still requires attention to ensure it does not become a barrier to ICT adoption. The lesser importance of ENJ, FC, and INNO suggests these factors might be leveraged more effectively or reevaluated to better understand their potential impact on ICT acceptance. Enhancing these aspects could provide additional pathways to increase acceptance, particularly by making ICT tools more enjoyable, accessible, and innovative. In conclusion, the analysis underscores the importance of focusing on the key drivers of ICT acceptance while also considering the potential of other factors to contribute to a more comprehensive and effective strategy for promoting ICT adoption among real estate agents in Malaysia.

5.2.7 Findings on a model that integrates the factors influencing the acceptance of ICT among real estate agents

To answer this research, Bootstrapping based on the SmartPLS was applied. The following are the findings that resulted from Research Objective 4:



Model of the Acceptance of ICT among Real Estate Agents
Source: Author, 2023

5.2.8 Discussion of Findings in Relation to the Proposed Model

1) Service Quality (SERQ) → Perceived Usefulness (PU):

There is a significant positive influence of Service Quality on Perceived Usefulness. The service quality provided significantly impacts how users perceive the usefulness of Information and Communication Technology (ICT). By focusing on providing high-quality service, ICT providers can directly impact agents' perception of usefulness. This involves ensuring reliability and responsiveness through stable platforms, prompt technical assistance, and quick issue resolution, which builds trust and demonstrates consistent performance.

Furthermore, enhancing tangibles and assurance through user-friendly interfaces, comprehensive training materials, and clear demonstrations instills confidence and highlights the tools' well-designed nature. Crucially, empathy and customization, such as tailored training, market-specific tools, and personalized support, make agents feel valued and understood, reinforcing the tools' relevance to their specific needs. Essentially, when agents experience reliable, user-friendly, and personalized ICT services, they perceive these tools as more valuable, leading to increased adoption and integration within the Klang Valley real estate sector.

2) Facilitating Conditions (FC) → Perceived Ease of Use (PEOU):

There is a significant positive influence of Facilitating Conditions on Perceived Ease of Use. The presence of facilitating conditions significantly contributes to users perceiving ICT as easy to use. By focusing on creating robust facilitating conditions,

ICT providers can directly address these concerns. Facilitating conditions encompass the availability of resources, technical support, and training that empower agents to confidently use ICT. When agents have access to readily available assistance, such as clear tutorials, responsive help desks, and user-friendly interfaces, they are more likely to perceive the technology as easy to navigate.

Furthermore, providing adequate infrastructure, including reliable internet access and compatible hardware, removes potential barriers and enhances the overall user experience. Effective training programs that cater to the specific needs and skill levels of real estate agents in the Klang Valley region can also significantly reduce perceived complexity. Ultimately, by establishing a supportive environment that simplifies the use of ICT, agents will find these tools less daunting and more accessible, leading to increased adoption and integration into their daily practices.

3) Enjoyment (ENJ) → Perceived Ease of Use (PEOU):

There is a significant positive influence of Perceived Enjoyment on Perceived Ease of Use. Users' perceived enjoyment of ICT significantly contributes to their perception of its ease of use. In a context where many agents are hesitant due to perceived complexity, fostering enjoyment can significantly reduce this barrier. When agents experience pleasure or satisfaction while using ICT, they are more likely to engage with the tools, reducing their anxiety and increasing their familiarity.

This positive emotional connection translates into a feeling of effortless interaction, effectively lowering the perceived learning curve. For instance, if a new system or tool incorporates gamification elements, interactive tutorials, or visually appealing interfaces, agents are more likely to find it engaging and, consequently, easier to use.

By focusing on creating an enjoyable user experience, ICT providers can demystify these technologies, making them less intimidating and more approachable, ultimately driving greater adoption and utilization among real estate agents.

4) Innovativeness (INNO) → Perceived Ease of Use (PEOU):

There is a significant positive influence of Innovativeness on Perceived Ease of Use. The level of innovativeness in ICT significantly contributes to users perceiving it as easy to use. Currently, many agents resist full ICT utilization due to perceived complexity and a comfort with traditional methods. By introducing innovative ICT solutions, providers can directly address these concerns. If agents perceive ICT as innovative, they are more likely to see it as easy to use. This stems from the understanding that innovative tools often prioritize user-centric design, streamlining processes and simplifying interactions.

