DIGITAL REAL ESTATE MANAGEMENT: IMPLICATIONS FOR PUBLIC AND PRIVATE SECTOR: A CASE STUDY OF ISLAMABAD, PAKISTAN

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APRIL- 2023

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A thesis submitted in partial fulfillment of the requirements for the degree of MS Urban and Regional Planning

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I certify that this research work titled “Digital Real Estate Management: Implications For Public And Private Sector: A Case Study Of Islamabad, Pakistan” is my own work. The work has not been presented elsewhere for assessment. The material that has been used from other sources has been properly acknowledged / referred.

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Acknowledgements

All praises to Allah Almighty who is the omnipresent and omnipotent. During the whole research process, I got continuous assistance from my research supervisor, advisors, my teachers, seniors, juniors and my classmates.

I would like to extend my heartfelt gratitude to my research supervisor Dr. Irfan Ahmad Rana who provided me with enlightening advice, enthusiastic guidance, and continuous encouragement throughout the journey. I would also like to thank Dr. Abdul Waheed and Dr. Abdur Rehman Nasir for their valuable inputs during the course of study.

I would also like to thank my colleagues for their continuous support during the data collection phase. Finally, I would like to express my gratitude to the people of Islamabad who supported me throughout the data collection stage.

Dedicated to my late beloved parents and my siblings whose tremendous support, prayers and cooperation led me to this wonderful accomplishment.

ABSTRACT

Real estate is an important contributor to the development of global economies. Almost every person in five regrets their purchase or rent decision. Lack of information, the complexity of buying processes of properties, multiple registries, involvement of brokers, and excessive paperwork are some of the major issues that lead to many land and property disputes. In real estate, development, consumers are a key part of the decision-making process because of the high involvement and multi-criteria nature of purchasing a home. From the literature, it is found that factors such as social, economic, locational, physical, marketing, and experienced-based factors affect consumer behaviour and help consumers to make an informed decision. This study aims to investigate the factors that impact consumer behaviour in development. Data was collected from 450 households in approved and unapproved housing societies using simple random sampling. For primary data analysis, descriptive statistics, factor analysis and ordinal regression analysis were conducted in SPSS to identify the most important factors that influence consumer decision-making. Factor analysis revealed that the location, proximity to open areas, shopping centers, educational and health centers, and marketing strategy were the most important factors affecting consumer behaviour. Results of ordinal regression analysis reflects that proximity to work, distance from city center, educational institutes, highway, public transport, healthcare center, parks along with concerns of safety and security and availability of drainage system, brand name/developer's repute, marketing from celebrities, TV Channels and internet access and usage enhance speed to buy properties are the factors that reduces the regret level of people after buying a property. Some of the factors that impact negatively to the regret level of consumer are on-site development status, water availability, distance from playground, shopping mall, airport, agents provide complete information, used platform provides information about approval status, marketing through messages, billbaords and internet access to give choice to compare properties. For integrating digital technologies in real estate, bibliometric and systematic reviews had been conducted on digital real estate that identified different themes: information communication technologies, data collection technologies, data networking tools, and digital decision-making systems. Digital real estate technologies should be integrated with the website to give customers a clear picture of real estate assets to avoid post-purchase and post-rent regret. In addition, digitalization and innovation, as well as a regulatory framework and stakeholder engagement, should be considered to make real estate development more livable, sustainable, resilient, and affordable.

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CHAPTER:1 INTRODUCTION

1.1. Background

Real estate refers to a property that consists of land or buildings, to be affected by process of urbanization (Z. R. Zhang et al., 2018). Real estate is defined as a property containing land and building on it as well as natural resources such as water, immovable property, etc. (Hassan, 2020). It is also a profession to buy, sell or rent a property in the form of land, building, or house (Hassan, 2020; Kamath Madhura Jagtap, 2018). Real estate is considered as long-term engine of development and becomes an economic barometer (Y. Chen et al., 2017). Real estate development is the process that starts with an inception of an idea and ends up with the sales and occupation of the physical space by the owner (Bilge & Yaman, 2021). The real estate industry is much wider than the general concept of buying or selling a property. It includes the business or profession that design, finance, develop, construct, and manage land, infrastructure, and buildings (Mahlon Apgar, 2009). The dynamics of real estate development are rapidly changing, showing the link between construction, marketing, regulation, finance, and management (Ratcliffe et al., 2004). Digital real estate refers to every domain name, website, or blog seen online or as an internet property. It can buy or sell like a house, apartment, or a lot (Peek, 2022).

In the real estate industry, global residential and commercial real estate is anticipated to be worth USD 162 trillion and USD 29 trillion (Wallace, 2018). Global commercial real estate transactions reached USD 873 billion in 2017 and about USD 30,000 billion in 2019. At the same time, global residential property reached USD 160,000 billion (Ullah, Sepasgozar, Thaheem, et al., 2021). In 2020, international commercial real estate reached USD 32.6 trillion, while residential real estate value grew by 13%, worth USD 258.5 trillion (Tostevin, 2021). This shows that commercial and residential property transactions grew more than any other type of real estate asset worldwide. Globally, it is estimated that about 1/3rd of the countries have already transformed their land records into a digital system (Shang & Price, 2015). Real estate plays a vital part in the economies of the world. Digital technologies significantly influence global innovation in many domains, from specialized fields to simple daily activities. In this digital era, real estate is evolving and transforming in different ways, creating opportunities for investments, benefits, and risks. Various digital technologies have been introduced into the global real estate industry (Ullah, Sepasgozar, Thaheem, et al., 2021). The fourth industrial revolution introduced disruption technologies that were developed to drive

changes in manufacturing methods that included the emergence and development of analytics of big data, cloud computing, machine learning, Internet of Things (IoT), Artificial Intelligence (AI), distributed manufacturing, 3D printing, robotic evolutions, mechanized processes and automated decision-making (Starr et al., 2021).

The economy of a country majorly depends on real estate market. The market size of the real estate industry is predicted to reach worth 853 billion dollars by 2028. The growth in the real estate sector acts as a catalyst to expand its share in the GDP of a country (N. Singh & Gupta, 2020). The real estate industry plays a significant role in a country's Gross Domestic Product (GDP) and provides employment opportunities worldwide. It involves converting abstract concepts into tangible physical spaces that are occupied by consumers, tenants, or owner-occupants. The constant process of reconstructing and rebuilding the built environment aims to meet the evolving needs of society (Bilge & Yaman, 2021). However, real estate transactions often involve lengthy registration procedures, leading to increased transaction costs. These inefficient processes create various issues such as a lack of transparency, transaction delays, and personal biases, ultimately affecting the efficiency of the real estate market, which is a critical component of any country's economy (Hoxha & Sadiku, 2019). The fraud in property is due to multiple reasons such as multiple registries on same land, issues in verification of ownership documents, deviation in name, address, location of owner or land, excessive paperwork and process becomes tedious due to involvement of brokers/agents/middlemen (Yadav & Kushwaha, 2021).

Consumer behaviour includes feelings, actions and thought of people experiences (Rai, 2020). Consumer behavior is the activities involved in obtaining, consuming, and disposing of products and services that are included in the decision-making process. It is the behavior of a person in search for purchasing, evaluating, and disposing of the product that satisfies the person’s need (Gajera & Malek, 2018; Kamath Madhura Jagtap, 2018; Sridevi & Saranya, 2018; T.K, 2014) as well as to fulfill the needs of the family and households (T.K, 2014). It is related to how organizations, groups, or individuals select, purchase and consume concepts, experiences, goods, or services to satisfy their needs (Mbura & Kagoya, 2021). Consumer behavior is dynamic and interactive due to the inclusion of changes in the feelings and actions of target consumers and society at large (Gaile Sarkane, 2009; Ticoalu, 2016). It is a dynamic process that includes interactions and exchanges. Various theories and research studies suggest that consumer behaviour is influenced by several factors, including social, economic, personal, environmental, or conditional factors, as well as marketing strategies (Gaile Sarkane, 2009).

To understand and predict consumer behaviour, it is necessary to examine the factors that influence consumer behaviour to change. Personal, economic and social factors are the reasons to change the consumer behaviour (Adolfo Di Crosta, Irene Ceccato, Daniela Marchetti, Pasquale La Malva, Roberta Maiella, Loreta Cannito, Mario Cipi, Nicola Mammarella, Riccardo Palumbo, Maria Cristina Verrocchio, 2021; Carpentieria & , Carmen Guid, 2019; T.K, 2014). Home purchasing is a multicriteria decision and it is the largest investment an individual can make and carries high financial risk (Grum & Govekar, 2016). 85% of millennials agreed that investing in real estate is a good option and can save 10% of their income (Ryan Fink, 2022). Home buying is one of the most expensive investments that one individual can make. Home demand studies focused on socio-economic parameters and neighborhood demographic and physical attributes. Consumers are the focal point in the decision-making process as it considers a multi-attribute or high-involvement decision to incorporate the purchase intentions of the household (Kaynak et al., 2022). The information provided regarding housing in real estate website is not detailed enough for consumer to make an informed decision (Takin et al., 2017). Thus, choosing a property to purchase or rent is a crucial decision that requires a thorough consideration of multiple factors.

In Pakistan, at the national level, more than 5492 unregistered and illegal housing societies were identified in 2018. They were mostly undeveloped, while some existed only on paper (Editorial, 2019). It is estimated that more than one million land-related disputes are pending decisions in Pakistan Courts, comprising 50-70 percent of all court cases (United States Agency International Development (USAID), 2010). It takes years 4 to 10, to resolve land-related disputes in courts. From the data, it came to know how illegal or unregistered housing societies trap the investment of the general public, and to some extent, this leads to disputes over land titles in courts. It cannot be estimated that people consider which factors before deciding to buy or rent a property. The above-mentioned alarming statistics show that there is a need to identify to study the digital real estate technologies and the factors affecting consumer behavior in real estate.

1.2. Problem Statement

The decision to buy a property is a series of interrelated activities that leads to a choice among options. Decision-making process of consumers comprises five steps: problem identification, information searching, alternative evaluation, buying decision, and post-purchase behaviour (Senthilmurugan et al., 2020). The property selection to buy or rent is an important multi-criteria decision that entails a significant financial risk (Gajera & Malek, 2018; Rabiei-

Dastjerdi et al., 2021) since it may be the most significant investment a person will ever make in their lifetime (J. Chen et al., 2011). Buying a house is the symbolic representation of social status and emotional value, and residential satisfaction is associated with life satisfaction (J. Chen et al., 2011). Real estate sellers or agents provide information about product attributes that creates a gap between buyers' expectation and the actual product which in turn leads to post-purchase regret. Ultimately, such dissatisfaction or regret impact sustainability and long term success of business in the real estate industry (Ullah & Sepasgozar, 2020). Almost every person in five regrets their purchase or rent decision, and 44% of Americans have regrets regarding their purchase decision or their process of selecting a property and their investments (Pierre A Calzadilla, 2017). Finding the right property became an obstacle for 53% of home buyers (Ryan Fink, 2022). Prevention from fraud is an important element in real estate management as it may be due to false listings and fake documents (Ahmad et al., 2020).

Globally, more than 70% people did not have legally registered title to their land (The World Bank, 2017). People find difficulties to defend their property ownership without having official access to land registry (Shang & Price, 2015). These issues lead to land and property disputes. In Pakistan, real estate activities had a share of 5.6% Gross Domestic Product (GDP) in 2021 (NAPHDA, 2021). In Pakistan, foreign direct investment of $2,074.5 million came from the public and private sectors of different countries in 020. It increased to $4,582.4 million in 2021 and decreased to $1788.9 million in 2022 (State Bank of Pakistan, 2022). At the national level, more than 5492 unregistered and illegal housing societies were identified in 2018. They were mostly undeveloped, while some existed only on paper (Editorial, 2019). According to an audit report given to the National Assembly on February 23rd, 2019, 109 illegal housing projects in the ICT (Islamabad Capital Territory) have cost the Capital Development Authority (CDA) a total of Rs. 5,217.39 billion (Auditor General of Pakistan, 2017). Islamabad, the capital city of Pakistan, people invest money without any doubt without confirmation of the site or the legal status of the schemes as people invest more in real estate. It is estimated that more than one million land-related disputes are pending decisions in Pakistan Courts, comprising 50-70 percent of all court cases (United States Agency International Development (USAID), 2010). It takes years 4 to 10, to resolve land-related disputes in courts. From the data, it came to know how illegal or unregistered housing societies trap the investment of the general public, and to some extent, this leads to disputes over land titles in courts. It cannot be estimated that people consider which factors before deciding to buy or rent a property. Therefore, this study focuses on determining the factors that affect consumer behavior regarding the decision-making

process to invest in real estate. The above-mentioned alarming statistics show that there is a need to identify to study the digital real estate technologies and the factors affecting consumer behavior in real estate. This study highlights the analytical framework or findings applicable in the decision-making process of home buying to minimize the regret level as home buying is long-lasting, important, irreversible, risky and complicated decision.

1.3. Research Questions

To understand and predict consumer behaviour, following questions have been targeted to examine the factors that influence consumer behaviour to change:

1. How literature of digital real estate grew?
2. What are the factors influencing the buying decision of consumers in real estate investment?
3. What are the factors affecting the regret level of consumers in real estate market?
4. How can regret level of consumers be reduced?

1.4. Research Objectives

The purpose of this study is to review the existing literature on digital real estate and also determine the effect of social, economic, marketing, location, physical, experience-based factors on regret level or buying decision of consumer. The objectives to be achieved are:

1. To perform bibliometric and systematic review of published digital real estate literature
2. To characterize factors influencing buying-decision of consumers in real estate investment.
3. To explore the factors affecting the regret level of consumers in real estate market
4. To suggest policy reforms for sustainable and resilient real estate development in Pakistan

1.5. Scope of the Study

The study covers the Islamabad city only. This study did not take gender equality in data collection from the field due to cultural values. This study covers the selected housing schemes of Islamabad and used random sampling technique to collect data. Therefore, the findings of this study cannot be generalized and results may vary in different areas of the world if this study is replicated. This study is limited to the demographic, locational, physical, economic, marketing, and experienced-based factors that only affect consumer buying behavior or process of decision-making in Islamabad only. The study highlights the major sources of regret and

provides the list of factors that should be considered at time of buying or renting a property. This study offers valuable insights of the factors that influence the intention to purchase property, making it a valuable reference for future research in the field of real estate.

CHAPTER: 2 LITERATURE REVIEW

2.1. Real estate

Traditionally, real estate studies were based on the neo-classical theory that assumed rational economic decisions of individuals intending to maximize utility. The decision-making process consists of no. of stages before making a final decision. It is good for real estate agents to be well aware of the changing aspects of the process of decision-making regarding house purchasing (Levy & Kwai-Choi Lee, 2004). Real estate is defined as a property containing land and building on it as well as natural resources such as water, immovable property, etc. (Gerardo et al., 2019; Hassan, 2020; Kamath Madhura Jagtap, 2018; Oroworokwu & Harcourt, 2013). Real estate provides shelter, accommodation, and comfort, without which survival could not exist easily, and it is as important as food and water. It embodies land, building, and immovable locations (Nyakutse, 2010; Rafi & Shaaf, 2022). It is also a profession to buy, sell or rent a property in the form of land, building, or house (Kamath Madhura Jagtap, 2018, Hassan, 2020). Activities in the real estate sector include the purchasing, selling, and development of land and buildings, and span across both the housing and construction industries (I. Singh, 2018). The real estate sector can be categorized into five main categories: residential, commercial, industrial, agricultural, and public amenities, which encompass a wide range of private and public spaces such as hospitals, schools, and other public buildings (Gajera & Malek, 2018; Kamath Madhura Jagtap, 2018; Mladenow et al., 2015; I. Singh, 2018).

Real estate development is a complex process that involves the transformation of conceptual ideas into tangible physical spaces intended for occupancy by consumers, tenants, or owner-occupants. The main objective of this process is to fulfill the needs of society by creating livable, functional, and sustainable environments (Bilge & Yaman, 2021). Natural resources like crops, water, minerals, etc. fall under real estate (Hassan, 2020). Real estate involves high transaction cost, land use regulations and demand-supply changes that make it different from other assets. Heterogeneity and immobility are two primary characteristics of real estate asset (Gerardo et al., 2019; Martijn, 2017; Oroworokwu & Harcourt, 2013). In urban areas with high population density, a real property may include a section of a multi-unit building (Meixner & Leberl, 2011).

Real estate is considered as long-term engine of development and becomes an economic barometer (Y. Chen et al., 2017). The real estate market is diverse whose components change in time and space. The decision of consumer is impacted by factors such as price, neighborhood

characteristics, advertisement. The absence of readily available information, incompleteness and invalidity of data are the main problem in analyses of real estate markets (Dawidowicz et al., 2014). Real estate has two functions: capital investment and a place of residence. It is related to the geographic (selected location) and economic (every location in the world) space (Rafi & Shaaf, 2022). It is a major sector in developing private investment as it impacts real estate development to foresee its rise or fall. Real estate development and urbanization are associated as they attract the population and meet basic needs. This stimulates employment in certain sectors/industries such as cement, paint, steel, interiors, furniture, etc. (Kumar Gupta & Malhotra, 2016) and improves supporting infrastructure. A dense population, an increase in market demand, and a labor force are the crucial factors that attract private enterprises (J. Li et al., 2018). The industry is broad and diverse in terms of functions and jobs. In India, the market size of the real estate industry is predicted to reach worth 853 billion dollar by 2028 (Singh & Gupta, 2020). The growth in real estate sector acts as a catalyst to expand its share in a country's GDP (Singh & Gupta, 2020). Investment in real estate is a major asset that accounts for 10% of the global GDP (World Economic Forum, 2021). Land and RE assets contributed 45-75% to developing nations' wealth (Ibbotson & Siegel, 1983). Real estate accounted for 79% of the total global property value in 2020 (Tostevin, 2021). Pakistan spent an average amount of 5.2 billion dollars in the housing and construction industry yearly over the last two decades, constituting around 2% of the GDP of Pakistan. Pakistan's real estate market is one of Asia's largest real estate markets, with an average annual growth rate of about 9% (Wahid et al., 2022).

The economy of a country majorly depends on real estate market. The ineffective functioning of the real estate market can result in various transparency issues, increased transaction costs, delays and individual biases (Hoxha & Sadiku, 2019). The fraud in property is due to multiple reasons such as multiple registries on same land, issues in verification of ownership documents, deviation in name, address, location of owner or land, excessive paperwork and process becomes tedious due to involvement of brokers/agents/middlemen (Yadav & Kushwaha, 2021). Globally, more than 70% people did not have legally registered title to their land (The World Bank, 2017). People find difficulties to defend their property ownership without having official access to land registry (Shang & Price, 2015). These issues lead to land and property disputes. Home buying is the most expensive investment that a person make in lifetime (J. Chen et al., 2011; Gajera & Malek, 2018). Home buying decision is not easily reversible. Income is positively associated with anticipated regret (J. Chen et al., 2011).

2.2. Consumer behaviour

Consumer behavior involves the study of how individuals, groups, or organizations select, purchase, use and dispose of goods and services to meet their needs and desires (Auf et al., 2018; Gajera & Malek, 2018; Gerardo et al., 2019; Gibler & Nelson, 2003; Jeff Bray, 2000; Kamath Madhura Jagtap, 2018; Mbura & Kagoya, 2021; Michael Solomon, Gary Bamossy, Soren Askegaard, 2006; Rai, 2020; Ramya, 2017; Sridevi & Saranya, 2018; T.K, 2014; Tanja Lautiainen, 2015; Tobergte & Curtis, 2013; Vainikka, 2015). Consumer behavior is dynamic and interactive due to the inclusion of changes in the feelings and actions of target consumers and society at large (Black et al., 2003; Gaile Sarkane, 2009; Rai, 2020; Ticoalu, 2016). It changes due to influence of new technologies, internet access and e-commerce (Gaile Sarkane, 2009). Consumer behavior is the interplay of cognitive (knowledge, information search, processing, thinking, and interpretation), affect (emotions or feelings), and behavior (visible or product specific) in the process of selection, usage, or disposal of goods or services. It involves the exchange process between buyer and seller for mutual benefits and uses qualitative and quantitative tools for research and analysis to predict consumer behavior (Dr. Veena Prasad and Booma Halpeth, 2016). Consumer behaviour is unstable and depend on various factors, affected by evaluation of consumers regarding goods and services and comparison to get the best of them that satisfies their needs (Raewf et al., 2021). Consumers analyze the available information and make choices on the basis of selected criteria. Level of complexity of decision process is increasing with the increase of investment value (Bartkowiak et al., 2018; Tsou & Sun, 2021). In the real estate sector, the demographic profile of respondents is a crucial factor that significantly influences consumers' purchase decisions (N. Singh & Gupta, 2020)

Marketers consider it imperative to comprehend consumer behavior in order to anticipate and predict consumer buying patterns in the market (Kamath Madhura Jagtap, 2018). Consumer behavior involves analyzing what, why, where, how, and from whom people make their purchases. Choosing a home to buy or rent is a major decision with numerous factors to be taken into account. From a financial perspective, it represents a substantial investment that carries significant risk. The factors that impact residential choice can be divided into three categories: household needs, property amenities, and locational as well as neighborhood attributes. Homes are diverse and possess varying qualities, making it necessary for buyers to collect adequate information on both price and quality to assess the true value of a house (Tsou & Sun, 2021; Zheng et al., 2006). Homebuyers must devote considerable time and resources to collect market information and survey a wide range of homes to find one that is satisfactory

(Zheng et al., 2006). The study of Consumer behaviour helps the marketers to comprehend the needs and wants of consumer to make success and survival in the competitive marketing environment. Consumers change their purchasing preferences in accordance with their social, economic and environmental impact (Purcărea et al., 2022). To understand and predict consumer behaviour, it is necessary to examine the factors that influence consumer behaviour to change. Personal, economic and social factors are the reasons to change the consumer behaviour (Adolfo Di Crosta, Irene Ceccato, Daniela Marchetti, Pasquale La Malva, Roberta Maiella, Loreta Cannito, Mario Cipi, Nicola Mammarella, Riccardo Palumbo, Maria Cristina Verrocchio, 2021; Carpentieria & , Carmen Guid, 2019; T.K, 2014). In the real estate market, all decisions are based on assumptions about consumer behaviour as consumer is considered the king of the market. Marketers need to understand the behaviour of consumer that on the basis of which attributes people make decisions to buy a property (T.K, 2014). The purchasing attitude of individuals and households to purchase goods and services is called as consumer behaviour. To foresee and understand consumer behavior is one of the challenges that businesses can confront (Hassan, 2020; Majid et al., 2012).

The process of consumer decision-making in the real estate sector is primarily concerned with how individuals make choices. Experienced buyers may already possess an idea of the essential factors for comparison among alternatives, while less experienced buyers may rely more heavily on external sources, such as real estate brokers, to determine their selection criteria. Consumers frequently feel that they lack adequate information to make a rational or well-considered decision, even after purchasing a house. Uneven access to information within the market can result in differing search times and intensities. Time constraints can also impact the extent of searching for real estate information. Furthermore, due to the significant cost of real estate, consumers are often more cautious and conduct more in-depth searches to select an alternative that can minimize the risk involved in choosing the property (Gibler & Nelson, 2003). The decision to buy a property is a series of interrelated activities that leads to a choice among options (Senthilmurugan et al., 2020). The property selection to buy or rent is an important multi-criteria decision that entails a significant financial risk (Gajera & Malek, 2018; Rabiei-Dastjerdi et al., 2021) since it may be the largest investment a person will ever make in their lifetime (J. Chen et al., 2011; Grum & Govekar, 2016). Buying a house is a symbolic representation of social status and emotional value, and residential satisfaction is associated with life satisfaction (J. Chen et al., 2011). There are four types of buying behavior of consumers; routine response behavior (need very little search), limited (buy product

occasionally), extensive (unfamiliar, expensive or infrequent buying of products), and impulse (no conscious planning) (Kumar Sharma, 2014). The purchase decision of the consumers consists of a five-step process; identify needs, seek information, evaluate alternatives, make a purchase decision, and behave after purchase (Hoxha & Sadiku, 2019; Nyakutse, 2010; Tanja Lautiainen, 2015; Tung, 2022). Decision-making is a very cumbersome process and three major models of complex decision-making apply to most real estate decisions. Consumers engage in different factors of the consumption process; product, information search and processing, decision-making, and the act of purchase that are found to influence the decision-making of consumers (Santos et al., 2022).

Almost every person in five regrets their purchase or rent decision, and 44% of Americans have regrets regarding their purchase decision or their process of selecting a property and their investments (Pierre A Calzadilla, 2017). Finding the right property became an obstacle for 53% of home buyers (Ryan Fink, 2022). In China, 30% of residential consumers regret purchasing a property (J. Chen et al., 2011). Regret is a negative or unpleasant feeling endured by a person due to the difference between the expectations of the person's desire and the attributes of the product or property they bought or rented (J. Chen et al., 2011; Ullah & Sepasgozar, 2020). Residential satisfaction is positively correlated with age; women home buyers are more likely than men to feel the risk and anticipate regret (J. Chen et al., 2011). Literature identified many factors affecting the consumer/buyer behaviour in real estate such as demographic profile (Carpentieria & , Carmen Guid, 2019; Machová et al., 2022; N. Singh & Gupta, 2020) and personal income (Hassan, 2020), social factors (Gaile Sarkane, 2009; Machová et al., 2022), marketing process and advertisement (Raewf et al., 2021). Purchase intention is considered as a behaviour of buyer that what and how he/she think about any product (Rai, 2020) and it measures the possibility of the consumers to buy products and services (Ticoalu, 2016).

2.2.1. Factors affecting consumer behavior

25% of the people regret due to neighborhood information, issues regarding parking and transportation, price, locality, lack of information and inspection, incompetent organizations, untrustworthy real estate professionals, hidden housing expenses, house design, area and layouts. According to the Trulia, 44% of the house owners regret their purchase decision due to lack of information. Lot of attributes on the basis of which all housing decisions have been made that determine the price that buyers are willing to pay. Bundle of attribute changes as circumstances change due to which weightage on each attribute may change that can become

a source of regret (Ullah & Sepasgozar, 2020). Factors such as social, economic, locational, physical, marketing, and experienced-based factors affect the consumer behaviour and help consumers to make an informed decision as shown in figure 1. All are described one by one as under:

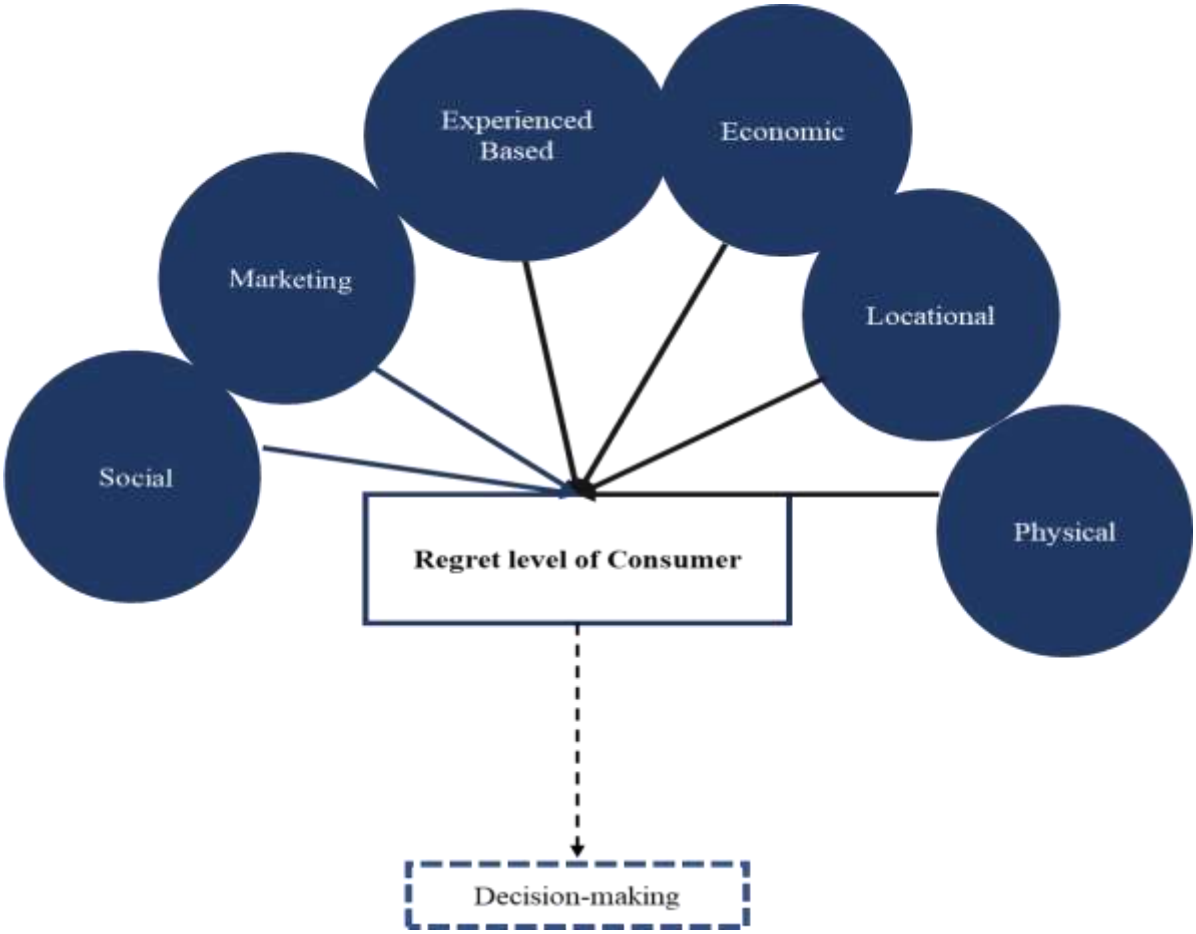


Figure 1: Factors affecting consumer behaviour

2.2.1.1. Social Factors

Social factors means the factors related to the human society, social structures and social processes (Hassan, 2020). Social factors impact the buying behaviour of consumer (Tobergte & Curtis, 2013). It includes household size, age, gender, marital status, qualification, occupation, educational level, income. Marketers find demographic studies particularly valuable as they provide insights into changes and trends within a population, which can be used to estimate the size of potential markets for various products (Al-Nahdi et al., 2015; Chia et al., 2016; Del Giudice et al., 2019; Gajera & Malek, 2018; Hassan, 2020; Majid et al., 2012; Maoludyo & Aprianingsih, 2015; Michael Solomon, Gary Bamossy, Soren Askegaard, 2006; Nisel, 2001; Rabiei-Dastjerdi et al., 2021; Raewf et al., 2021; Rai, 2020; Ramya, 2017; Senthilmurugan et al., 2020; Sridevi & Saranya, 2018; T.K, 2014; Tsou & Sun, 2021; Ullah,

Sepasgozar, Shirowzhan, et al., 2021; Ullah & Sepasgozar, 2020; Waheed et al., 2014; L. Wang, 2016; Q. Zhang, 2021; Źróbek et al., 2015). When it comes to purchasing a home, household needs can vary widely and may be influenced by factors such as income level and social and personal communal influences (Michael Solomon, Gary Bamossy, Soren Askegaard, 2006).

Demographic factors, such as age and education, can also impact search behavior (Gajera & Malek, 2018; Sridevi & Saranya, 2018). For example, older consumers may have less desire for additional information due to accumulated experience, while more educated consumers may be more confident in their ability to search effectively. Furthermore, demographic characteristics such as income, location preferences, and life cycle stage can all influence a family's residential requirements (Tsou & Sun, 2021). Changes in demographics can result in varying demand for different housing attributes, making it necessary to analyze demographic factors when assessing housing demand in the short term (Y. Zhang et al., 2020). Education level and family size are two demographic factors that can significantly impact housing intake. It is important to note that the primary factor affecting housing intake is the changing demand for housing triggered by shifts in demographic patterns. Residential satisfaction generally tends to increase with age, as people tend to experience more contentment with their homes as they grow older (J. Chen et al., 2011). Socio-cultural factors and personal income factors can also significantly influence consumer purchasing behavior (Hassan, 2020).

From literature, it is found that female households, widowed and married households, high qualification, self-employed household, high income level and no. of dependencies save more than male households, unmarried people, people of lower educational level, employed or retired household and people with low-income level. Similarly, saving of the household decreases with the increase of age of household (L. Wang, 2016). Income level, social and personal communal influences more on purchase of house among the consumer (Sridevi & Saranya, 2018). Socioeconomic factors include safety, neighbours with similar social status and independence and stress (Bartkowiak et al., 2018). Buying intention has a association with age and gender while there is no significant change in buying intention with change of educational level (Rai, 2020). Age (negatively) and education(positively) are related to the amount of information search. (Gibler & Nelson, 2003). The household characteristics may vary from family to family (Grum & Govekar, 2016). Reference groups means individuals or group of people who are used as a source when comparing attitudes, beliefs, values or behaviour. Real estate consumer is influenced by some reference group (Tobergte & Curtis,

2013). The core reference groups in a person's life are their family and close friends, while their schoolmates, neighborhood, coworkers, and other acquaintances make up their secondary reference groups (Al-Nahdi et al., 2015; T.K, 2014; Tobergte & Curtis, 2013). Reference groups impact the attitude and norms of behaviour acceptable to individuals (Chantharat & Narukod, 2010). The buying behaviour of consumer is significantly influenced by social roles and status of individuals or groups from where they belong (Tobergte & Curtis, 2013).

2.2.1.2. Locational Factors

Location is an important element that influences property choice (Kamath Madhura Jagtap, 2018; Rabiei-Dastjerdi et al., 2021). It is the main indicator that helps the owner to make up their mind about where he or she is going to purchase a house. Location is viewed as the proximity to desirable or undesirables facilities that affect consumer decisions of residential buyers in the country (Hassan, 2020). Location provides the information about the distance from central business district, supermarket, airport, work, public transport, entertainment area, hospital, educational institutions, availability of parks, proximity to schools, distance from sports area, distance from recreational areas (park, open space, forest, gardens), scenic value, proximity to water body, distance from swimming pool, accessibility to amenities or public facilities (club, gym, playgrounds, adequate parking space), infrastructural and utilities facilities, environmental quality and safety (Al-Nahdi et al., 2015; Alkan-Gökler, 2018; Bartkowiak et al., 2018; Baser et al., 2020; Chia et al., 2016; Del Giudice et al., 2019; Gajera & Malek, 2018; Hassan, 2020; Kamath Madhura Jagtap, 2018; Kaynak et al., 2022; Majid et al., 2012; Maoludyo & Aprianingsih, 2015; Morena et al., 2021; Rabiei-Dastjerdi et al., 2021; Raewf et al., 2021; Ramya, 2017; Salzman & Zwinkels, 2017; Tobergte & Curtis, 2013; Tsou & Sun, 2021; L. Wang, 2016; Q. Zhang, 2021; Źróbek et al., 2015). These attributes defines the matching criteria for consumers in real estate decisions (Rabiei-Dastjerdi et al., 2021). These factors collectively determine the quality of housing and the overall welfare of the household.

Location is considered as one of the major factors that impact the purchase decision (Hassan, 2020; Majid et al., 2012). Residential choices of household are functions of various housing and locational attributes. Market of real estate is location-oriented. Theory of housing location choice explains decision support system (Del Giudice et al., 2019). Location plays a significant role in evaluating the values of property as prices are different in different locations or regions (de Oliveira Tavares et al., 2014). Higher price for a house near natural scenery, mountain or lake view or closer to the proximity of amenities (Q. Zhang, 2021). Infrastructural factors

include accessibility to utilities such as drinking water, sewer connections, quality of air, drainage (Bartkowiak et al., 2018; Chia et al., 2016; Muczyński et al., 2019; Źróbek et al., 2015).

In most of the studies, property price and location were analyzed separately. In some of the studies, the cost of travelling to market hubs and network improvements are considered when analyzing the land prices. Residential property prices are determined by various factors such as location, amenities within a neighborhood (Gym, club), parks, sense of security, size, interest rate, and specifications (Gajera & Malek, 2018; Źróbek et al., 2015). The buyer usually focuses on the interest rate, cost of the property, mortgage amount, payment amount in monthly installments, and length of the property market while purchasing a property. Financial support, disposable income, and access to the mortgage loan play a positive impact on the purchase decision of consumers (Senthilmurugan et al., 2020). (Gajera & Malek, 2018) concluded that price has a negative relation with privacy, location has a positive correlation with the neighborhood and a negative one with the area of the property. The above-mentioned factors are measurable quantitatively, or empirically that can make a comparison among properties (Kaynak et al., 2022; Rabiei-Dastjerdi et al., 2021). These factors are utilized in satisfying basic human needs with respect to everyday duties (Bartkowiak et al., 2018).

2.2.1.3. Physical Factors

Physical factors or environmental factors concern features of real estate as durable goods. Physical factors deal with the variable related to the specific property, such as the area of the property, number of floors, number of rooms, cardinal directions, building's architectural style, age, building/usable area, number of bathrooms, land areas, availability of store-rooms and kitchen size, footprint of the building, building height, presence of parking space, swimming pool and backyard, clean and safe environment, view of the housing area, floor plan, distance from sports facility, age of the real estate, zoning and land use plan (Al-Nahdi et al., 2015; Bartkowiak et al., 2018; Baser et al., 2020; Chia et al., 2016; Del Giudice et al., 2019; Gajera & Malek, 2018; Hassan, 2020; Kamath Madhura Jagtap, 2018; Kaynak et al., 2022; Locurcio et al., 2020; Majid et al., 2012; Maoludyo & Aprianingsih, 2015; Meixner & Leberl, 2011; Morena et al., 2021; Muczyński et al., 2019; Rabiei-Dastjerdi et al., 2021; Raewf et al., 2021; Ramya, 2017; Takin et al., 2017; Tsou & Sun, 2021; Ullah & Sepasgozar, 2020; L. Wang, 2016; Q. Zhang, 2021; Źróbek et al., 2015). All mentioned factors affect the housing price (Q. Zhang, 2021) and impact the residential purchase decision (Chia et al., 2016). Real property is defined by coordinates, location or physical characteristics (Meixner & Leberl, 2011). The

information provided regarding housing in real estate website is not detailed enough for consumer to make an informed decision (Takin et al., 2017). The mentioned factors are measurable and can be used to compare one property to another. These attributes defines the matching criteria for consumers in real estate decisions (Rabiei-Dastjerdi et al., 2021).

2.2.1.4. Marketing Factors

In the real estate industry, consumer behavior is affected by digital marketing or advertisement. The introduction of digital technology affects the commission rate or replace the professionals of real estate sector which become an issue since its implementation. Communication between consumers and real estate brokers/agents has changed due to technological resources (Adolphus Bryant, 2021). Digital marketing refers to the marketing activities that occur in an electronic market place and aims to identify, anticipate and fulfill customers' need in a profitable and efficient way in an online environment. Digital marketing permits to reach broader audience, while also precisely target specific niche segments with valuable content. Therefore, approach of digital marketing is interactive, sophisticated, targeted, dynamic and enables customer engagement and retention, marketing communication, customer service, product promotion, brand building, relationship management and sources of customer value formation in the digital space. Popular digital marketing channels include email, social media, website, affiliated marketing and mobile advertising. Moreover, initiatives of digital marketing are cost-effective (Matidza et al., 2020). Real estate companies can benefit significantly from using digital marketing as an impactful and cost-efficient tool to attract potential clients. As consumers increasingly expect access to comprehensive information about available properties for sale, they tend to prefer digital advertisement (Adolphus Bryant, 2021). Advertisement influences the consumers to choose the property as advertisement provide information to the targeted customers. The varied advertisement media includes TV, print media, internet and radio. Among these options, television advertisement has the most significant impact, accounting for 53% in changing a purchasing behaviour of consumers in real estate, radio advertisement accounts for 27%, whereas print media advertisement and online advertisement contribute 13% and 7%, respectively, to change the purchase behaviour of real estate customers. Therefore, all the four variables are positively related to consumers' buying behaviour at varying levels (Mbura & Kagoya, 2021). 88% of the consumers or buyers use an agent while TV, Billboards and print channels play a minimal role in decision making process for them (National Association of Realtors NAR, 2013). Mostly respondent (30%) collected information from net, 3% people from agents, 22% through hoardings, 16% through newspaper

ads, 13% through property exhibitions and 16% through family and friends (Kamath Madhura Jagtap, 2018).

The real estate agent uses online platforms to display properties to potential clients (Ullah et al., 2018). The effect of internet marketing is huge that a buyer like to buy a property online 2.4 times more than in person (Itani, 2022). Social media influence the consumer behaviour through providing information and platform to give their views or feedback. The appealing features of social media have significantly transformed the advertising and marketing industry (Nadu & Nadu, 2018). The rise of internet usage and web technologies, digital marketing strategy is used as a smart and sustainable tool to promote products and services as it is easy to target the customers, due to its reliability and effectiveness (Low et al., 2020). Internet technologies has transformed the way people and businesses connect in both their personal and professional lives. Digital marketing is a cost-effective and timely approach that utilizes digital technologies such as internet, web and mobile devices to achieve marketing objectives (Matidza et al., 2020). In 2018, 50% of home buyers found a home online, while 1% in a newspaper advertisement and 7% through a yard sign or open house (Zito, 2019). In 2021, 57% of the home buyer used social media, 79% used Multiple Listing Services (MLS), and 69% used websites as top digital marketing technology tools (National Association of Realtors NAR, 2021). Digital marketing plays a critical role in consumers' purchasing decision, as demonstrated by Zillow report-2017, which found that 75% of home sellers expected to use some form of digital marketing (Adolphus Bryant, 2021). Due to the increase in no. of internet users, the impact of consumer behavior will not be the same as the information provided by the real estate agent in person (Adolphus Bryant, 2021). Real estate professionals are increasingly relying on digital marketing technology to reach their target audience. Social media, Multiple Listing Service-MLS, and brokerage websites are the top tools used by real estate professionals (Adolphus Bryant, 2021; Matidza et al., 2020; Nadu & Nadu, 2018; Srivastava, 2022). The importance of online searches (92% of all purchases) in the home buying process highlights the significance of the digital transformation in the real estate industry (Realtors, 2019). An internet influences more than half of the decisions of home buyers even buyers spend only 6-7% of the budget on marketing and advertising online. 75% of the budget spent on print advertisement while rest of the budget spent on TV and outdoor media (Srivastava, 2022). Print media, online media and newspapers are sources of advertisement and information (Mbura & Kagoya, 2021). Internet usage and e-commerce saves time, facilitate processes, easy to use, availability of up-to-date information, convenient to all, convenient to compare products and

prices, reliability and precision (Gaile Sarkane, 2009). Internet (31%) and media including press, radio and TV (25%) are major sources of information regarding property and its neighborhood. Besides that, Environmental education (13%), municipal offices (7.5%), schools (6.5%), Chief Inspectorate of Environmental Protection (14%) and environmental organizations (3%) are other sources of information about property (Źróbek et al., 2015). Therefore, this study incorporates the platform which has been used by the consumer and how is their experience.