For instance, features like intuitive drag-and-drop interfaces, AI-powered automation, or virtual reality property tours, which represent innovation in the real estate context, can drastically reduce the perceived learning curve. When agents experience these novel, user-friendly features, they are more likely to believe that the ICT tools are straightforward and effortless to operate. In essence, by focusing on developing and implementing innovative ICT solutions that prioritize ease of use, providers can effectively bridge the gap between agents' current reluctance and full ICT adoption within the Klang Valley real estate market.

5) Perceived Ease of Use (PEOU) → Perceived Usefulness (PU):

There is a significant positive influence of Perceived Ease of Use on Perceived Usefulness. The perceived ease of use with which users can interact with ICT significantly contributes to their perception of its usefulness. By focusing on simplifying the user experience, ICT providers can directly enhance agents' perception of the tools' usefulness. When agents find ICT platforms and applications intuitive, straightforward, and easy to navigate, they are more likely to recognize the practical benefits these tools offer.

If a CRM system, for example, allows for quick data entry, easy client management, and streamlined property searches, agents will perceive it as a valuable asset that saves time and improves efficiency. Conversely, if a platform is cumbersome, requires extensive training, or presents a steep learning curve, agents are likely to dismiss it as impractical and burdensome. Therefore, by prioritizing user-friendly interfaces, providing clear instructions, and offering accessible training, ICT providers can significantly boost agents' confidence and demonstrate the tangible advantages of incorporating these technologies into their daily workflow. Ultimately, when agents perceive ICT tools as easy to use, they are more likely to recognize their usefulness, thereby increasing adoption and integration within the Klang Valley real estate sector.

6) Perceived Usefulness (PU) → Behavioral Intention (BI):

There is a significant positive influence of Perceived Usefulness on Behavioural Intention. Users' perception of the usefulness of ICT significantly influences their intention to use it. Currently, their limited ICT utilization reflects a skepticism about

its practical value. By demonstrating clear and tangible benefits, ICT providers can directly impact agents' willingness to integrate these tools into their workflow. When agents perceive ICT as genuinely enhancing their productivity, efficiency, or client relationships, they are more likely to form a strong intention to use it. For instance, if a CRM system demonstrably streamlines lead management, automates property listings, or improves client communication, agents will recognize its value and be motivated to incorporate it into their daily routines.

Conversely, if ICT tools are perceived as merely adding complexity without delivering substantial advantages, agents will remain reluctant to adopt them. Therefore, highlighting the practical applications and positive outcomes of ICT, such as increased sales, improved client satisfaction, or reduced administrative burden, is crucial. By emphasizing the "what's in it for me" aspect, ICT providers can foster a strong sense of perceived usefulness, which in turn will cultivate a positive behavioral intention among real estate agents in Klang Valley, ultimately leading to greater ICT acceptance and utilization.

7) Perceived Ease of Use (PEOU) → Behavioral Intention (BI):

There is a significant positive influence of Perceived Ease of Use on Behavioural Intention. Users' perception of the ease of use significantly influences their intention to use ICT. By prioritizing user-friendly design and intuitive functionality, ICT providers can significantly boost agents' intention to use these technologies. When agents find a platform or application easy to navigate, understand, and operate, they are far more likely to embrace it as part of their routine.

For instance, a simple, mobile-friendly app that allows agents to quickly access property information, manage client interactions, and schedule viewings will foster a greater inclination to incorporate it into their daily workflow. Conversely, a complex system with a steep learning curve will deter even the most motivated agents. Therefore, by focusing on clear interfaces, streamlined processes, and accessible training, ICT providers can reduce the perceived effort required to utilize these tools, thereby increasing agents' confidence and willingness to adopt them. Essentially, when agents perceive ICT as easy to use, their intention to integrate it into their professional practice significantly increases, leading to greater acceptance and utilization in the Klang Valley real estate market.