The marketing-oriented approach considers consumers as a focal point in decision-making (Kaynak et al., 2022). Advertisement is a good way to bring awareness to consumers to send the right message to potential consumers. 90.5% of first-time buyers are influenced by advertisements and marketing communications (internet, television, bulletin, etc.) (Nyakutse, 2010). Advertisements increase knowledge, quality perception, and judgments in behavioral actions (Sachdeva, 2020). Consumer behavior has undergone significant changes due to the proliferation of digital technology. In response, organizations have had to adapt their marketing strategies to keep up with these changes. Marketing efforts have traditionally used various types of mediums, including digital, print, radio, and TV, to influence consumers. TV ads are particularly impactful because of their audio-visual nature, while radio ads are cost-effective and reach a wide audience, including remote areas. Print media, such as newspapers and magazines, are another form of advertising, while online advertising has become increasingly popular due to technological advances and affordability (Mbura & Kagoya, 2021).

2.2.1.5. Economic Factors

Economic factors refers to the factors that concerns with the financial position of consumers that how much an individual is able to spend on the purchase of goods and services (Hassan, 2020). Economic factors that affect consumer behavior are interest rates, employment rates, affordable down payment, payment period, housing cost, brand name of the developer/builder, availability of loans etc.(Bartkowiak et al., 2018; Chia et al., 2016; Gajera & Malek, 2018; Kamath Madhura Jagtap, 2018; Muczyński et al., 2019; Rabiei-Dastjerdi et al., 2021; Sridevi & Saranya, 2018; Tobergte & Curtis, 2013; Ullah & Sepasgozar, 2020; Źróbek et al., 2015). These factors reflect the financial position of the consumer and overall sales of the firm, which in turn have an impact on the level of spending on goods and services (Hassan, 2020). Affordability or housing costs become one of the reasons for regret in purchase decisions (Ullah & Sepasgozar, 2020). The buyer usually focuses on the interest rate, cost of the property, mortgage amount, payment amount in monthly installments, and length of the property market

while purchasing a property. Financial support, disposable income, and access to the mortgage loan play a positive impact on the purchase decision of consumers (Senthilmurugan et al., 2020). The decision to purchase a home is significantly influenced by economic and financial factors. However, buyers with high-profile occupations and high incomes, due to the contribution of multiple family members to the household income, tend to place less emphasis on economic and financial factors, and are more likely to make bold decisions to purchase homes without much consideration of these factors (Senthilmurugan et al., 2020). Price is taken as dependent variable vs physical attributes and location features as independent variables (Źróbek et al., 2015). Home purchasing is a multicriteria decision and it is the largest investment an individual can make and carries high financial risk location (Rabiei-Dastjerdi et al., 2021).

2.2.1.6. Experienced based

On the basis of experience or working in the field of real estate, checking approval status of layout plan of housing scheme, visit of concerned authority, visit of website of concerned authority and approval status of certain property have been taken as factors that affect the buying behaviour of consumer. Inspection of a property is another factor that contributes towards post-purchase or post-rent regrets (Ullah & Sepasgozar, 2020). The last is fame and repute of developers (Maoludyo & Aprianingsih, 2015). For homebuyers, the reputation of developer brand is significant factor to consider. Developer image has powerful impact on intention to purchase a house (Chia et al., 2016). Clearance certificates, land use plan, building permits, etc. are examples of digital building documentation of a property. Legal factors include ownership, private easement, mortgage (Bodenbender et al., 2019).

2.3. Decision Support System

Home purchasing is a multicriteria decision and it is the largest investment an individual can make and carries high financial risk. The process of buying decision is a sequence of interconnected actions that gives choices among alternatives. Decision-making process of consumers comprises five steps: problem identification, information searching, alternative evaluation, buying decision, and post-purchase behaviour (Senthilmurugan et al., 2020). Mostly decisions in real estate are production oriented rather than the demand or market oriented. Residential choices of household are functions of various housing and locational attributes. Market of real estate is location-oriented. Decision support system originated from the theory of housing location choice (Del Giudice et al., 2019). Decision Support System (DSS) is defined as a system designed to enhance or assist an individual or group's decision-

making capabilities. It consists of three key components; data, model and a user interface. The use of Geographic Information System (GIS) can have a tangible advantages in facilitating advancements in urban technologies or development (Glumac & Des Rosiers, 2020).

Prior to making a final decision, consumers must establish the criteria by which they will evaluate the options available to them. Decision rules can be utilized by consumers to arrive at an optimal choice based on the most relevant product attributes. Conjunctive non-compensatory decision rule use cutoffs or minimum attributes to qualify the products e.g; set a price range or size. If no alternative meets the minimum criteria, consumer can use lexicographic non-compensatory rule to make final decision. In this rule, consumers rank the attributes by importance and select the property that is better than all others. On the other hand, compensatory decision rule considers all decisive attributes and assign weight to them. Then, rate all alternatives on each attribute and select the one with highest summated weighted value (Gibler & Nelson, 2003; Michael Solomon, Gary Bamossy, Soren Askegaard, 2006). Experiences may affect the consumer behaviour because past experience was useful in comparing the alternatives by using specific type of gathered information. Lack of sufficient information and time constraints are reflected in informed decision making due to which buyers mostly rely on real estate agents for market data and that causes regret. Regret is a negative term based on negative emotions and home purchase is a long lasting and important consequence to illustrate regret due to its most expensive investment in terms of finance, time and effort in the lifetime of people (Ullah & Sepasgozar, 2020). Regret level is an effect or measured by plan of people to move or shift from one home to another. A house is usually considered as a symbol of social status or identity (J. Chen et al., 2011). Real estate sellers or agents provide information about product attributes that creates a gap between buyers' expectation and the actual product which in turn leads to post-purchase regret. Ultimately, such dissatisfaction or regret impact sustainability and long term success of business in the real estate industry (Ullah & Sepasgozar, 2020). Positive evaluation after purchase leads to satisfaction while negative leads to dissatisfaction or regret (Rodica, 2009).

During the process of making a decision, consumer buying behavior is highly influenced by various factors such as price and location, attributes of a particular property, layout design and specification, the reputation of the builder, availability of information, proximity to markets, educational institutes, health centers, amenities, utilities and infrastructural developments, personal inspection, time to buy property, amount and method of payment and precious experience (Gajera & Malek, 2018; Maoludyo & Aprianingsih, 2015; Tobergte & Curtis, 2013;

Ullah & Sepasgozar, 2020). The aim is to determine the effect of social, economic, location, physical, marketing, and experiences-based factor on consumer buying behaviour.

CHAPTER:3 METHODOLOGY

The research methodology comprises of two parts; methodology for conducting bibliometric and systematic review and analysis on collected primary data.

2.1. Bibliometric and Systematic Review

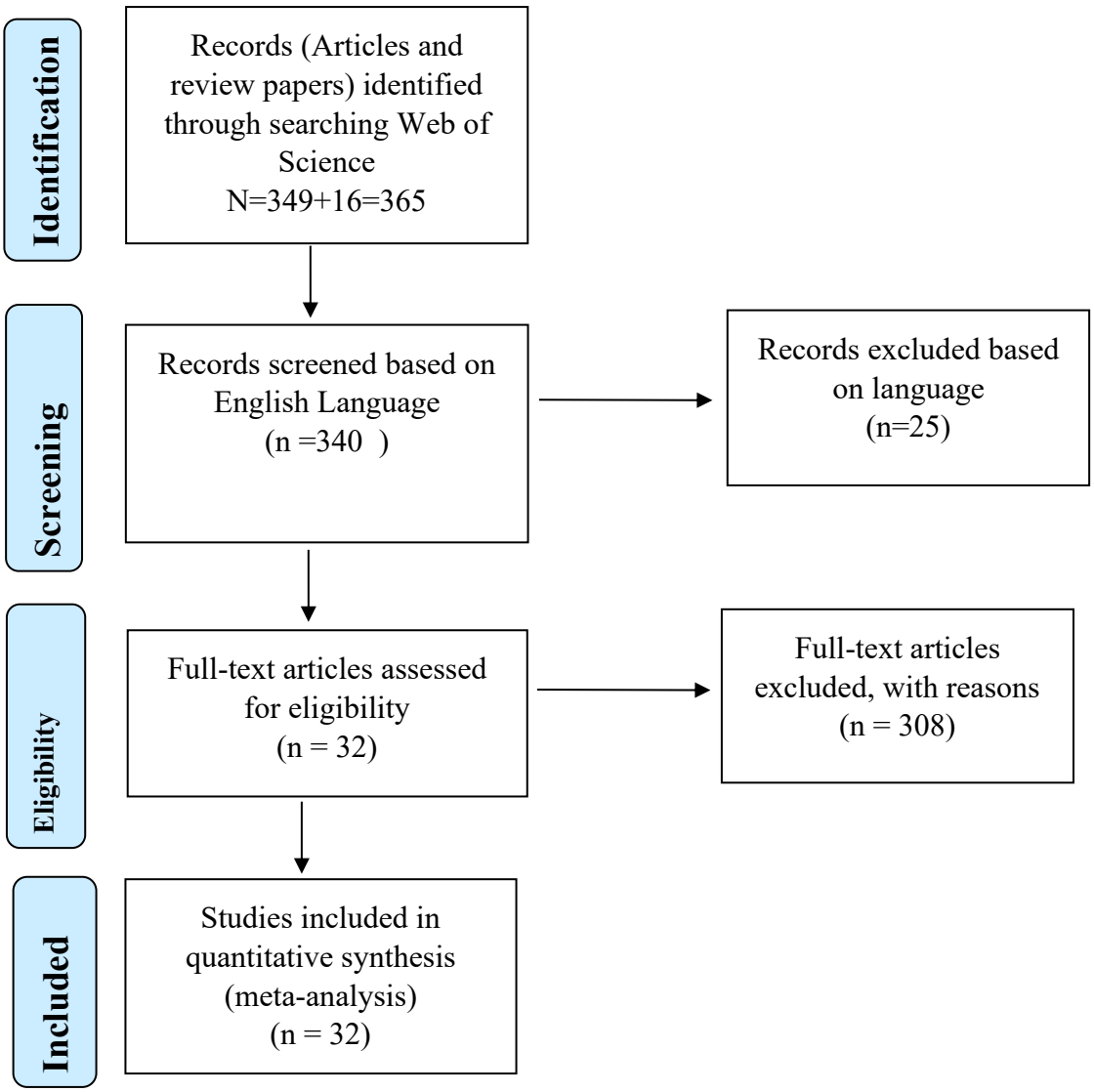
Web of Science database was used for retrieving relevant publications. The search query Digital "Real Estate" was used to retrieve publications. A total of 616 results were obtained from the database on 8th August 2021 (Table 1). The results included all types of documents. These documents were further used for bibliometric analysis. Figure 2 summarizes the methodology used in this study in the form of a flowchart.

Table 1: Search Criteria and Results

Search Criteria and results					
Keywords used	Database	Documents	Indexes Searched	Years	Results
Digital AND "Real Estate"	Web of Science	All	CPCI-S	All Years	616
		Articles	SCI-EXPANDED		341
		Proceeding papers	ESCI		256
		Early Access	SSCI		17
		Book Chapters	CPCI-SSH		15
		Editorial Materials	BKCI-SSH		5
		Book Reviews	A&HCI		1
		Data Papers	BKCI-S		1

A systematic review can be considered a technique to evaluate or sum up the results of several studies. It is achieved through identification, selection, appraisal, and then synthesizing the available or accessible appropriate research evidence (Gates & March, 2016). It can also be called a meta-analysis (Naeem & Rana, 2020. The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines have been taken up in this study to analyze literature based on a checklist of 27 items along with a flow diagram of four phases to present a vigorous and detailed framework of a systematic review as shown in flow chart 1.

Inclusion criteria include any publication in the selected database that analyzed and examined the topic of digital real estate in an extensive way. After scrutinizing the abstracts, publications that did not qualify for the inclusion criteria were removed. The articles focusing on mathematical modeling, the real estate brokerage industry, 3D modeling, digital financial services, pricing model, building construction, urban expansion, and environmental protection were excluded. The results were then also limited to English thematic articles. After including the relevant articles, 32 articles were selected for in-depth review and thematic analysis. Microsoft Excel 365, Microsoft PowerPoint (for listing and infographics), Mendeley Desktop (for citation), and VosViewer 1.6.16(for keyword analysis) were used.



Flow chart 1 Retrieved Articles for Systematic Review by Using PRISMA Flow Char

2.1.1. Bibliometric analysis

Bibliometrics is a method to analyze and quantify the growth of published literature on a specific topic (Du et al., 2014). It supports historical assumptions about field development, recognizes links between scientific advancement and policy changes, and explores the joint formation of interdisciplinary fields (Youngblood & Lahti, 2018). It consists of two steps: collecting related work from the appropriate database after a valid search query and reviewing and analyzing searched work (Keramatfar & Amirkhani, 2019).

Topic search for selected keywords that included searches from title, abstract, and author's keywords. The bibliometric analysis covers all publications, such as academic articles, books, conference papers, etc. This study search incorporates Title, Abstract, and Author's keywords to identify relevant publications. The year limit was not applied to the search criteria. Therefore, according to the keywords, the oldest article was from 2006, so it can be assumed that publications were extracted from the duration of 2006–2021.

The retrieved data of published literature was exported to Microsoft Excel and incorporated a year-wise number of publications, document types, languages, countries, authors, institutions, journals, citations, and keyword analysis. All cited references and full records were exported in text file format (delimited tabs) and used for network visualization in VOSviewer (version 1.6.16). The exported data comprises title Information, source title (journal name), author-wise publication data, publication year, affiliation (institutions), subject categories (discipline), abstract, author's keywords, language, and the number of citations (if present on publication). VOSviewer (version 1.6.16) is an open software used to analyze bibliometric data through a visualization network based on co-authorship and co-citation (van Eck and Waltman, 2009). The research findings were reaffirmed by using the online tools "Citation Report" and "Analyse Results" of Web of Science in Bibliometric analysis.

2.1.2. Thematic analysis

Thematic analysis is characterized as a qualitative or descriptive study approach. It is extensively used for the analysis of qualitative data that has been used in various studies (Attride-Stirling, 2001a, Braun & Clarke, 2008, Nowell et al., 2017a, Naeem & Rana, 2020, Zilembo, 2021). It can be considered a methodological procedure of coding to examine and describe common facts by creating themes. Four-phased theme development has been used to identify, select, and name thematic areas: Initialization, Construction, Rectification, and Finalization for high-quality results or findings (Mojtaba Vaismoradi, 2016.

The first step in the thematic analysis included familiarization with all published articles and generating provisional ideas (Glisczinski, 2018). At the initial stage, coding was done for generic themes extracted from published articles using an inducive approach (also known as open coding with no pre-determined codes). The procedure was repeated three times to revisit articles to identify any missed code/theme. After that, themes were constructed based on a qualitative analysis of the content of published articles. The constructed themes were reviewed again as a final refinement of themes till the different themes had been merged as sub-themes under the umbrella of major themes. All the sub-themes were also discussed under each finalized theme.

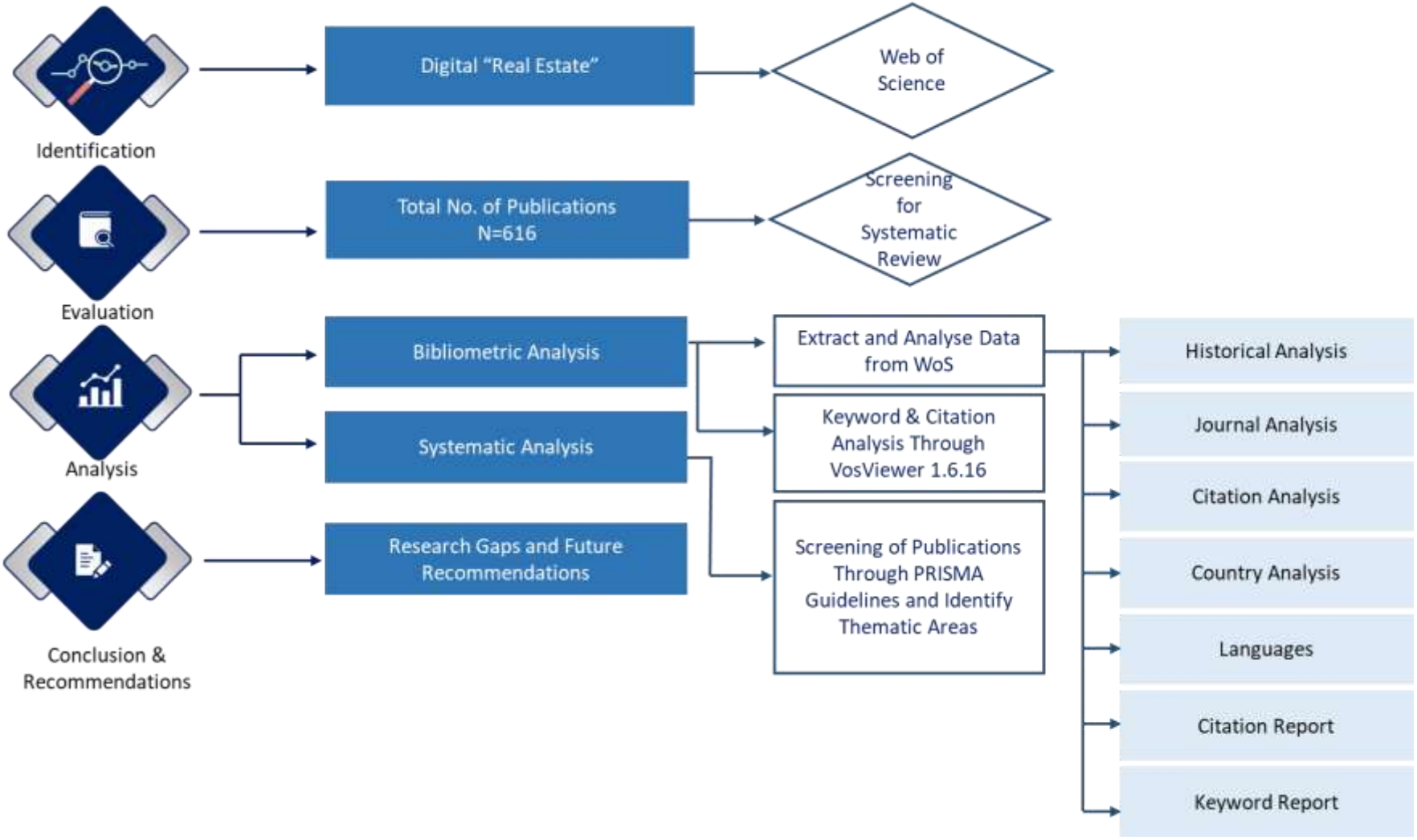


Figure 2: Methodology for Bibliometric and Systematic Review

2.2. Methodology for Primary Data Collection and Analysis

Research methodology entails the type of research design used to describe an approach the study has taken, sample size and sampling techniques, data sources, and data collection procedures. It also incorporates the data analysis techniques used to analyze or evaluate the data to develop the relationship among factors influencing consumer behavior in real estate investment. This research is based on quantitative data and follows a descriptive research design. It is based on data collection, analyses, and interpretation of collected data utilizing some analysis. The population for the present study consisted of consumers or households of different housing societies in Islamabad-Pakistan.

2.2.1. Data collection and sampling

This research is based on collecting primary data that refers to the information obtained by the researcher firsthand on the variable of interest. Data has been collected through structured questionnaires from selected housing schemes, as shown in figure 2. The population means the whole group of people, events, or things of interest that the researcher wants to investigate (Hassan, 2020). Sample size refers to choosing the no. of observations using Yamane's Formula (1960) with a confidence level of 95% and a margin of error (e) of 5%. The same formula has been used by several studies such as (Aslam et al., 2019; Hassan, 2020). Using this formula, the sample size of Islamabad comes out to be 400, with a population of 2 million. The calculation of the sample size is as below:

$n = N/(1+Ne^2)$ ---------- (i)

$n = 400$

where;

n: Sample size, N=Population, e: Margin of error

There are two parameters based on which housing schemes have been selected for data collection from households: layout plan approval status of housing schemes and habitation rate of more than 60%. The selected housing schemes are shown in figure 3. This study used simple random probability sampling to select the sample population.

The first author hired a team of 4 surveyors and went into the field for a questionnaire survey of the household of selected housing schemes. In some of the housing schemes, people did not give a response or open the door due to security issues and cultural issues, due to which the team visited two societies two times for data collection. To complete the sample size, data collected after Jumma prayers from those living in the schemes or from the people who come in the park in the evening. Data has been collected from 24-08-2022 to 01-09-2022. It is observed in the field that open spaces or parks are missing in some of the housing schemes. Data from 450 households have been collected to reduce the error margin in sampling.

2.2.2. Indicators and questionnaire design

A questionnaire has been designed employing various scales, including the Likert scale, dichotomous scale, and numerical value range. The numerical values or scale ranges have been utilized to design parameters related to respondent's profile and household needs. In contrast, parameters pertaining to neighborhood characteristics, consumer engagement factors, and investment determinants have been designed on a Likert scale ranging from 1 to 5 (ranging from "strongly agree" to "strongly disagree"). The questionnaire was divided into the sections based on the selected factors; social, economic, locational, physical, marketing and experienced-based. The questionnaire included 57 close ended questions. Participation from selected sample size was voluntarily and confidentiality of responses was ensured. Table 2 illustrates the selected variables and their respective scales.

Sr.No.	Study Area	Sample Size
1	Margalla View	24
2	Ghouri Town	50
3	Bahria Enclave	23
4	Shaheen Town	33
5	Javed Iqbal Town	37
6	Jinnah Garden	31
7	River Garden	18
8	PWD	43
9	Pakistan Town	50
10	Media Town	50
11	Bahria Garden City	26
12	Zaraj Housing Scheme	65

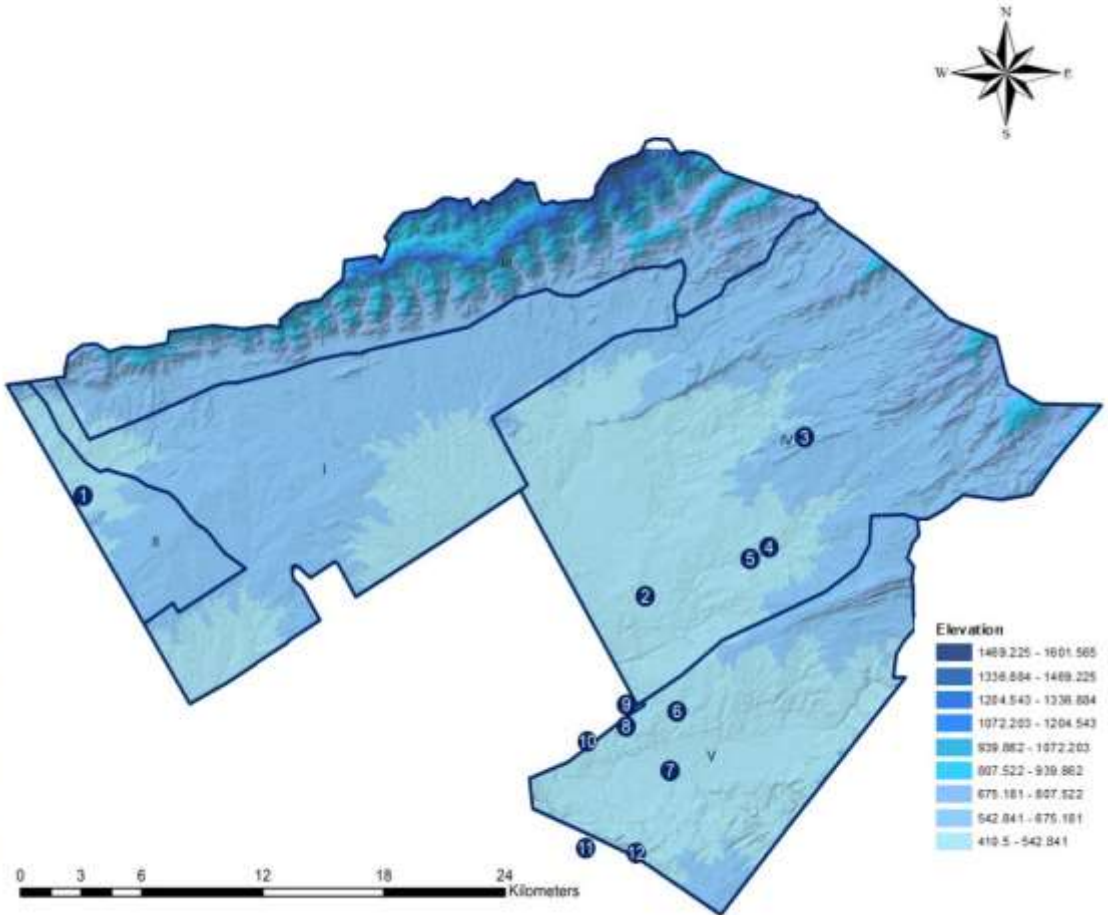


Figure 3: Study Area

Table 2: Questionnaire Design and Coding

Code	Factors	Scale
	Social Factors	
S-1	Age	Scale from 1 to above 40 years
S-2	Gender	Dichotomous
S-3	Educational level	From Illiterate to Post Graduation
S-4	Marital status	Dichotomous (Single or Married)
S-5	Household size (from 1 to 4 scale)	1= 0 to 5, 2=6 to 10, 3=11 to 15, 4=16 to 20
S-6	No. of children	0=0, 1=1, 2=2, 3=3, 4=4, 5=5, 6=6
S-7	No. of adults	0=0, 1=1, 2=2, 3=3, 4=4, 5=5, 6=6, 7=7, 8=8, 9=89, 10=10, 11=11, 12=12
S-8	No. of old-age people	0=0, 1=1, 2=2, 3=3
S-9	No. of people with disabilities	0=0, 1=1, 2=2
	Physical Factors	
P-1	Property buy/rent	Dichotomous
P-2	No. of properties buy/rent	0=0, 1=1=, 2=2, 3=3, 4=4, 5=5
P-3	Required area	Scale defined for 1-4
P-4	Required number of storeys	0=0, 1=1, 2=2
P-5	Required number of bedrooms	0=0, 1=1, 2=2, 3=3, 4=4, 5=5
P-6	Required number of bathrooms	0=0, 1=1, 2=2, 3=3, 4=4, 5=5
P-7	Required number of kitchen	0=0, 1=1, 2=2
	Locational Factors	

L-1	Have you ever bought/rented any property?	Dichotomous scale
L-2	Proximity to work influences you most to buy the property	Likert Scale
L-3	Distance from city center influences you most to buy the property	Likert Scale
L-4	Distance from educational institutes influences you most in buying the property	Likert Scale
L-5	Distance from highway influences you most to buy the property	Likert Scale
L-6	Distance from Airport influences you most to buy the property	Likert Scale
L-7	Distance from shopping mall influences you most to buy the property	Likert Scale
L-8	Distance from public transport influences you most to buy the property	Likert Scale
L-9	Distance from healthcare services influences you most to buy the property	Likert Scale
L-10	Distance from open areas/parks influences you most to buy the property	Likert Scale
L-11	Distance from playgrounds influences you most to buy the property	Likert Scale
L-12	Safety and security influence you most to buying the property	Likert Scale
L-13	Water availability and its infrastructure influence you most to buy the property	Likert Scale

L-14	Nullah or sewage disposal or sewerage treatment plant influences you most to buy the property	Likert Scale
L-15	Drainage system influences you most to buy the property	Likert Scale
L-16	Development status on site influences you most to buy the property	Likert Scale
L-17	Property views influence you most to buying the property	Likert Scale
	Marketing Factors	
M-1	Agents provided complete information	Likert Scale
M-2	Used platform provide any information about the approval status of the scheme	Likert Scale
M-3	Marketing from celebrities influences you most to buy the property	Likert Scale
M-4	Newspaper advertisement influences you most to buy the property	Likert Scale
M-5	Social media marketing influences you most to buy the property	Likert Scale
M-6	Marketing through news/TV channels influences you most to buy the property	Likert Scale
M-7	Marketing through messages/phone calls influences you most to buy the property	Likert Scale
M-8	Marketing through billboards influences you most to buy the property	Likert Scale
M-9	Internet access and internet usage enhance the speed of buying property and save time	Likert Scale

M-10	Internet access and internet usage give you more choice to compare different properties and their prices	Likert Scale
M-11	Brand Name/repute of developer influences you most to buy the property	Likert Scale
	Economic Factors	
E-1	Monthly income	From 1 to 6 (Less than 25,000 to above 200,000)
E-2	Affordability influences you most to buy the property	Likert Scale
E-3	Less down payments influence you most to buy the property	Likert Scale
E-4	Readily availability of loans influences you most to buy the property	Likert Scale
E-5	Flexible payments or flexible instalment plans influence you most to buy the property	Likert Scale
	Experienced-Based Factor	
EB-1	Property visit before buying	Dichotomous
EB-2	Visit of CDA website before buying	Dichotomous
EB-3	Checking of land use plan before buying	Dichotomous
EB-4	Residential Land use in concerned plan	Dichotomous
EB-5	CDA office visit before buying	Dichotomous
EB-6	Layout plan approval status	Dichotomous
EB-7	Approval of the scheme influences you the most to buy property	Likert Scale
EB-8	Time taken to buy property	From 1 to 5 (less than 6 months to above 3 years)
EB-9	Consideration of alternative option	Dichotomous

2.2.3. Data analysis

This study undertakes factor analysis as it is used in literature. Factor analysis means reducing measurable and observable factors from large datasets to a few variables with a share of common variance that assembles into descriptive categories. For factor analysis, the recommended sample size is 300 participants with at least 5-10 observations or variables (FORD et al., 1986). It is usually performed on ordinal, categorical, dichotomous, or continuous variables. If the dataset contains missing values, it is necessary to re-consider the sample size (Yong & Pearce, 2013). SPSS generally does not consider missing values in sample size and only takes those variables that have the maximum missing values as the sample size in analysis. It overall disturbs the results of the analysis. Therefore, it is good enough to remove that variable with missing values or to adjust the data of missing values.

From the literature, it is found that most studies conducted Descriptive Analysis, Factor Analysis (Baser et al., 2020; Hassan, 2020; Maoludyo & Aprianingsih, 2015; Sridevi & Saranya, 2018; Tzeng & Shiu, 2019). Regression Analysis, ANOVA, Reliability Analysis-Cronbach's alpha test (Abdu & Purwanto, 2013; Al-Nahdi et al., 2015; Chia et al., 2016; Nasution & Baginda Harahap, 2022; Raewf et al., 2021; Rai, 2020; Senthilmurugan et al., 2020; Ticoalu, 2016; Waheed et al., 2014; Q. Zhang, 2021; Zhi, 2022), Pearson's Correlation (Ticoalu, 2016), Chi-square Test (Majid et al., 2012), Multiple Regression Analysis (Abdu & Purwanto, 2013; Ticoalu, 2016), Cluster Analysis, T-Test and KMO and Bartlett's Test (N. Singh & Gupta, 2020; Sridevi & Saranya, 2018) to evaluate factors affecting the consumer behavior in real estate investment.

For this study, Descriptive Analysis, Principal Component Analysis (PCA) and Ordinal Regression Analysis have been performed in SPSS that are described in detail in subsequent sections.

2.2.3.1. Principal Component Analysis

It is defined as a procedure of reducing variables and is useful for a large number of variables dataset. It is described as a linear combination of optimally weighted observed variables (Rosenblad, 2015). This analysis has been done in SPSS where the analysis on the menu bar has been clicked and then go to dimension reduction factor to open the

dialog box of factor analysis. In the dialogue box, move all the variables from left to the right-hand Variable box. The whole process is summarized in figure 4. The steps are described in detail as below:

Step 1: Descriptive and correlation matrix

Select univariate descriptive, significant levels, determinants and KMO and Bartlett's test of sphericity. The mean value describes the characteristics of the most common response among the stated dataset(Chetty, 2015). After descriptive analysis, the next output from PCA is a correlation matrix that reflects how each item is associated with each other of the item. A high value shows that two items are associated and grouped, while variables with values less than 0.5 consider the elimination of variables from factor analysis. The principal diagonal matrix is always 1 as the correlation coefficient between a variable and itself is always 1, and the values above and below the principal diagonal are the same. In a good model, all values in the off-diagonal elements should be very small (close to zero)(Chetty, 2015).

The Kaiser-Meyer-Olkin (KMO) measures the adequacy of sampling data, and its value should be close to 0.5(minimum or barely accepted value) for satisfactorily proceeding with factor analysis, while values between and above 0.7-0.8 are acceptable. Bartlett's test is another demonstration of the relationship strength among variables. Its significant value should be less than 0.05, which means the variables are correlated enough to give a reasonable basis for factor analysis.

Step 2: Extraction

In the extraction dialogue box, select Principal Components, where the correlation matrix is used by default. The option of setting the eigenvalue cut-off but the value used in Kaiser's criterion is 1. Then choose a scree plot to display in the output. The output is a table of commonalities that reflects variance values and items whose values are more than 0.5 to be considered for further analysis, which has been accounted for. The eigenvalue shows the number of extracted factors whose sum is equal to the number of variables subjected to factor analysis. The factors are arranged in descending order based on the explained variance. The eigenvalue table is divided into 3 sections; Initial Eigen Values, Extracted Sums of Squared Loadings, and Rotation of Sums of Squared. This is the strategy of decision-making to determine the number of factors in most of the

statistical packages. A Scree plot is a graphical representation of eigenvalues against all factors. The number of factors to be retained is the data points that are above the break or point of inflexion. It is only reliable with a sample size of minimum of 200 Loadings (Chetty, 2015; FORD et al., 1986; Thompson, 2004; Yong & Pearce, 2013).

Step 3: Rotation

In the rotation dialogue box, select Varimax technique as it is recommended. Varimax rotation lessens the number of variables with high loadings on each factor and works to make small loadings even smaller. Loading plots are selected to generate a factor loading plot. The purpose of the rotation is to obtain a simple optimal structure to arrange factors under distinct clusters of interrelated variables to make interpretation easier. Maximum iteration for convergence is used to determine the number of times the SPSS will search for an optimal solution. The default value is 25, which is generally enough for most analyses. If the value is too low for the required analysis, a larger value can be picked for a large dataset (FORD et al., 1986)(FORD et al., 1986; Taylor & Francis, 2009).

Step 4: Factor score

In the score dialogue box, it has been asked to SPSS to save new extracted variables in the datasheet by using the Anderson-Rubin method. Then, SPSS created new columns with the factors scores in the dataset. The extracted factors are then named as it is an 'art' as there is no rule for naming the factors, except to give names that best demonstrate the variables within the factors(Yong & Pearce, 2013).

Step 5: Options

In the options dialogue box, set the option of missing values, and the coefficient display format. Select exclude cases listwise, sorted by size, and suppress small coefficients using an absolute value of 0.5 to prevent overestimating factors and for easy interpretation within the large dataset.

Step 6: Run the Analysis

Finally, return to the main dialog box and click OK to run the analysis.

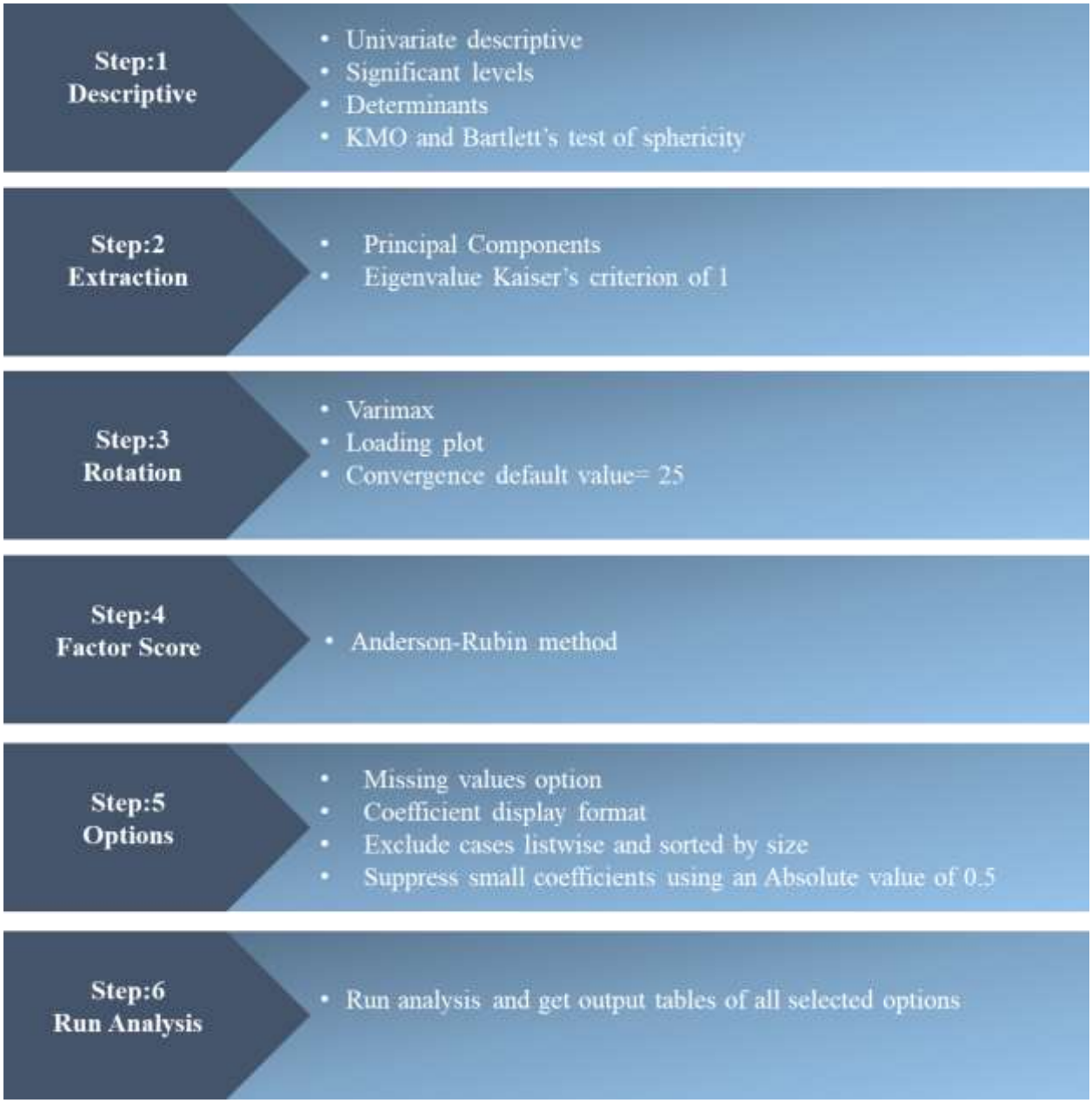


Figure 4: Process of factor analysis

2.2.3.2. Ordinal Regression Analysis

For this study, regression analysis has been performed as it is used by most of the studies in literature to determine the relationship between consumer behaviour with other factors affecting it. As the dependent variable is on likert scale, ordinal regression analysis has been performed. Before doing ordinal regression analysis, test of data reliability has been conducted.

Reliability test check the consistency and stability of the data. SPSS generally does not consider missing values in sample size and only takes those variables that have the maximum missing values as the sample size in analysis. It overall disturbs the results of the analysis. Therefore, it is good enough to remove that variable with missing values or to adjust the data of missing values. The ordinal regression analysis in this research has been performed by using SPSS 18 to reflect the relationship between dependent and independent variables.

Reliability Test

Alpha Cronbach shows that how an item/variable has positive correlation with another (Ticoalu, 2016). For establishing the validity of inferences based on test or measure scoresm it is crucial to have reliable sources of evidence (Gadermann et al., 2012). The more uniform your measurement, the higher reliability will be (Richard N. Landers, 2015). In this study, Cronbach's alpha was ccomputed to assess internal consistency of the used scales. Cronbach's alpha coefficient ranges from 0 to 1 with value closer to 1 indicating a high internal consistency. Coefficients above 0.8 are generally considered good while 0.7 is demmed acceptable and values less than 0.6 are considered poor (Chia et al., 2016; Nasution & Baginda Harahap, 2022).

Multi-collinearity Test

In regression analysis model, multi-collinearity arises when there exists a high degree of correlation among independent variables. This phenomenon makes it challenging to interpret the model's results and can also lead to overfitting issues. Typically, researchers perform this test before selecting variables for regression model. When independent variables are highly correlated, change in one variable can cause change to another, leading to significant fluctuations in the model results. This can result in unstable model results that vary significantly with even minor changes in the data or model (Songhao Wu, 2020). For all independent variables, the value of variance inflation factor (VIF) should be less than 10 that reflects no relationship across independent variables. It is highly recommended to address the issue if correlation > 0.8 between 2 variables (Desta, 2023; Songhao Wu, 2020). A tolerance value (T) below 0.1 is considered critical and multicollinearity is present.

Ordinal Regression Analysis

Regression analysis is a statistical technique used to examine relationships between variables. Usually, the researcher aims to determine the causal impact of one variable on another. Evaluation of "statistical significance" of the estimated relationships is a common practice, which reflects the degree of confidence that the estimated relationship is close to the true relationship (Humpage, 2000). Overall model fit can be assessed by examining (adjusted) R2 and F-value significance. The R2 (or coefficient of determination) reflects the level to which the model elucidates the observed variation, relative to the mean, in the dependent variable (Mooi, 2016). Ordinal regression depicts the relationship between a dependent and two or above independent variables. This method requires the data type of dependent variable on ordinal scale and independent on ordinal or continuous level (Moshinsky, 1959). It requires independent variable to be continuous, ordinal or categorical.

Model fitting

A likelihood-ratio test was conducted to assess the improvement of the final model over the intercept-only model. This test examines whether the final model provides a better fit than the baseline model that includes only the intercept (Johnson, 2012; Strand et al., 2011). The significant chi-square statistics ($p<0.0005$) shows that the final model provides a significant amendments over the baseline intercept-only model. This model provides more accurate predictions than simply guessing based on the marginal probabilities of the outcome categories (Strand et al., 2011). It reflects that the entire model fits significantly. This shows the overall importance of the explanatory variable (Desta, 2023; Marquier, 2019).