8) Trust (TRU) → Behavioural Intention (BI):

There is a significant positive influence of Trust on Behavioural Intention. The level of trust user has in ICT significantly influences their intention to use it. Building trust is therefore paramount to driving behavioral intention, which ultimately translates to actual usage. When agents trust the ICT platforms and providers, they are more likely to intend to integrate these tools into their daily workflows. This trust can be fostered through transparent data handling practices, robust security measures, and consistent performance. If agents believe that their client data is secure, that the platforms are reliable, and that the providers are committed to their success, they will be more inclined to use the tools.

For instance, a real estate platform that demonstrates a strong track record of data security, provides verifiable testimonials from other agents, and offers clear terms of service will build trust and encourage agents to use its services. Conversely, if agents perceive a lack of transparency, experience frequent technical glitches, or have

concerns about data privacy, their intention to use the ICT tools will diminish. In essence, by prioritizing trust-building measures, ICT providers can significantly influence agents' behavioral intention, leading to greater acceptance and utilization of ICT within the Klang Valley real estate sector.

9) Behavioural Intention (BI) → Acceptance (ACC):

There is a significant positive influence of Behavioural Intention on Acceptance. Users' intention to use ICT significantly influences their overall acceptance of it. In essence, simply providing access to technology is insufficient; agents must genuinely intend to integrate these tools into their daily routines. This intention is shaped by a confluence of factors, including perceived usefulness, ease of use, and social influence. When agents develop a strong desire to utilize ICT, fueled by the perceived benefits and ease of operation, they are far more likely to translate that intention into actual acceptance.

This means actively incorporating digital tools for tasks like property listings, client management, and market analysis. By fostering a positive attitude and creating an environment that encourages proactive engagement with ICT, providers can bridge the gap between initial interest and sustained adoption. Ultimately, if real estate agents in Klang Valley develop a firm behavioral intention to use ICT, their overall acceptance and integration of these technologies will significantly increase, leading to a more digitally proficient and efficient real estate sector.

5.3 Chapter Summary

This chapter presented the findings and discussion of the research, focusing on the factors influencing ICT acceptance among real estate agents in Klang Valley. The analysis commenced with an examination of the ICT tools utilized by agents in practice, revealing a disparity between the adoption of basic communication devices and advanced software platforms. Subsequently, the chapter explored the determinants of perceived usefulness, perceived ease of use, behavioral intention, and acceptance of ICT. The findings demonstrated statistically significant relationships aligning with the research hypotheses. An analysis of the importance and performance of these factors was conducted using the Importance-Performance Map Analysis (IPMA). This analysis identified areas requiring improvement, specifically in service quality and advanced tool training, despite their recognized importance to agents. The discussion further contextualized the findings with the established hypotheses, validating the proposed conceptual framework. Finally, the chapter presented a comprehensive model integrating these factors, offering a predictive model for ICT acceptance among real estate agents. This model underscores the necessity of a holistic approach, encompassing both technological and human factors, to facilitate digital transformation within the Klang Valley real estate sector.

CHAPTER 6: CONCLUSION

6.1 Introduction

This chapter primarily serves as a recap of the entire research. To conclude, it also addresses the limitations of the present research and recommends several opportunities for future research.

6.2 Summary of the Research

The use of Information and Communication Technology (ICT) has become essential in today's real estate industry. The present research sought to explore the factors of ICT acceptance among real estate agents in Klang Valley, Malaysia, aiming to propose a model for the acceptance of ICT among real estate agents in Klang Valley, Malaysia. The research was guided by four key objectives, each designed to provide a comprehensive understanding of the ICT landscape in the real estate sector. All the objectives of this research have been met and they are discussed in detail in the previous chapter. The following sections summarize the findings and implications of each objective.

Research Question 1: What are the Information and Communication Technology (ICT) tools used by real estate agents in practice?

This research question was accomplished through a comprehensive survey of 400 real estate agents in Klang Valley, Malaysia. The survey inquired about the frequency with which various ICT tools are used in their daily work. Respondents indicated their usage frequency on a scale ranging from "Never" to "Every time" for a variety of ICT tools. The findings revealed that mobile instant messaging, social media, and real estate agent

websites are the most frequently used tools, while technologies like virtual reality, augmented reality, and robotic process automation have seen limited adoption. This limited adoption of advanced technologies indicates a potential area for growth and education within the industry. These findings can guide strategies to encourage greater ICT adoption. This could involve developing user-friendly tools that cater to the specific needs of real estate agents, providing comprehensive training and support, and showcasing the tangible benefits of ICT adoption through success stories and testimonials. By overcoming the existing obstacles to ICT adoption, the real estate industry can leverage technology to its full potential, leading to increased efficiency and productivity in real estate professionals.