Goodness of fit

Statistics of pearson chi-square and deviation gives model of goodness of fit test. This test involves the comparing the observed values with the expected values based on the model. It is assumed that the model should have a p-value greater than 0.05 to be considered statistically significant (Balsalobre-lorente, 2021; Johnson, 2012; Marquier, 2019). The goodness-of-fit tests (Pearson and Deviance) provides a measure of how well the model fits the observed data or how poorly it performs (Johnson, 2012).

Pseudo R^2

The calculation of R2 values shows that how independent variables explain the dependent variable. It measures the success of the model through explaining the data variations which indicates the strength of association between dependent and independent variable (Balsalobre-lorente, 2021). Pseudo R2 measures the variance of the model (Johnson, 2012). The satisfactory value for pseudo R2 is 0.50. for Cox and Snell, Nagelkerke and McFadden (Balsalobre-lorente, 2021). The value of R2 ranges from 0 to 1 and this value is another measure which is calculated on the basis of log-likelihood between intercept-only model and full estimated model. The model with highest R2 value is considered the most suitable or best (Kadir & Omer, 2021). The significant value is considered significant at $p > 0.05$ (Balsalobre-lorente, 2021).

Parameter Estimates

Parameter estimates is the final dataset as a result of ordinal regression analysis that provides valuable information to researchers regarding the ability to predict changes in the outcome variable based on a of one-unit change in the predictor variable, while holding all other predictors constant (Johnson, 2012). It represents the core of the output of the analysis. It reveals the relationship between the explanatory variables and the outcome or dependent variable (Strand et al., 2011). The estimate indicates that the variables has positive or negative influence on dependent variable or threshold coefficient (Balsalobre-lorente, 2021). In the model, the importance of predictor variable is determined by the wald statistics which is the square of the ratio of the coefficient with significant (sig.) heading sig. (<0.05). The predictor variable has a significant impact on outcome variable with high values of wald statistics (O Chandrasekhara Reddy, 2015).

2.2.3.2.1. Hypothesis Formulation/Research Hypothesis

Hypothesis of this test are as under:

H-1: There is a significant association between social factors and regret level of consumer behaviour.

H-2: There is a significant association between economic factors and regret level of consumer behaviour.

H-3: There is a significant association between marketing factors and regret level of consumer behaviour.

H-4: There is a significant association between locational factors and regret level of consumer behaviour.

H-5: There is a significant association between physical features and regret level of consumer behaviour.

H-6: There is a significant association between experienced-based factors and regret level of consumer behaviour.

CHAPTER:4 DATA ANALYSIS

4.1. Bibliometric analysis

The bibliometric analysis covers an overall review of publications, the historical development of literature, Research area-wise/discipline-wise analysis, publication sources analysis, citation analysis, institutional and country analysis, and keyword analysis. The summary of the bibliometric analysis is shown in Figure 5.

The overall summary of the publications is shown in table 1. Out of 616 publications, 314 were articles, 256 were proceeding papers, 17 were early access, 15 were review articles, 12 were book chapters, five were editorials, one was a book review, and one was a publication was a data paper, as shown in Figure 6a. A total of 1694 authors have published research on digital "real estate." The most citations were observed in 2020. An average citation of 6.4 per article was observed. Out of 616, English Publications counted as 94.6% (583), followed by Spanish, German, Chinese, Portuguese, Russian, Croatia, French, Italian, Slovenian, and Swedish, as shown in Figure 6b.

The trending progress of a particular topic can be analyzed through annual no. of publications. Results showed an annual increase in no. of publications on digital real estate till 2020(Fig. 6). It is found that the first publication on digital real estate was in 2006. Results show that in 2006, 14 publications were published, which increased to 98 publications in 2020 and 51 by August 2021 (Figure 6c). This identifies an expansion of research interest of the scientific community in digital real estate. There are six most productive journals in which most articles have been published on digital real estate. Automation in construction, remote sensing, International Journal of Geographical Information Science, Annals of The Association of American Geographers, and Computers in Industry are the most productive journals (Figure 6d).

Citation analysis reveals which publications on digital real estate were the most-cited ones. Analysis revealed that a study by "Rokni, Komeil; Ahmad, Anuar; Selamat, Ali; Hazini, Sharifeh" is the most cited one, as shown in Table 3. The shortlisted documents on digital real estate received 3945 citations (an average of 6.4 citations per document). The total number of citations increased from 2007 to 2020 and up until August 2021. The top ten cited publications on digital real estate emphasize the multi-temporal Landsat

imagery, seamless mapping, application of google street view or modified green view index in measuring urban greenery at street level, simulating construction processes, and the Internet of Things, as shown in Table 3.

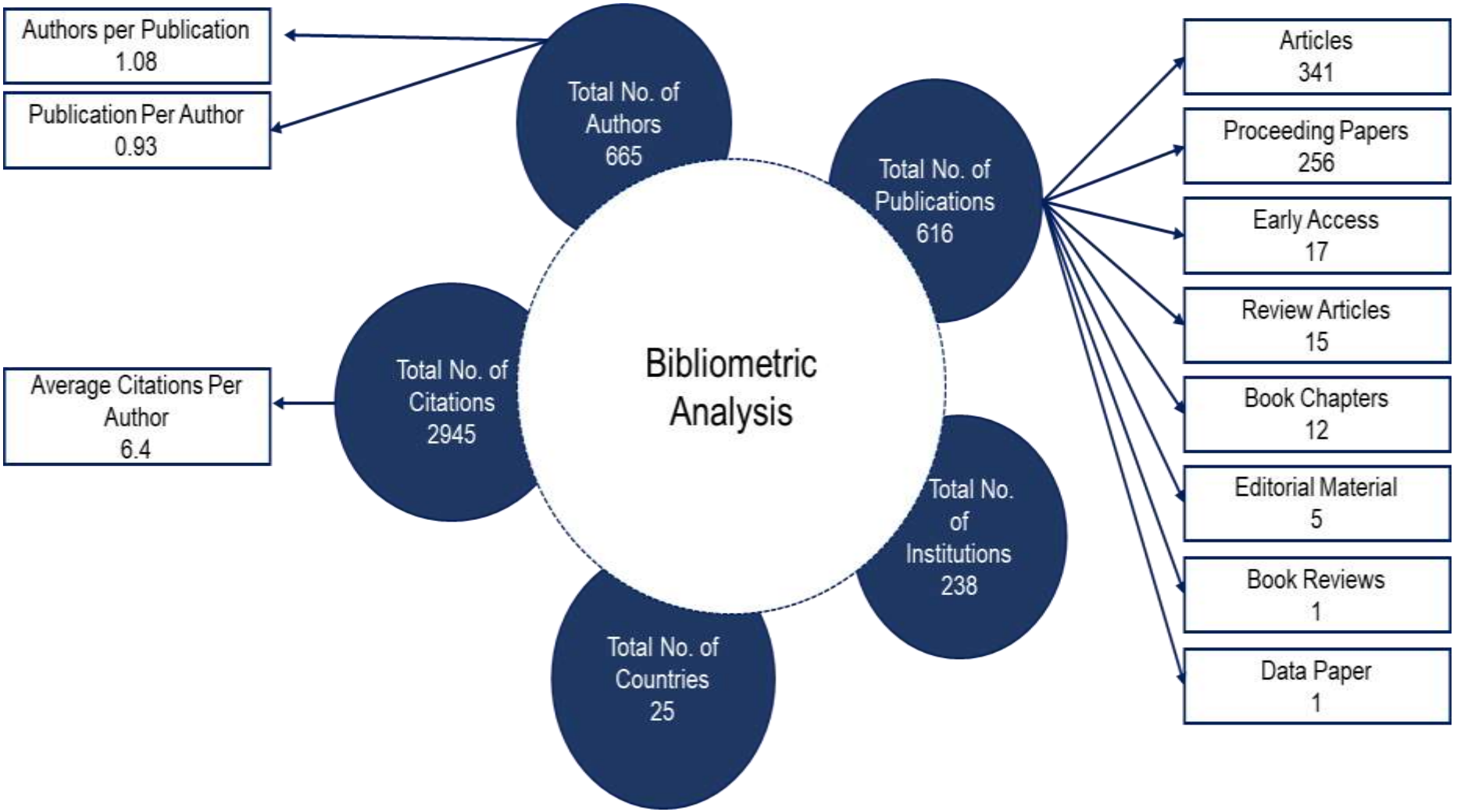


Figure 5: Summary of Bibliometric Review

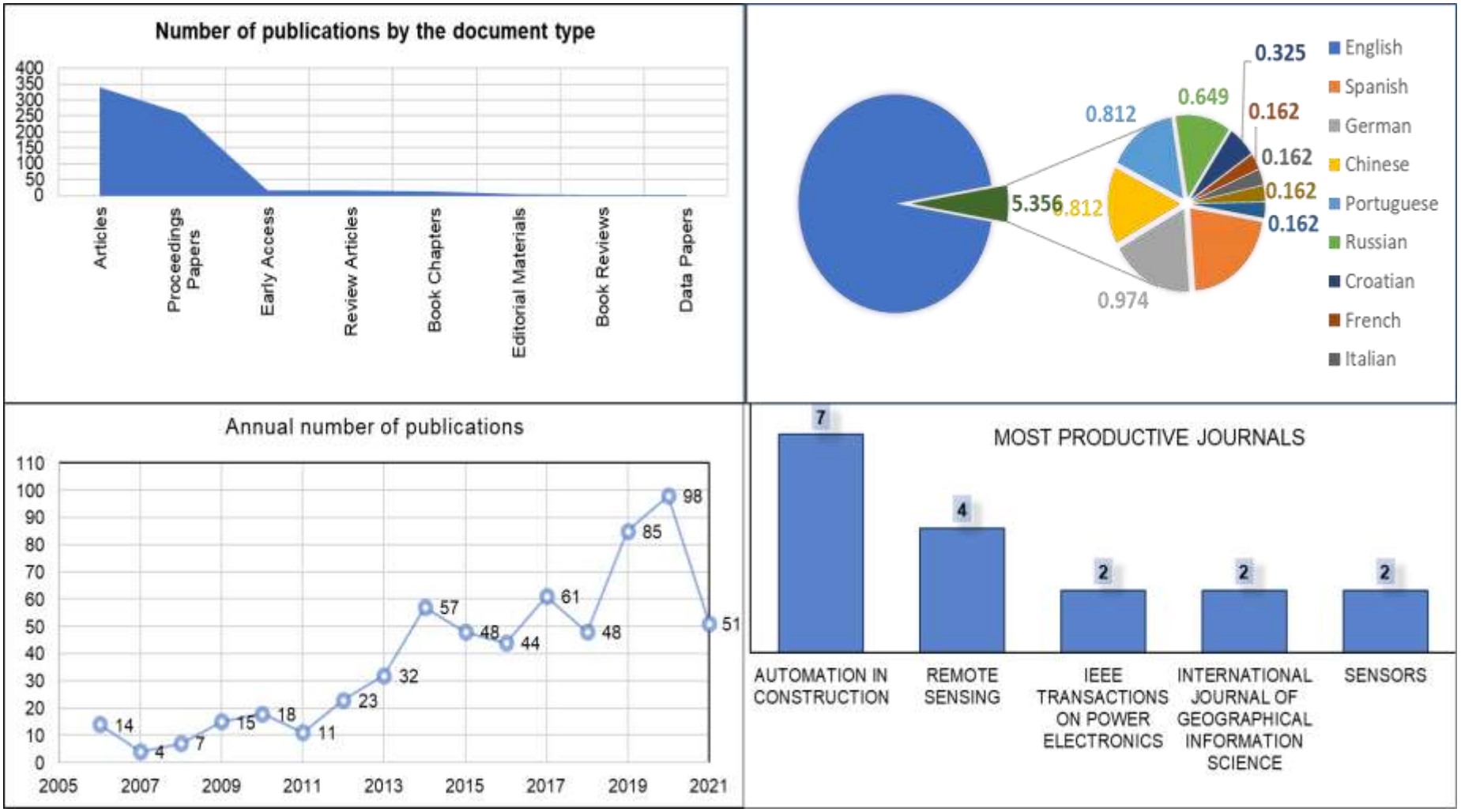


Figure 6: 6a- No. of Publications by Document Type, 6b- No. of Publications by Language, 6c- Annual No. of Publications, and 6d- Most Productive Journals

Table 3: Top 10 most cited Publications

Title	Authors	Publication Year	Total Citations
Applying population-based evolutionary algorithms and a neuro-fuzzy system for modelling landslide susceptibility	(W. Chen et al., 2019)	2019	124
Seamless Mapping of River Channels at High Resolution Using Mobile LiDAR and UAV-Photography	(Flener et al., 2013)	2013	111
A virtual prototyping system for simulating construction processes	(Huang et al., 2007)	2007	98
An Internet of Things-enabled BIM platform for on-site assembly services in prefabricated construction	(C. Z. Li et al., 2018)	2018	91
Determinants of urban expansion and their relative importance: A comparative analysis of 30 major metropolitans in China	(Q. Zhang & Su, 2016)	2016	77
Research and solution on the issues of information system updates and upgrades in digital real-estate	(Li, Max Z. –Y& Bian, Fu-ling, 2010)	2010	74
Farmland fragmentation due to anthropogenic activity in rapidly developing region	(Su et al., 2014)	2014	62
Developing a framework to improve virtual shopping in digital malls with intelligent self-service systems	(Demirkan & Spohrer, 2014)	2014	61
BIM and the small construction firm: a critical perspective	(Dainty et al., 2017)	2017	56
Satellite Images for Monitoring Mangrove Cover Changes in a Fast Growing Economic Region in Southern Peninsular Malaysia	(Kasturi Devi Kanniah, Afsaneh Sheikhi, Arthur P. Cracknell, Hong Ching Goh, Kian Pang Tan, Chin Siong Ho, 2015)	2015	46

The research strength of a region can be shown by no. of publications on a given topic by a particular country. The analysis revealed that institutions published most publications from mainland China, the USA, and Australia (Figure 7). On digital real estate, most of the research has been conducted in developing countries. China, Malaysia, and the USA were at the top of the list in this research (Figure 7). In this regard, China, Malaysia, and the USA published 21.68%, 18.44%, and 14.88 % of total research publications on the selected topic.

Keyword analysis shows the precise content of digital real estate research. There were 2061 distinct keywords and 40 unique keywords. VOSviewer is an open-source software to be used to visualize the linkages and co-occurrence of specified or selected keywords by study authors. The circle in the visualization map represents the co-occurrence of each keyword, and the diameter of a circle shows the number of links between one keyword to another. Therefore, the larger the diameter of a circle, the more linkages with other keywords. The line thickness between two circles indicates how often keywords appear together. Figure 8 shows keywords used in publications on digital real estate with at least five times the co-occurrence of a keyword in extracted publications. This analysis has demonstrated that the concepts of GIS, blockchain and BIM were the most frequently used keywords in digital real estate.

Countries	No. of Publications
Peoples R China	134
Malaysia	114
USA	92
Australia	38
England	32
Italy	29
Germany	25
Finland	21
Poland	19

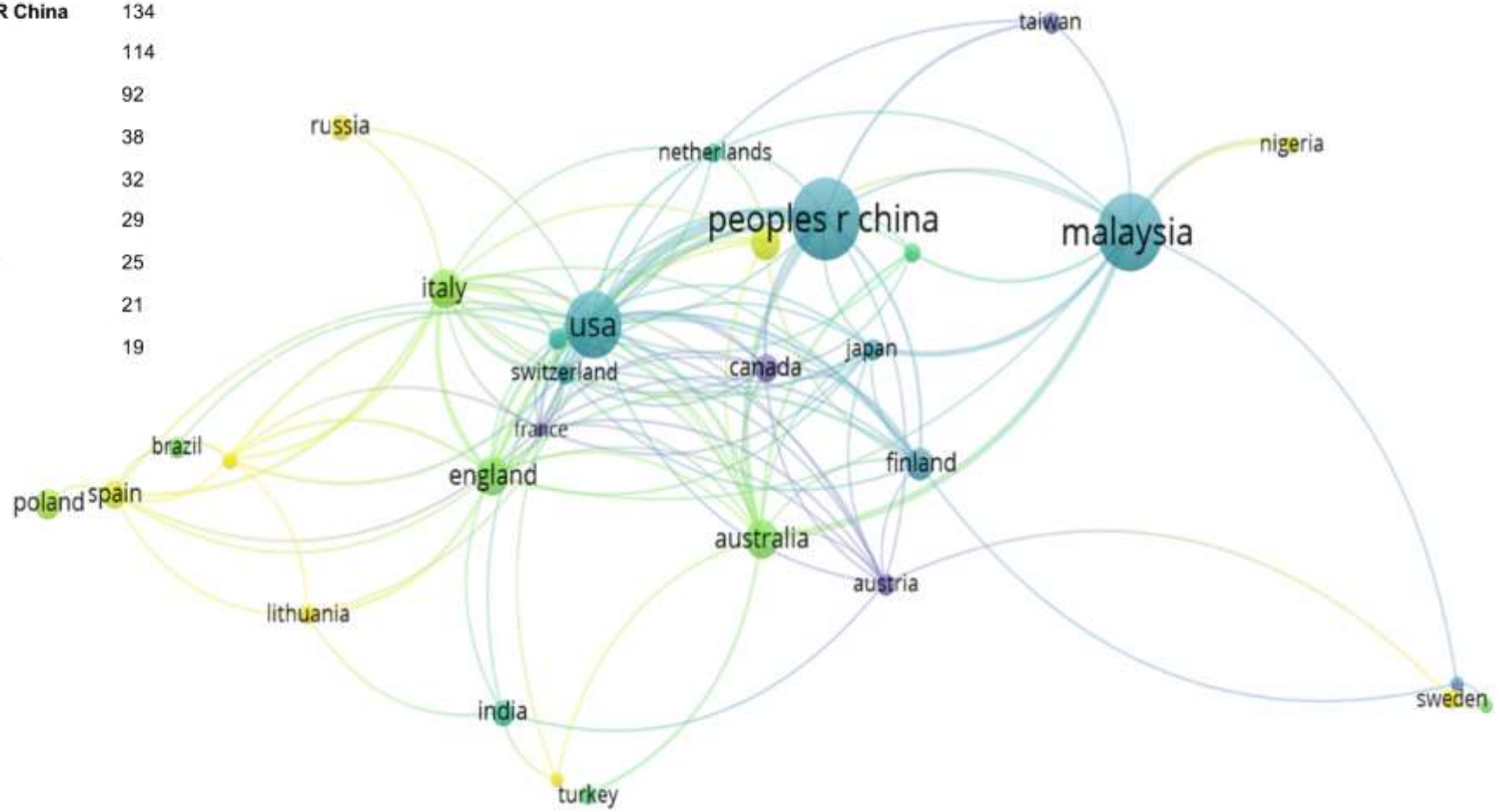


Figure 7: Top 10 Countries Publishing on Digital Real Estate

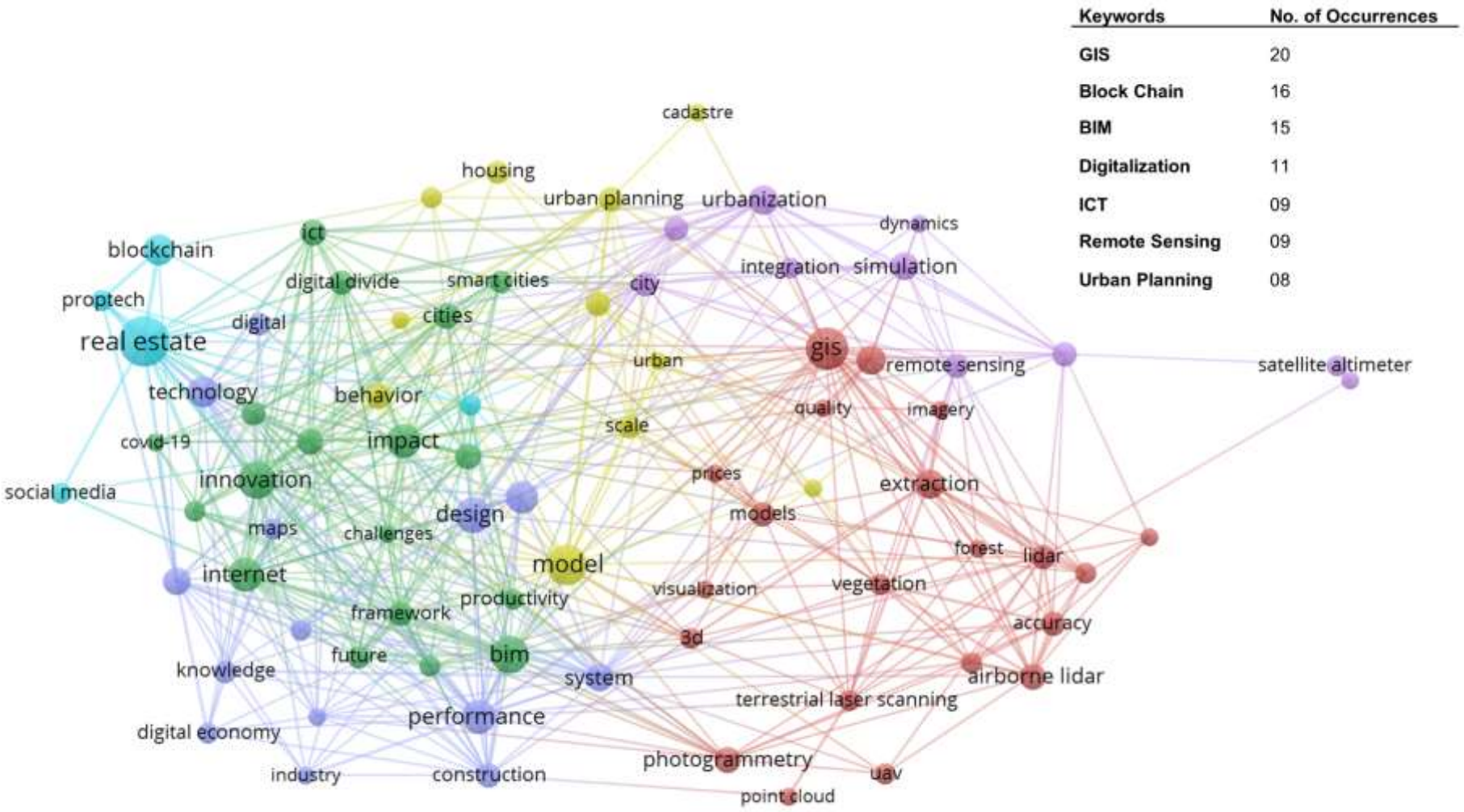


Figure 8: Network visualization map of all keywords in documents (5 occurrences)

4.2. Thematic Review- digital real estate

Systematic review has been done by using PRISMA Guidelines as already discussed in previous sections. The thematic analysis has helped identify common themes of digital real estate. The themes were categorized and named as information and communication technology (ICT), data collection technologies, data networking tools, and decision-making systems (Figure 9). All are discussed one by one in detail in the subsequent sections.

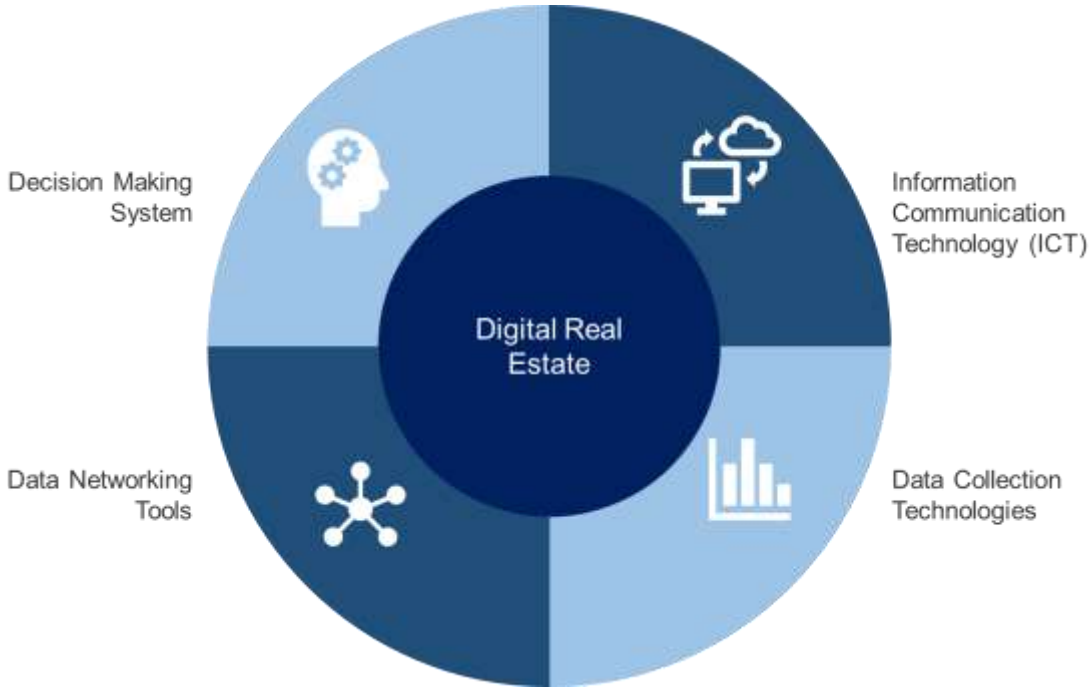


Figure 9: Thematic Areas extracted from Systematic Review of Published Articles on Web of Science

4.2.1. Information and communication technology

Nowadays, ICT plays a vital role in each and every domain of life in this era of technology. ICT is used on smart city to enable real time monitoring, proficient management of urban facilities, and public safety insurance. ICT can promote modernization process and it effects urbanization and regional development in a positive way. Examples of use of ICT in real estate transactions are Ontario Land Registration and Information System (POLARIS) in Canada, Land online internet service in Oceania, Israel land registry in Israel and URPERA and E-recording in USA are some of the examples of countries that developed electronic land registry system. Real estate

companies are using PropTech to enhance their customer experiences, increase sales and improve operational efficiencies.

Urbanization and smart city

Urbanization is considered to increase the urban populations, agricultural and construction land readjustment, and modifications in production modes and social styles (D. Wang et al., 2021). The growth of cities in developing countries has dramatically changed. In developing countries, the total urban population between 1950 and 2015 increased ten times from approximately 300 million to 3 billion. In the same way, the urban proportion decreased from 17% to 50% (Jedwab et al., 2017). With this rapid urbanization, the necessities of human life, such as education, health, food, housing, employment, infrastructure, and other basic human needs, have been undergoing major changes, and their impacts were very substantial (Nanda et al., 2021).

The review showed that the smart city concept had been excessively in the digital real estate literature. Smart buildings shift real estate from physical to digital. Technology became the main heterogeneity factor for real estate in smart cities both at city and property scales (Lecomte, 2019). Real estate technology in the smart city is considered an evolving solution to address the challenges of urbanism and achieve sustainable development (Berlin, 2020). Smart buildings, smart mobility, smart citizens, smart governance, smart education, smart infrastructure, smart technology, and smart energy are all components of a smart city and are surrounded by the Internet of Things and Big Data. The real estate sector plays a vital role in moving towards smart cities and making rapid progress in the development and innovation of smart buildings in smart cities (Jonathan Hills, 2018).

Urbanization is supported by progress due to information and communication technology (ICT), which can promote modernization. The growth of cities has been formed by an evolving technological frontier (Payne et al., 2020)**.** ICT positively affects urbanization and regional development (D. Wang et al., 2021). It also helps decrease poverty (Sharma, 2005) by generating employment opportunities that enhance overall per-capita income (T.D. Stanley, Chris Doucouliagos, 2015). It has paved the way for urban e-governance and the popularization of geographic information systems. ICT has been extensively used

to plan and manage infrastructure, property and land records, finance and mortgage, digital information systems, surveying, etc. (Fields & Rogers, 2021; Tapp & Kay, 2019).

ICT's role in urbanization essentially defines the smart city concept. A smart city uses comprehensive ICT infrastructure to enable real-time monitoring, proficient management of urban facilities, and public safety. The smart housing concept (Tomal 2020) and commercial real estate (Lecomte 2019) are two domains that define smart cities to some extent. It is about the valuation of real estate property, whose credibility largely depends on the systematization level of digital real estate data from several sources (Tomal 2020). Real estate is shifting from the physical to the digital environment through a smart city. Commercial real estate is shifting from providing assets to services (Lecomte, 2019). In today's world, policymakers are willingly supporting and implementing smart city concepts across the world. Although, the Covid-19 pandemic proved itself transformational, it repositioned the business objectives and optimized the physical and digital presence of the business (Nanda et al., 2021). The introduction of ICT has promoted interest at hypothetical and empirical levels in the smart built environments, i.e., outfitted with smart articles, such as sensors, well as computing and communication competencies, allowing them to interact intelligently with their human occupants and assist them in their daily activities (Xu et al., 2019).

ICT act as a primary engine of urbanization, but it also widens the digital divide that impedes urbanization. In the information age, the digital divide challenges healthy urbanization. There is huge potential to govern cities if the digital divide can be reduced. Government plays an essential role in urbanization and technological progress. Government-led and ICT-based urbanization is believed to be able to mitigate the effects of the digital divide and obtain balanced regional growth (D. Wang et al., 2021).

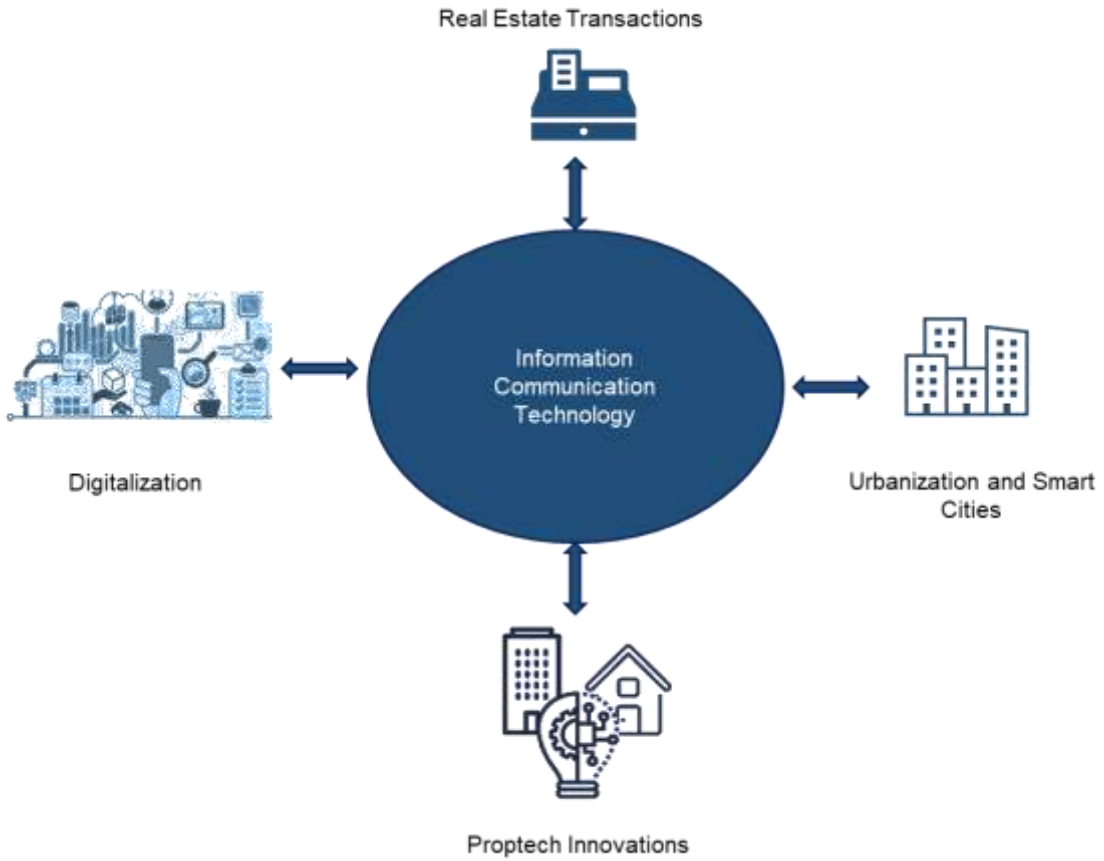


Figure 10: Sub-Themes of Information Communication Technology (ICT)

Digitalization

Digitalization is defined as the method of making digital everything that can be digitized and the process of changing over information into digital format (Bhadra, 2015). It is the use of digital technologies to convert a business model and offer new revenue streams and value-producing opportunities, paving the way to a digital business (Gray & Rumpe, 2015, Branca et al., 2020). It is associated with future socioeconomic pathways, such as urbanization, sustainability, climate change, and demographics, which all have a principal effect on the everyday lives of people in society (European Commission, 2018). It is the practical use of ICT resulting computerization of land records and registrations at the end of the 20th century.

The baseline data for digital real estate depends upon the digitization of past data. In the housing market, digitization is important in coding residential property attributes (location, size, standard, etc.) in digital format (Tomal, 2020). As a result, real estate

organizations are actively investing in digitalization and contemporary computer-aided facility management software (Koch et al., 2019). It provides the input for supporting Building information models (BIM), big data, Internet of Things (IoT), augmented reality (AR), blockchain, and building information standards (Koch et al., 2019). COVID-19 has provided the opportunity to invest in digitalization to revolutionize real estate (Nanda et al., 2021).

Real Estate Transactions

Real estate transactions involve ownership transfer of land, properties, apartments, etc. It is an expensive and time-consuming procedure. For example, it takes about 22 days on average for property transfer and costs around 5% of the total value (The World Bank 2018). Causes for the delay in transactions are unavailability of accurate or digital information, inefficient search criteria for customers, inconsistencies in parcel identification due to the difference between digitalized and paper plans, and unavailability of standard inquiry forms or reporting mechanisms (Saull et al., 2020).

Real estate transactions require an online land registry system. It is a conceptual and abstract model that includes four components associated with parties (individuals and organizations), administrative units (ownership rights), spatial units (parcels), spatial sources (surveying), spatial depiction (geometry and topology) (ISO, 2012, Lemmen et al., 2011). A good electronic system can better monitor the registration process, automatically prevent fraud, and make an alert by detecting typical fraud patterns (Sandberg, 2010). These systems can save time, reduce workforce, minimize bureaucratic delays, improve convenience and public access to land registration, enhance search possibilities, and provide remote access to records or registers (Whitman, 1999).

Proptech Innovation

Proptech is defined as a technology that comes into direct contact with real estate operations through performing tasks or shifting duties, intervening between purchasers and sellers, transforming physical products and information into data and services, and supporting the organization of people (Tagliaro et al., 2021). Integration of technology with real estate, especially the development of real estate digital technologies, is often called as PropTech, is destined to transform the whole industry (KPMG, 2017). Large-scale real estate organizations are growing and improving their business practices in

reaction to recent technological breakthroughs, focusing on new technology platforms, tools, and paradigms (Battisti et al., 2020). Real estate firms use PropTech to enhance customer experiences, increase sales and improve operational efficacies (Nikolai Siniak, 2020). Baum (2017) divided the Proptech industry into three categories: Smart real estate (SRE), Shared Economy, and Real Estate Fintech. These comprise technology-oriented systems that make it easier to utilize, operate, or manage assets of real estate and ownership transactions of real estate. The real estate framework includes the automation, brokerage, digitization, and management processes that explain the overall impact of technology (Tagliaro et al., 2021).

4.2.2. Data collection technologies

Data collection technologies deal with hardware and gadgets. In real estate, gadgets are used to tell digital story based on augmented information through integration of VR and BIM, real-time tracking of accidents and as-built modelling with Lidar and 3D laser scanning. There are various data collection methods and devices that have been developed with the passage of time to augment real estate activities. In this study, the focus is limited at VR and AR, drones, 3D scanning, wearable technology and big data.

Augmented and virtual reality

Various data collection technologies have been used in digital real estate (Figure 8), e.g., virtual reality, drones, and big data. One of the most common tools is virtual and augmented reality. Virtual reality (VR) processes virtual worlds without spatial reference to the world (Chai et al., 2019). Whereas augmented reality created a fusion of actual life and digital reality (Ullah et al., 2018) through the superimposition of computer-created virtual objects, scenes, and systems on actual scenes to enhance reality (Jin et al., 2020. These technologies have evolved, and in In 2017 alone, these technologies raised huge investments to about $13 billion (Ullah et al., 2018). By 2025, revenues generated from VR/AR software are expected to reach $2.6 billion, and the market of VR and AR is expected to make a minimum of $80 billion in real estate (Forbes Real Estate Council, 2017).

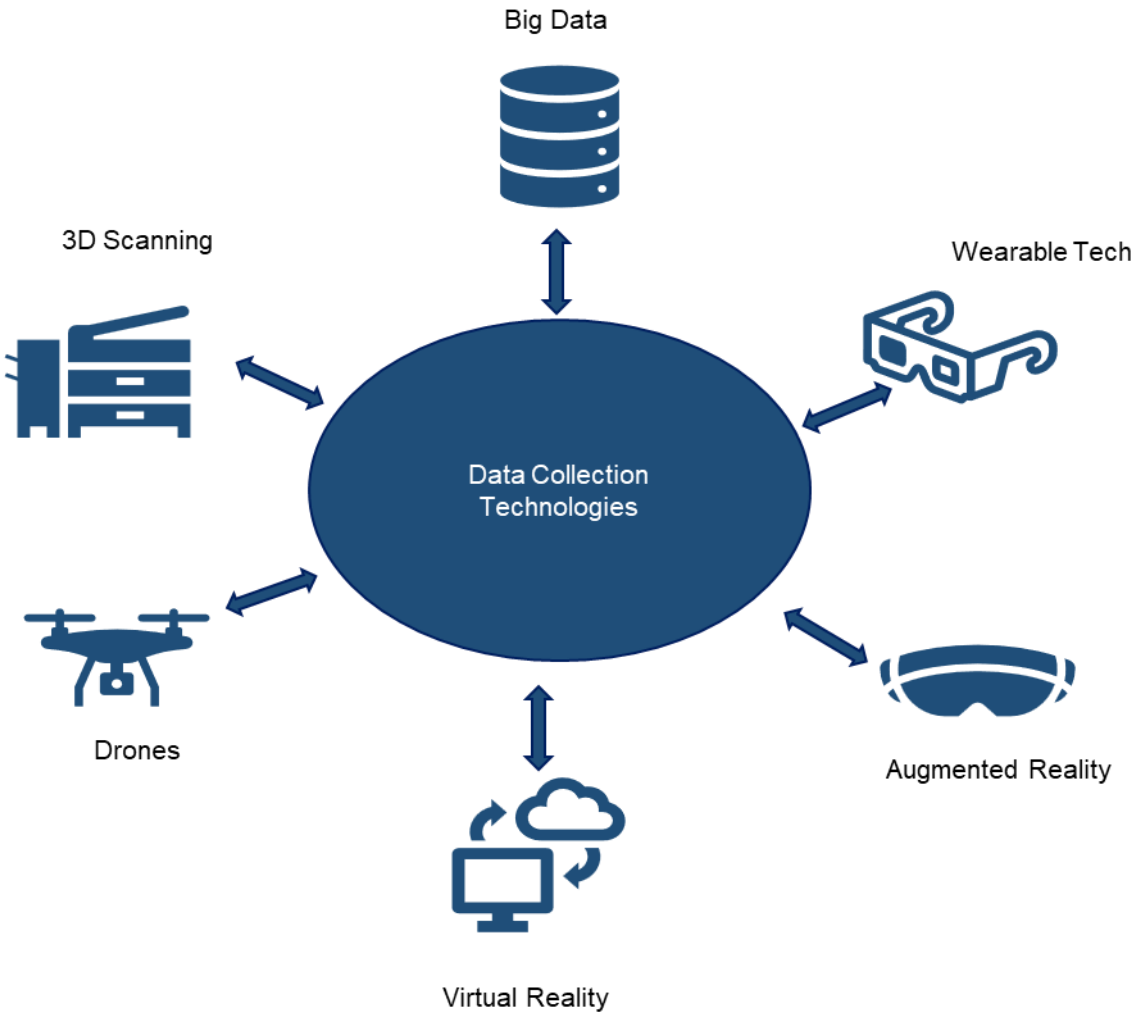


Figure 11: Sub-Themes of Data Collection Technologies

Real estate agencies are using AR technologies to enrich classified advertisements and real estate search functions. AR and VR offer opportunities such as platforms of virtual property, directed and interactive visits, virtual presentations, architectural visualization, and virtual trade (Gleb B., 2020). The 3D-virtual excursions can be approached via VR headsets. Individuals wear these headsets over their eyes and the upper part of their faces (attached with a strap), allowing them to be fully immersed in a virtual home (Sihi, 2018). AR has caught concentration for design review and collaboration as it is appropriate for creating an interactive 3D communication setting for the design, allowing consumers to find out the greater possibilities for design scenarios and more intuitively analyze 3D BIM models before they are physically constructed (Jin et al., 2020). In this way, the end user can attain a feeling for an asset before viewing it physically and increases their

confidence in purchasing such property (Ullah et al., 2018). Thus, the advantages of using such technologies are global transactions, time savings, confronting intangibility, and narrowing down the pool of interest for buyers (Forbes Real Estate Council, 2017).

Technical limitations of detecting sensors regarding real-time tracking, user's limited and uncomfortable wearing experience, unsatisfied visual quality, and display screen issues are some of the drawbacks that have been criticized in existing AR displays. To address these issues, Spatial Augmented Reality (SAR) was introduced. It provides an Augmented Reality experience by transforming the real-world appearance with an optical projector. It helps the consumer comprehend how a virtual product appears in the real world better (Jin et al., 2020). Thus, the potential of SAR is being evolved in the real estate industry.