Research Question 2: What are the factors influencing Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Behavioral Intention (BI), and Acceptance (ACC) of ICT among Real Estate Agents in Klang Valley?

The second research question was achieved by employing the Technology Acceptance Model (TAM) and extending it with additional constructs. The research hypothesized relationships between these constructs and external variables such as service quality, facilitating conditions, innovativeness, perceived enjoyment, and trust. These hypotheses were rigorously tested using Partial Least Squares Structural Equation Modeling (PLS-SEM). The analysis yielded several key findings that shed light on the factors influencing ICT acceptance among real estate agents. The results revealed that service quality significantly and positively influences perceived usefulness, suggesting that real estate agents are more likely to find ICT useful when they perceive the associated services to be of high quality. Similarly, facilitating conditions, such as access to resources and support, were found to positively impact perceived ease of use, indicating that real estate agents find ICT easier to use when they have the necessary infrastructure and assistance.

Furthermore, the research found that innovativeness and perceived enjoyment also positively influence perceived ease of use. This suggests that real estate agents who are open to new technologies and find them enjoyable are more likely to perceive them as easy to use. The analysis also confirmed that trust in ICT has a positive impact on behavioral intention, highlighting the importance of trust in shaping real estate agents' willingness to use ICT.

The core relationships within the TAM were also validated, with perceived usefulness and perceived ease of use both positively influencing behavioral intention. The research further solidified the TAM by confirming the strong positive influence of behavioral intention on the overall acceptance of ICT. The findings of this research highlight that the acceptance of ICT among real estate agents is not solely determined by the technological features of the tools themselves, but also by the psychological and contextual factors that surround their use. The significant influence of service quality, facilitating conditions, innovativeness, and perceived enjoyment underscores the importance of creating a supportive and user-friendly environment for ICT adoption. The positive impact of trust on behavioral intention further emphasizes the role of psychological factors in shaping agents' willingness to use ICT. These findings suggest that successful ICT adoption in the real estate sector requires a multi-faceted approach that addresses both the technological capabilities of the tools and the psychological and contextual needs of the users.

Research Question 3: What are the importance and performance factors that influence the perceived usefulness (PU), perceived ease of use (PEOU), behavioral intention (BI), and acceptance (ACC) of ICT among Real Estate Agents in Klang Valley?

The third research question was successfully achieved through the Importance-Performance Map Analysis (IPMA). The IPMA results revealed that service quality emerged as the most crucial factor affecting perceived usefulness. This suggests that real estate agents place a high value on the quality of service associated with ICT tools, such as reliability, responsiveness, and assurance. In contrast, innovativeness was identified as the most important factor influencing perceived ease of use, indicating that agents are more likely to perceive ICT tools as easy to use if they are innovative and incorporate advanced features.

The analysis further highlighted the central role of perceived usefulness in shaping behavioral intention. This finding underscores the importance of demonstrating the practical benefits and value of ICT tools to real estate agents in order to encourage their adoption and usage. Finally, the research confirmed that behavioral intention is the most significant predictor of the overall acceptance of ICT, suggesting that a positive intention to use ICT is a strong indicator of actual adoption and utilization.

By recognizing and addressing the key factors that influence their perception and usage of technology, stakeholders can develop targeted strategies to enhance acceptance and utilization. This could involve improving service quality, providing better resources and support, making ICT tools more enjoyable and innovative, and building trust in these technologies. The ultimate goal is to create a more conducive environment for ICT adoption, where real estate agents are not only willing but also equipped and motivated

to use technology effectively. This, in turn, can lead to significant improvements in efficiency, productivity, and service quality within the real estate sector, benefiting both agents and their clients.

Research Question 4: How to integrate the factors in the implementation of ICT acceptance among Real Estate Agents in Klang Valley?

The fourth and final of this research question was how to integrate the factors in the implementation of ICT acceptance among real estate agents in Klang Valley. The model, built upon the findings from the previous objectives, provides a holistic view of the complex interplay between various technological and psychological factors that shape ICT adoption in the real estate sector. It visually represents the relationships between external variables (such as service quality, facilitating conditions, trust, and innovativeness), the core constructs of the Technology Acceptance Model (perceived usefulness, perceived ease of use, and behavioral intention), and the outcome of ICT acceptance.

The model serves as a valuable tool for understanding the factors of technology adoption in the real estate industry and can guide future research and practical interventions aimed at promoting ICT usage among real estate agents. By providing a clear and structured representation of the key factors and their interrelationships, the model can help stakeholders identify areas for improvement and develop targeted strategies to enhance ICT acceptance and utilization, ultimately leading to increased efficiency, productivity, and service quality in the real estate sector.

Since this model is grounded in the Technology Acceptance Model (TAM), a well-established and widely used model in technology acceptance research, specific validation of the model was deemed unnecessary.

6.3 Research Contributions and Implications

6.3.1Theoretical Contribution

The theoretical contributions of this research model are multifaceted, providing a robust framework for further scholarly inquiry and expanding the understanding of ICT adoption within the real estate sector, particularly in a developing market context like Klang Valley, Malaysia.

Firstly, this research contributes to the theoretical expansion of technology acceptance models. By integrating factors like service quality and innovativeness alongside established constructs like perceived usefulness and perceived ease of use, the model offers a more comprehensive understanding of the determinants of ICT adoption in a specific professional domain.

Secondly, the research contributes to the methodological development of technology adoption studies. By employing a quantitative research design and rigorous statistical analysis, the study demonstrates a robust approach to measuring and analysing the relationships between various factors influencing ICT acceptance. Researchers can adapt and replicate this methodology in other studies, enhancing the reliability and validity of findings. The inclusion of specific variables, such as service quality, also encourages future research to explore the impact of support systems and external factors on technology adoption, broadening the scope of inquiry.

Thirdly, this research encourages interdisciplinary collaboration. By bridging the gap between information systems research and real estate studies, the model highlights the importance of interdisciplinary approaches to understanding technology adoption in specific industries. Researchers from various disciplines, including business, sociology, and urban planning, can leverage this model to explore the socio-economic and spatial implications of ICT adoption in the real estate sector. This fosters a more holistic understanding of the impact of digital transformation on professional practices and market dynamics.

Finally, the research generates avenues for future research. The findings can serve as a springboard for further investigations into the long-term impacts of ICT adoption on real estate agent performance, client satisfaction, and market efficiency. Future research can also explore the moderating effects of demographic factors, organizational culture, and regulatory frameworks on the relationships identified in the model. Additionally, qualitative studies can be conducted to delve deeper into the lived experiences of real estate agents using ICT, providing richer insights into the challenges and opportunities associated with digital transformation in the real estate industry.

6.3.2 Practical Contribution

This research offers significant practical contributions for various stakeholders in the Klang Valley real estate sector, each with distinct actionable insights. Government agencies, such as the Ministry of Finance or the Malaysian Communications and Multimedia Commission (MCMC), can utilize this model to formulate evidence-based policies that accelerate digital transformation within the property sector. By understanding the critical role of service quality, perceived ease of use, and behavioral intention, these agencies can design targeted interventions. For instance, recognizing that

service quality directly influences perceived usefulness, the government can facilitate partnerships between ICT providers and real estate agencies to ensure reliable platforms and responsive technical support. Furthermore, informed by the model's insights on perceived ease of use, agencies can allocate resources to develop user-friendly ICT training programs, potentially through collaborations with vocational training centers, to bridge the digital literacy gap. Subsidies or tax incentives can be offered to real estate agencies that invest in proven ICT solutions, thereby addressing financial barriers to adoption. These initiatives directly align with the Malaysia Digital Economy Blueprint (MDEB) by providing a data-driven approach to increasing ICT adoption, ultimately fostering a more competitive and technologically advanced real estate market.