Drones

Drones are aerial vehicles operated through remote control or a ground control station. Its use has recently surged in real estate management for data collection (Kuzma et al., 2017). It allows property managers/agents to get aerial views through videos and images for displaying them to potential customers. They are used in aerial photography, automated mapping, property marketing (Jo Kuzma, 2016), 3D images, and the development of land surface data (Mohan, 2015). It is estimated that 72% of real estate companies in the United States used drones, while 52% in UK, 48% in France, and 24% in Germany. In total, 72% of agents reported aerial photographs through drones, while 48% reported through drones for surveying (Kuzma et al., 2017). Customers can check the proximity distance of the property from neighboring houses and facilities without visiting in person (Ullah et al., 2018). Due to its advantages, 83% of home sellers globally prefer to work with agents with drones (*Real Estate Drone Statistics*, 2018). In this way, the selling rate of property with aerial photographs becomes 68% quicker than a property with normal photographs (Young, 2016). It enhances the transactions of property and reduces inspection time

3D Scanning

3D scanning is a disruptive data collection technique used in modeling, views, and images that give users more reliable and credible data for real estate stakeholders (Takin et al., 2017). Hand-held scanners, mobile scanners, and structured light scanners are some types

of 3D scanning. Hand-held scanners include Lidar, used to create as-built drawings to amend drawings or keep a record of maintenance and repairs (Sepasgozar, Forsythe, et al., 2016). These scanners help construction managers update data and drawings by using updated multi-dimensional models (Sepasgozar, Wang, et al., 2016). Scanned models can easily restore, renovate and preserve work for real estate departments and the government (Ullah et al., 2018).

Wearable Technology

Wearable technology is a term that refers to electronic gadgets, technologies, or accessories that allows the wearer to track and get data in real time (Warburton, 2018, Ullah et al., 2019). Due to their close proximity to the body, they can be used to monitor better information about a user and their surroundings (Page, 2015).

In real estate, wearable technology and devices are electronic gadgets that can track maintenance and equipment records, offer visual signs for building elements, and present public data to target consumers (Warburton, 2018). Furthermore, consolidating wearable technologies with building management systems provides benefits such as fault detection and as-built drawings (Sepasgozar et al., 2014). This can give customers the power to make more informed decisions (Ullah et al., 2018). Similarly, in the construction industry, wearable tech can help monitor the well-being and safety of workers and equipment in real time (Shirowzhan et al., 2017).

Big data

With the wide utilization of technology, high-speed and massive data are being produced in numerous forms, which are troublesome to process and analyze (Kumar Padhi et al., 2018), giving rise to the term “big data”. It refers to huge volumes of complicated data processing using conventional software techniques (Warburton, 2018). This exponential growth in the rate of data generation is due to the expanded utilization of smartphones, computers, and social media. Nearly 95% of businesses are producing unstructured data, and they spent $187 billion in 2019 on big data management and analytics (Arina, 2019). The use of big data is an emerging theme for research purposes for a better understanding of both urban dynamics and infrastructure management (Talamo et al., 2016).

IT technologies transform the real estate market structure into a prominently data-driven industry. Big data recently made its way into the real estate and property management

industry. It is being used in numerous forms, such as visualization of properties and 360 videos (Felli et al., 2018), virtual and augmented realities (Ullah & Siddiqui, 2017), stakeholder management (Ullah et al., 2019), and online customer management (Munawar et al., 2020). Big data can save time searching real estate listings with details on price, property, rents, etc. It can help find potential clients and their needs to make real estate decisions (Warburton, 2018). Particularly, big data in real estate incorporates a variety of databases that include transaction histories, sociodemographic data, and geo-referenced data (Battisti et al., 2020).

4.2.3. Data networking tools

Networking means to use digital telecommunications that allow devices to share resources on a network. Data links in computing systems to interchange data with wired or wireless connections (Ullah et al., 2018). It has been used in several real estate domains, including coordinating multi-site construction projects via federated clouds, indoor door environment detection, reconstruction and modelling of as-built 3D pipelines and so on. Real estate industry has a variety of networking applications, but this study limited its scope to the following tools:

Cloud computing

Networking allows devices to share resources on a network through wired or wireless connections (Ullah et al., 2018). Various tools and technologies are available for networking and computing (Figure 9). Cloud storage, retrieval, and computing have recently emerged as data networking technologies. Cloud computing attributes include on-demand self-service, broad network access, resource pooling, rapid elasticity, and measured service (Bulusu & Sudia, 2012, Carroll et al., 2011). In 2021, the applications of the global cloud market had a value of US$133.6 billion and were estimated to reach US$ 168.6 billion by 2025 (Liu, 2022a). The benefits of cloud computing in the real estate industry are cost effectiveness, improved security, data tracking, improved relationship with customers, and increase productivity (GRAFF, 2020; Jane, 2022; ONGC Systems, 2019; PADMALOSANI, 2021)

Cloud computing can help archive, store, and display real estate data for decision-making. Customers face regret if they need to make a decision based on insufficient (Ullah et al., 2018). Cloud-based software and apps can help track and show maintenance and

refurbishment records to stakeholders. It also reduces regret by providing more information by giving stakeholders access to the financial details of the property (Ullah et al., 2018). Similarly, it improves scalability, flexibility, integration of devices, data security, and reliability (Bulusu & Sudia, 2012, Vennam, 2020, Zhu & Chappell, 2017). Various studies have highlighted the cloud-computing services, like Google App Engine, Microsoft Azure, Salesforce.com, Google Docs, Online Payroll, Cloudwatch, and Azurewatch, for assisting in real estate management (Aboul et al., 2011; Aceto et al., 2013; Hashem et al., 2015; Jaeger & Schiffman, 2010). The cloud market share in the real estate industry is expected to grow to 9.7% in the coming five years (Lilia Shkuropat, 2022).

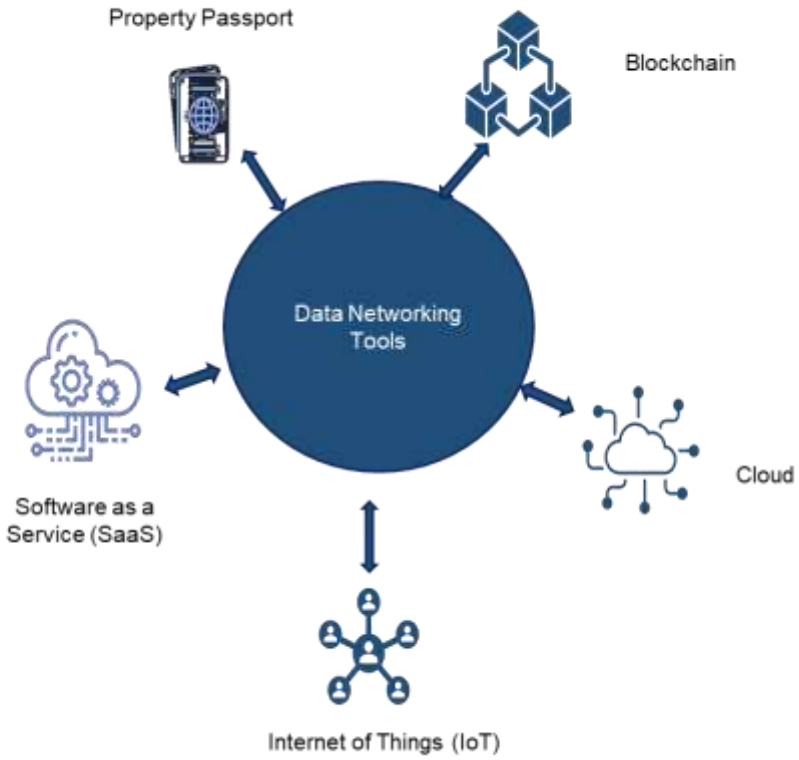


Figure 12: Sub-Themes of Data Networking Tools

Internet of Things (IoT)

Internet of Things (IoT) means internet-based and connected gadgets that can detect physical characteristics, such as temperature, humidity, lighting, and other characteristics (Wortmann & Flüchter, 2015). IoT is also defined as an innovative internet-based model

that links various things or objects in the surrounding with wireless or wired technologies to achieve anticipated goals (Ullah et al., 2018; Wortmann & Flüchter, 2015). The global market of IoT is estimated to touch $875,000 million by 2025, at an annual compound growth rate of 26.9% (Petrov, 2022).

IoT devices are used in real estate property management to monitor buildings and associated environments to manage temperature, humidity, indoor air quality, and lighting levels (Ullah et al., 2018. In real estate, examples of IoT are real-time production logistics synchronization systems (Qu et al., 2017) and fog computing for wind farms, smart grids, and smart cities (Bessis & Dobre, 2014). Almost 73% of real estate businesses have already used IoT. IoT shaped the real estate industry through house hunting, smart real estate homes, smart building, and management systems (Mihir Mistry, 2022). IoT in real estate reduces operational cost, improve quality of life, and provides additional security. In large sites such as industrial zones, office parks, shopping malls, airports, and seaports, IoT reduces energy , spatial management and building maintenance costs up to 30% (Serhiy Chernyshov, 2022).

Software as a Service (SaaS)

SaaS usually operates software in the tech industry by providing remote access to software via web-based network services instead of installation on user's desktop. This remote access is provided through the internet, which is cost-effective for agents and users (Warburton, 2018). It integrates various solutions by bringing several property management services under one roof (Ullah et al., 2018). SaaS has been used in construction management, client care management, supplier management, marketing, retailing, and diverse administrative tasks (Limbăşan & Rusu, 2011; Warburton, 2018). SaaS-based software packages, for example, RealSpace and PropertyBase, facilitate information sharing regarding contracts and work orders, lease and occupancy, maintenance, and security among major stakeholders involving consumers. This information is needed for consumers to reduce post-purchase regrets (Ullah et al., 2018). In real estate SaaS platforms, customer management, transaction management, property management, team management, listing management, and marketing automation are 6 key functions related to it (Elena Semeniak, 2022). The benefits of SaaS in the real estate industry are ease of accessibility, affordability, flexibility, cost-effectiveness, and ease to use (Albert Aranbaev, 2021).

Blockchain

A blockchain is a decentralized and distributed database that stores ownership records. A blockchain stores information electronically in digital format in the form of blocks linked via cryptography. For Bitcoin, transactions are permanently recorded and viewable to anyone (HAYES 2022). Decentralized blockchains cannot be modified, and entered data is irreversible (HAYES, 2022; Sam Daley, 2022).

Real estate has relatively higher profits, but it also faces major issues such as high transaction fees, a lack of transparency, time-consuming transactions, fraud, and undue commissions (Ahmad et al., 2020; Yadav & Kushwaha, 2021). Blockchain has emerged as a powerful supporting technology to remove these within the real estate investment market. It also offers various benefits such as speed, reliability, immutability traceability, transparency, decentralization, and trust (Ahmad et al. 2020; Garcia-Teruel 2020; Yadav and Kushwaha 2021). Thus, the need-based demand for a blockchain-based structure arises to execute efficient, tamper-proof, fast, free of fraud and reliable property transactions.

Blockchain technology can act as a registry that indicates records of property rights (token title) and transactions. Due to this, it fits both legal traditions by keeping title records and keeping chains of deeds (Konashevych, 2020). To minimize the risk of fraud, personal digital keys are given to involved parties in a contract (Ahmad et al., 2020). The technologies in blockchain include smart contracts, immutable record management, and time-stamped (Ahmad et al., 2020; Garcia-Teruel, 2020; Koch et al., 2019; Konashevych, 2020).

Property passports

A property passport means saving an individual's property information in a unique digital file maintained by the property owner and transmitted with a title. The recurring steps of a property passport can be completed using advanced and up-to-date technologies. Still, detailed, transparent, and cost-effective property passports demand the integration of digital technologies, especially networked sensor technologies (IoT, BIM) and automated means to manage occupants and properties. Real estate professionals identified a digital logbook as an important step to avoid delays in real estate transactions (Saull et al., 2020).

4.2.4. Decision Making Systems

Decision-making is crucial for real estate property valuation, selection, buying, or rent. From a monetary standpoint, purchasing a property may be the biggest investment a person can make and therefore holds a high financial risk. The decision is primarily based on three criteria: household needs, building facilities, and location characteristics. Decision-making systems or procedures are based on different methods and models. Some are geographic information systems (GIS) for locational characteristics, geostatistical analysis, and building information systems (BIM) for describing building details/facilities. At the same time, the more dominant approaches involve artificial intelligence-based methods for real estate management (Figure 13).

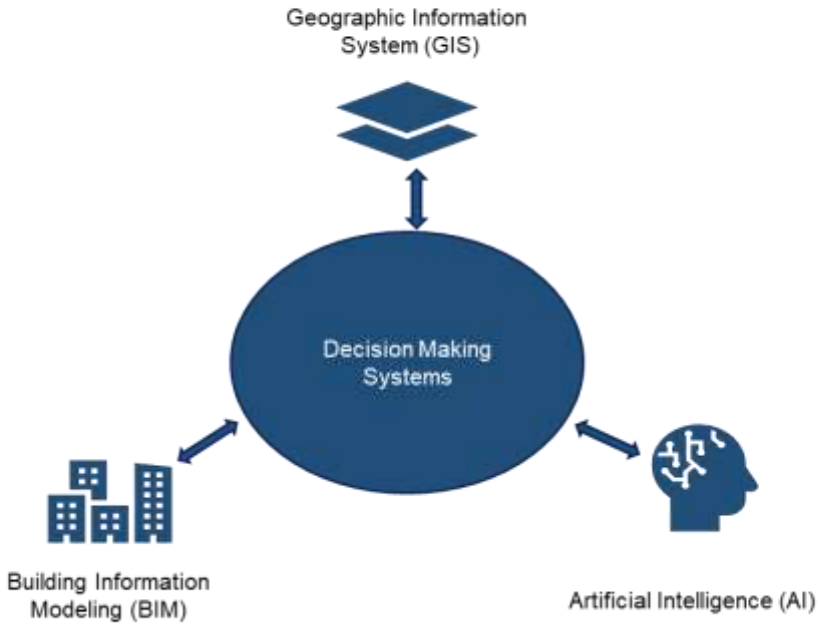


Figure 13: Sub-Themes of Decision-Making Systems

Building Information Model (BIM) and Geographic Information System (GIS)

Building Information Modeling (BIM) was originally introduced in the industry of AEC (architecture, engineering, and construction) (Eastman et al., 2011). It is a digital

demonstration of the physical and functional characteristics of a building (Dainty et al., 2017; Xue et al., 2020), creating a shared information resource for building information. It provides a trustworthy foundation for decision-making in various stages of the life cycle of a building, from initial conception (design, construction) to operation, maintenance, and demolition. Available data and information in digital format through BIM can be amended, replicated, and shared with project stakeholders (Dainty et al., 2017; Mahdjoubi et al., 2013; Saka et al., 2020; Sun et al., 2019). BIM and GIS could be utilized to identify precise property units, demonstrate cadastral boundaries better, and comprehensively depict complicated buildings (Sun et al., 2019).

Building Information Modelling (BIM) is a new real estate paradigm that allows designing, building, and managing the built assets from planning to operating in a digital environment. It provides a smooth information flow throughout the project's life cycle from concept to disposal of the project in the form of digital representation, effective cooperation, visual representation, and data management (Ali et al., 2018; Ma et al., 2014; Qie & Jiao, 2014). It generates a new paradigm and works environment by integrating all real estate stakeholders (Bilge & Yaman, 2021). The benefits of using BIM include savings in cost and time, improvements in quality and performance, clash detection, improved accuracy, enhanced collaboration and communication, a better process of presentation and documentation, improvement in planning and design, and better visualization, cost estimation, facility management and sustainability (Ali et al., 2018).

A geographic Information System (GIS) is defined as a computing system for assembling, processing, and analyzing spatial data or information. The major function of GIS is to manage both graphic and attribute data. GIS model became a major tool in designing and planning real estate based on different spatial datasets in community management (Dueker & Delacy, 1990; Lin et al., 2001; Sun & Zhu, 2009). With the introduction of GIS, real estate professionals can measure the exact impact of location and make an appropriate decision based on knowledge of that impact. GIS has become the real estate information management tool (Sun & Zhu, 2009; Thrall, 1998). GIS is used for property valuation by comparing the physical characteristics of a property, proximity, and network analysis to make a good decision in real estate (Dueker & Delacy, 1990; Wyatt, 1997; Zeng & Zhou, 2001). GIS technology presents a means of implementing vastly improved land information systems to provide consistent, accurate, and timely data (Dueker &

Delacy, 1990). GIS-based framework for sustainable land use planning or land use scenario planning in the urban renewal of high-density cities for decision making. It acts as an assessment tool to evaluate particular land sites and is a prototype of planning support systems (li et al., 2005; H. Wang et al., 2014). GIS tools can support and facilitate urban planners and other stakeholders involved in the decision-making process (de Toro et al., 2020).

It provides an opportunity to improve real estate analysis by linking geographic location with data types such as demography, customer profile, transport network, distance, employment, climate, etc. There is a variety of GIS real estate applications. GIS data provides opportunities to locate regional real estate markets for new residential, retail, and industrial developments. Large institutional investors such as real estate investment trusts, pension funds, life insurance companies, mortgage bankers, and international banks can utilize GIS databases to evaluate real estate investments in their portfolios (Fletcher, 2003) (Rodriguez et al., 1995).

The cadastral information is saved based on the land administration domain model (LADM), which is then combined with BIM at the building level to represent authorized boundaries accurately and with GIS at the city level to visualize 3D cadastre in an urban setting (Sun et al., 2019).

Artificial Intelligence (AI)

AI means the performance of complicated functions which can be performed by computers and intelligent programs (Rossini, 2000). The concept is that computers use various forms of rules and reasoning to express new knowledge as symbols (Xu et al., 2019). AI is growing rapidly and is being adopted by a variety of industries. By 2025, global AI revenue is expected to reach approximately $ 126 billion (Liu, 2022b). Artificial intelligence-based technologies have been comprehensively used in civil engineering, urban planning, and smart city domains. AI supports real estate agents in filtering potential users through the collection of information through data-mining search algorithms and marketing strategies. AI-based solutions can connect users to find their dream residences by applying filters to narrow their search and extract related attributes based on massive data sets through AI predictive analysis. This type of intelligent matching can prevent consumers from having regrets caused by human error (Ullah et al.,

2018). In the real estate industry, AI will become an instrument for value-added and innovative business models and products, for example, automated data validation and evaluation, documentation review, benchmarking, and other analytical applications (Bodenbender et al., 2019).

4.2.5. The Digital Real Estate Transformation Framework (DReTF)

Adoption: Digital real estate is evolving rapidly. Real estate professionals and firms should learn and utilize various specialized software required for modern real estate practices. Real estate agencies need to adopt the digitization of consumer behavior to increase their ability to compete in the market. Organizations must adapt to follow, track, and adopt digital updates and progress. Real estate firms can place sustainability and quality of life by using technology and digitalization at the heart of their projects, generating a safer, healthier, and more fulfilling future.

Integration: Digital real estate technologies should be integrated with the website component to help customers make decisions regarding the selection and buying of a property by providing them with inspection, view, and customization services. Digitalizing all available stored data related to the environment, transportation, landmarks, amenities, property/real estate, cadastral, legal affairs, planning, demographics, remote sensing, and mapping is necessary. It can bring more transparency to real estate transactions and save people from fraudulent activity. Digital developments should be able to provide new possible forms of integration between physical and digital urban infrastructure, from which potential future support services for territorial and urban management and development can be achieved.

Implementation: There are barriers to embracing digital technologies in real estate. These barriers include a lack of awareness, understanding, capabilities, support, and willingness to adopt digital technologies among stakeholders. Similarly, the high cost of software, hardware, and digital services pose a challenge for digital real estate. In developing countries, data inaccessibility and availability limit the adoption of digital technologies. These digital technologies continuously evolve along with policies, regulations, standards, security protocols, and user privacy concerns. Addressing all these barriers in digital real estate can help consumers make informed decisions. Governments can enrich city operations in light of the positive impacts of ICT on urbanization with respect to

urbanization level and efficiency. They should formulate and implement urban development plans and raise investment in ICT projects. The government must promote digitalizing records at national and local levels and establish clear real estate ownership data regulations. Governments should promote innovation and expedite the widespread use of ICT services.