The Board of Valuers, Appraisers, Estate Agents and Property Managers (BOVAEP) can integrate the model's findings into their professional development programs for real estate agents. Recognizing that behavioral intention drives acceptance, BOVAEP can design training modules that not only teach agents how to use specific ICT tools but also emphasize the benefits of integrating these tools into their daily workflows. Training can focus on demonstrating how ICT can enhance client management, streamline property transactions, and improve market analysis. Furthermore, BOVAEP can incorporate case studies and success stories into their training programs to illustrate the practical applications and positive outcomes of ICT adoption. By emphasizing the relationship between perceived ease of use and perceived usefulness, BOVAEP can ensure that training programs focus on user-friendly tools and provide hands-on experience, fostering confidence and reducing resistance to technology.

Real Estate Agencies can leverage this model to make strategic technology investments that align with their business objectives. By prioritizing ICT tools that are both useful and user-friendly, agencies can enhance agent productivity and improve service quality. For

example, understanding that service quality impacts perceived usefulness, agencies can prioritize ICT providers with strong customer support and reliable platforms. When selecting CRM systems, agencies can focus on platforms that offer intuitive interfaces and seamless integration with other real estate tools, maximizing perceived ease of use. Agencies can also implement internal training programs to ensure that agents are proficient in using the selected ICT tools, reinforcing behavioral intention and driving adoption. By promoting a culture of digital innovation and providing ongoing support, real estate agencies can empower their agents to embrace ICT, improve operational efficiency, and provide enhanced services to clients.

6.4 Research Limitations

Firstly, the research focuses on real estate agents in Klang Valley, Malaysia. While this provides in-depth insights into the real estate market in Klang Valley. The findings may not be generalizable to other regions or countries with different real estate markets and technology landscapes. Secondly, the rapid pace of technological change may mean that the tools and platforms studied may quickly become outdated. The findings may not fully capture emerging trends or the impact of new technologies that are adopted after the research's completion. For example, the gaining popularity of Ai like "ChatGPT" in Malaysia in early 2023, after the data collection for this research was completed.

Next, this research is cross-sectional, meaning it collects data at a single point in time. This design limits the ability to infer causality or understand the evolution of attitudes and behaviors over time. While cross-sectional designs are efficient and useful for assessing the state of a population at a given time, they are less effective for understanding how variables change over time and for establishing causation. Lastly, this research does

not account for all external factors that may influence technology acceptance, such as economic conditions, regulatory changes, or cultural factors specific to Malaysia.

6.5 Recommendation for Future Research

To address the limitation of focusing solely on Klang Valley, future research could broaden the research area to include other regions in Malaysia or even conduct comparative studies across different countries. This would allow for a more comprehensive understanding of how ICT adoption varies across diverse real estate markets and technological landscapes. Besides that, to account for the rapid pace of technological change, future studies could employ a longitudinal design. This would involve collecting data at multiple points in time to track the evolution of ICT adoption, usage patterns, and perceptions among real estate agents. Longitudinal studies could also help identify emerging trends and assess the impact of new technologies, which emerged after the completion of the current research.

Next is to combine quantitative surveys with qualitative interviews or focus groups to gain a deeper understanding of the underlying reasons behind real estate agents' technology acceptance or resistance. This would provide richer insights into the complex interplay of factors influencing ICT adoption, such as perceived usefulness, ease of use, and individual preferences. Lastly, to include variables related to economic conditions, regulatory changes, and cultural factors specific to Malaysia in future research models. This would allow for a more comprehensive understanding of the multifaceted influences on ICT adoption and usage within the real estate sector.

6.6 Final Remark

This research concludes that Malaysian real estate agents' adoption of ICT is a complex process driven by various interconnected factors. The research expands on the traditional Technology Acceptance Model by including factors like service quality, support systems, trust, and innovation, providing a deeper understanding of ICT adoption in this field. This knowledge can help government agencies create programs to encourage digital advancements, guide BOVAEP in improving training, and assist real estate agencies in making smart technology choices for better efficiency and service. Moreover, this research fills a gap in academic knowledge about technology adoption in developing countries, offering a model for future studies. By understanding the specific factors that influence ICT use in different situations and cultures, and taking a broad view that considers both individual and environmental factors, we can effectively encourage the use of ICT and drive innovation across industries, contributing to economic and social progress, especially in developing economies like Malaysia.

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