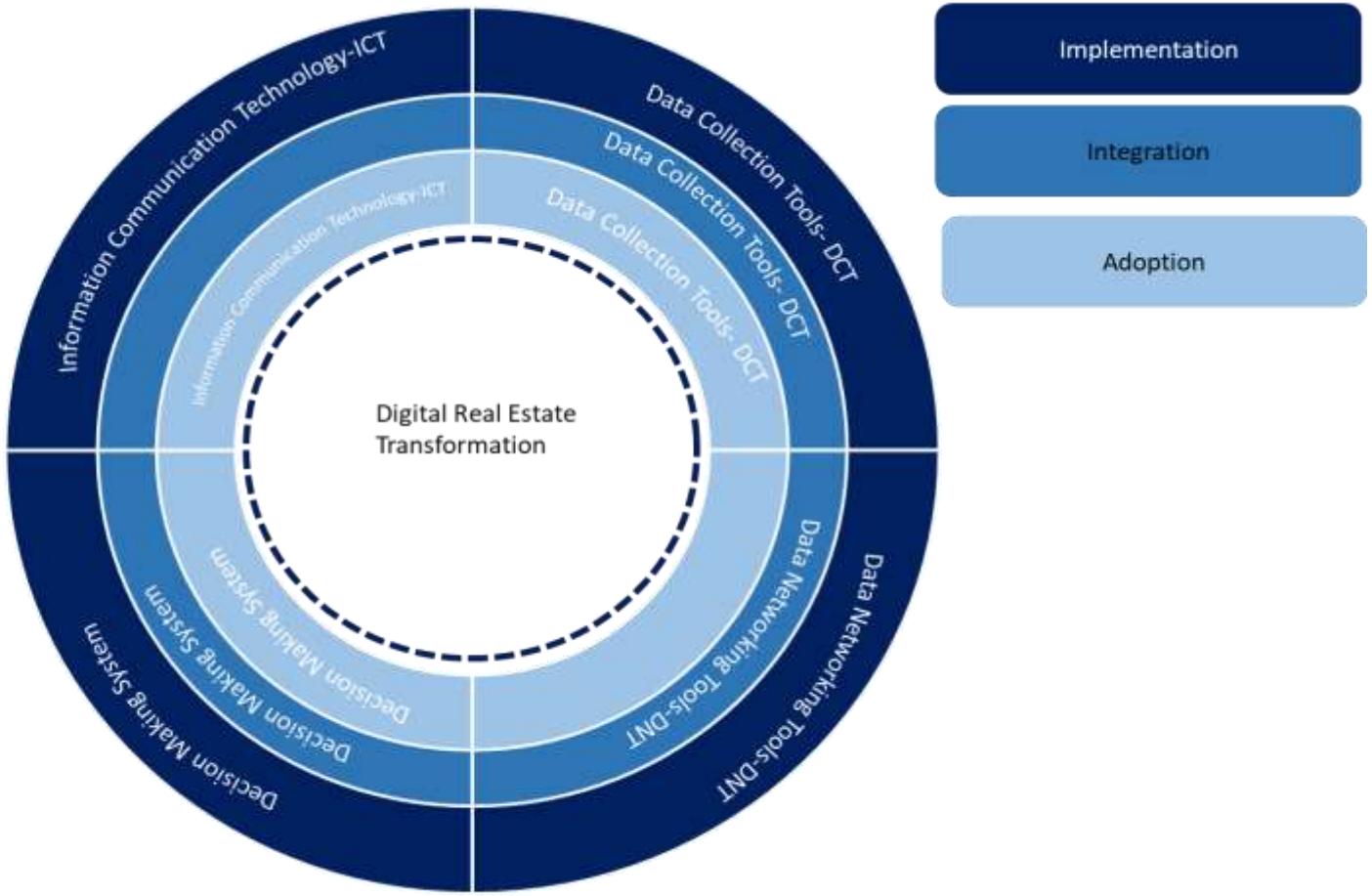


Figure 14: Digital Real Estate Transformation Framework

4.3. Descriptive Statistics

The characteristics of the selected respondents reveal that 47% of the population belong to the age group of above 40 years, followed by 30% falling in the age bracket of 30 years to less than 40 years, 20% in the range of 2 years to less than 30 years, and 2% of the population belonging to the age bracket of less than 20 years. The sample size comprises of 98% male respondents and the remaining 2% being female. Out of the total respondents, 84% are married, while 16% are single.

Concerning monthly income, almost 38% of the respondents have a monthly income above PKR 1 lac to 2 lac, while 26.7% fall in the income category of above PKR 75,000 to 1 lac. Furthermore, 11% of the respondents fall in the range of PKR 25,001 to 50,000, 11.8% have a monthly income above PKR 2 lac, 8.2% of the respondents have a monthly income of PKR 50,001 to 75,000, and 4.7% of the respondents have a monthly income less than PKR 25,000.

In terms of education, almost 68% of the respondents are graduates, and only 1.8% of the respondents are illiterate. 79% of the respondents are working in private sector while 21% are working in public sector. The family or household size of the respondents consists of 6 to 10 persons (56.4% of the sample size), 0 to 5 (40.7% of the sample size), and 11 to 15 persons (2.9% of the sample size). The profile of the respondents is illustrated in figure 15.

4.3.1. Physical factors

During the process of residential property acquisition, nearly 50% of the respondents expressed their preference for properties larger than 5 marla (150 sq. yds.) and up to 10 marla (300 sq. yds.). Approximately 24% of the respondents aimed to purchase properties greater than 10 marla (300 sq. yds.) but less than 15 marla (453 sq. yds), while 21.6% of the sample size desired a property up to and including 5 marla (150 sq. yds.). Only 5.6% of the sample size currently reside in properties larger than 15 marla (453 sq. yds.). With regard to the family composition of the respondents, 42.4% desired a property with three bedrooms, followed by two bedrooms (34.7% of the sample size), four bedrooms (18.5% of the sample size), five bedrooms (3.8% of the sample size), and six bedrooms (0.2% of the sample size). These statistics are displayed in figure 16.

The aforementioned figures indicate that a majority of the respondents in the sample size aspired to live in houses ranging from 5 to 10 marla in size. This is consistent with the fact that in Pakistan, over 70% of the population falls into the low-income group, with only 10%

belonging to the middle-income group (Nayab, 2011). As a result, most people in Pakistan are able to afford properties within the range of 5 to 10 marla.

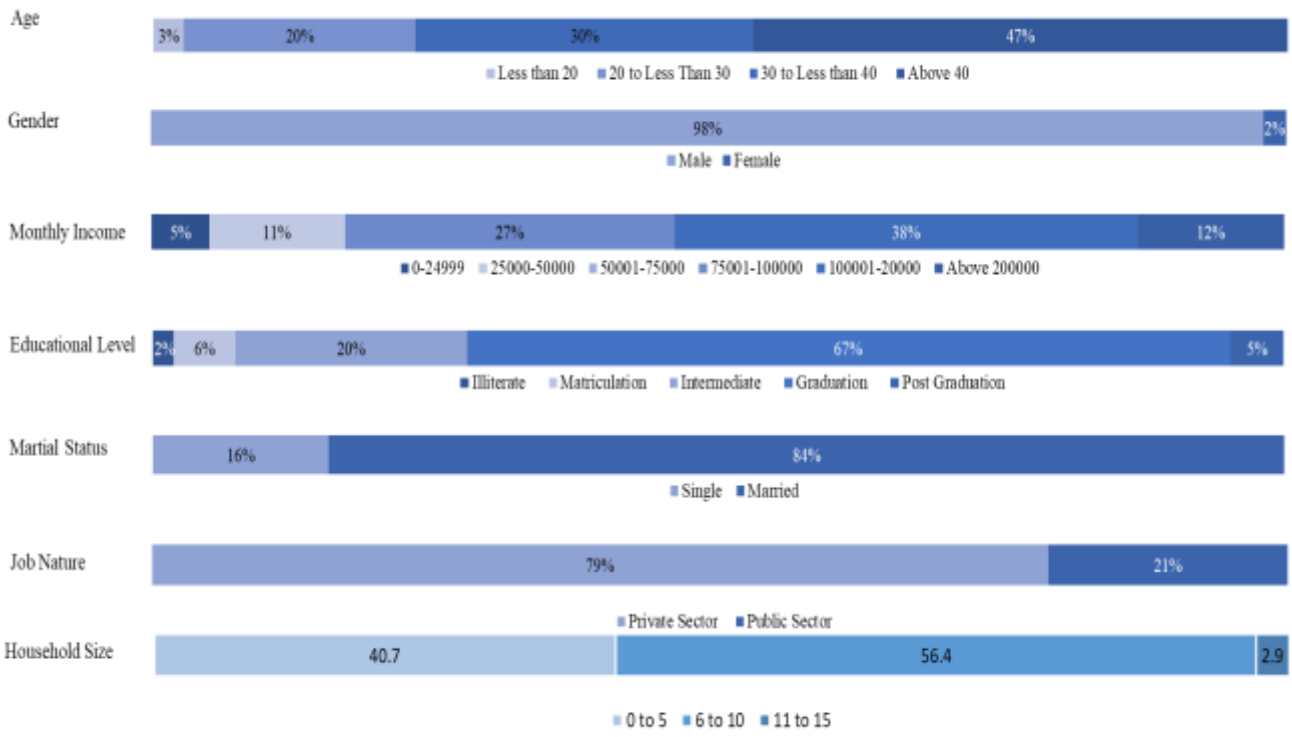


Figure 15: Respondent's Profile (%ages)

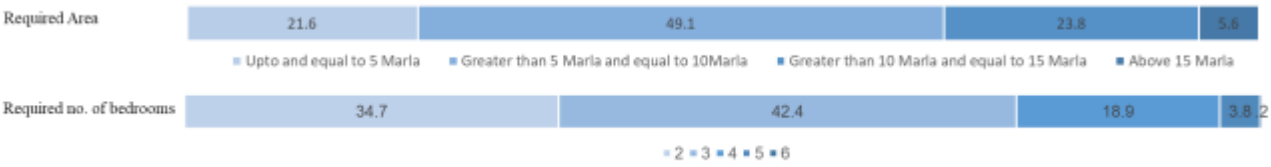


Figure 16: Descriptive Statistics of Physical Factors (%ages)

4.3.2. Locational factors

When considering neighborhood characteristics, a significant proportion of respondents indicated that proximity to workplace, distance from open areas and parks, distance from public transport, distance from shopping mall, distance from educational institutes, and water and infrastructure availability influence their decision to buy a residential property. Specifically, 65% of the respondents agreed that proximity to workplace influenced their decision, while 14.9% strongly agreed and 7.1% disagreed. In terms of distance from the airport, 36% of people agreed, 23% were neutral, 22% disagreed, and 18.7% strongly agreed. Moreover, 64.8% of the respondents agreed that distance from open areas and parks influenced their decision, while

24% strongly agreed and 2.4% disagreed. Additionally, 52.4% of people agreed that distance from city center influenced their decision, while 22.2% strongly agreed and 8% disagreed. Distance from public transport was found to influence the decision of 60% of the sample size, with 32.9% strongly agreeing and 5.6% disagreeing. Moreover, 66.4% of the respondents agreed that distance from shopping mall influenced their decision, while 23.3% strongly agreed and 2.7% were neutral, and 22% disagreed. The presence of educational institutes was also found to be a significant factor, with 57.8% of the respondents agreeing and 37.8% strongly agreeing that distance from educational institutes influenced their decision to buy a property. Water and infrastructure availability were also important factors, with 54.2% of the sample size agreeing and 37% strongly agreeing that they influenced their decision. Drainage systems within the vicinity were also found to be significant, with almost 55% of the respondents agreeing and 42% strongly agreeing that they influenced their decision to buy a property. The percentages of all mentioned indicators is shown in figure 17.

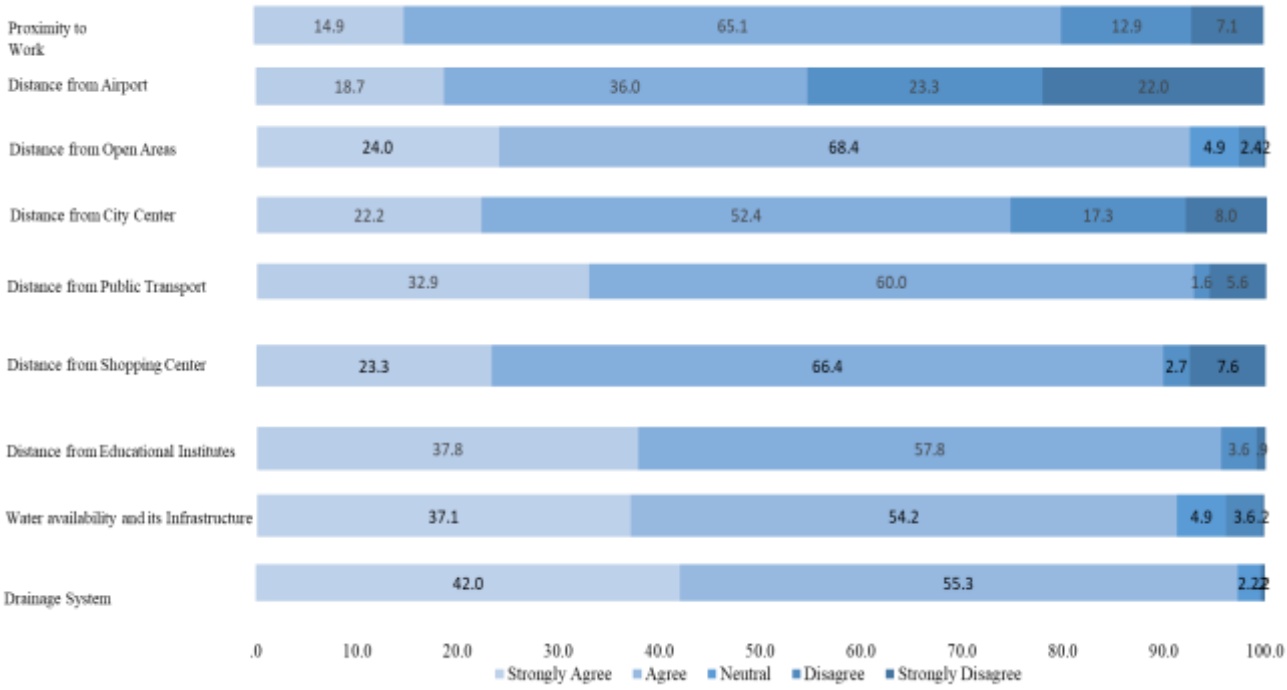


Figure 17: Descriptive Statistics of Locational Factors (%ages)

The location of a property is a crucial factor in determining its value and desirability. A good location includes proximity to important amenities, the appearance of the property, and the availability of infrastructure. Additionally, the distance from major landmarks or daily routine activity places plays a vital role in determining the overall appeal of a property. Neighborhood characteristics, particularly the proximity and distance from places such as work, school,

university, shopping centers, and parks, hold significant importance. The factor of distance from public transport also plays a crucial role in residential purchasing decisions, particularly for daily commuting purposes. Furthermore, neighborhood characteristics help determine the return on investment for a property. The distance or proximity to important amenities is one of the critical criteria on which consumers decide to purchase a house or property. Thus, it is important for home buyers to check the transport links and well-ranked educational institutes within the proximity before making a final decision.

4.3.3. Marketing/Consumer engagement factors

The study examines the consumer engagement factors that influence the decision-making process of home buyers. The findings reveal that various factors play a role in influencing the consumers' purchasing behavior. Marketing through celebrities appears to have less influence on the respondents, with 34.7% disagreeing and 6.2% strongly agreeing. On the other hand, newspaper advertisement seems to have a significant impact on the buying decision, with 44% agreeing and 6.7% strongly agreeing. The study also found that social media is an essential factor in consumer engagement, with 56.7% of respondents agreeing and 6.7% strongly agreeing that social media engaging factors influence them to buy property.

Marketing through TV channels and billboards or visuals appear to have a moderate influence on home buyers, with 55% agreeing and 50% agreeing, respectively. The brand name or repute of the developer/builder is another factor that has a mixed influence on the respondents, with 39.6% agreeing, 22.9% neutral, and 14.4% disagreeing. The percentage of responses against each variable is mentioned in figure 18.

The present analysis demonstrates that billboard advertising exerts a significant influence on consumers' decisions to purchase a particular property, followed by social media engagement, brand reputation of the developer or builder, marketing through television channels, and newspaper advertisements. In contrast, marketing through celebrity endorsements has the least impact on consumers' property purchase decisions. The strategic placement of billboards in high-traffic areas at elevated locations, combined with their visual appeal and high visibility, enables them to capture consumers' attention from afar.

In today's digital era, the readership of newspapers as a medium for checking property availability has significantly declined, rendering newspaper advertisements less influential in consumers' property purchase decisions.

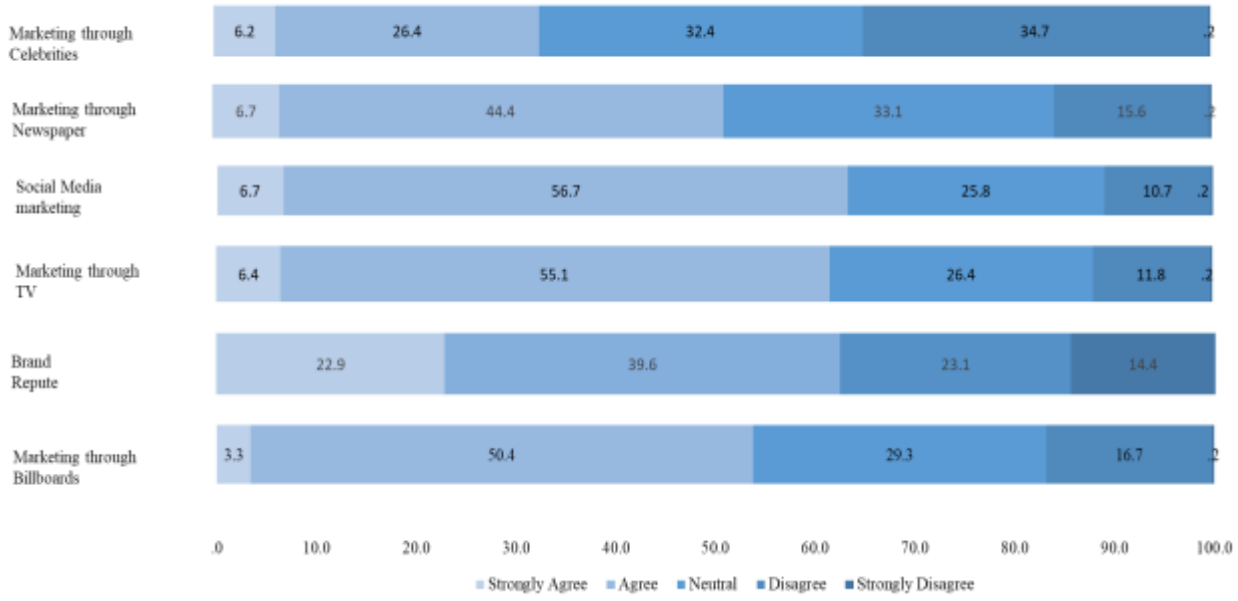


Figure 18: Descriptive Statistics of Marketing Factors (%ages)

4.3.4. Economic factors

According to the investment determinants analysis, affordability emerged as the most critical factor influencing individuals' decisions to purchase a property. 48.2% of respondents agreed, 17.6% strongly agreed, and 26% disagreed that affordability played a role in their property purchase decision. Similarly, less down payment was considered a less important factor, with 53% agreeing, 7.3% strongly agreeing, 20.9% having a neutral stance, and 18.4% disagreeing.

Readily available loans were found to have a moderate impact, with 50.9% of respondents agreeing, 13.8% strongly agreeing, and 15.8% disagreeing. Flexible payment plans or instalment options were also found to be influential, with 54.7% of respondents agreeing, 14.4% strongly agreeing, and 10.2% disagreeing.

Figure 19 displays the percentages of the above-mentioned factors, while figure 6 highlights that affordability is the most significant consideration in the property purchase decision-making process. In contrast, less down payment has the least impact, which could be attributed to the fact that a large percentage of respondents belong to low or middle-income groups. It is worth noting that inflation plays a crucial role in determining affordability and the ability of households to purchase or construct a home.

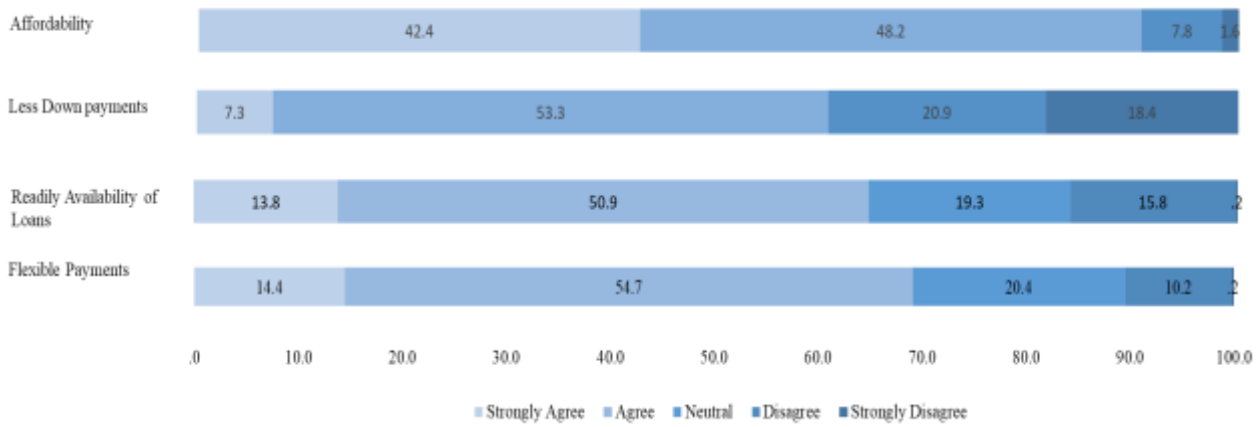


Figure 19: Descriptive Statistics of Economic Factors (%ages)

4.4. Factor analysis

4.4.1. Descriptive statistics

The first output table is of descriptive statistics with value or mean and standard deviation as shown in table 5.

4.4.2. Correlation matrix

The next output from the PCA analysis is the correlation matrix that shows how much each variable is correlated with each other variable, as shown in figure 20. The value of 1 means the each variable is perfectly correlated with itself which is shown in principal diagonal of a matrix. The values above the diagonal matrix is the mirror of the values below the diagonal matrix. Positive value means the both variable changes or effect each other in the same way i.e; increases or decreases in same ways. The variables which have values of 0.5 or above are highly positive correlated with each other. Required no. of bedrooms and bathrooms is positively correlated with required area. Distance from airport, shopping mall, city center, public transport all are changed positively with each other due to highly positive correlation. Availability of nullah and drainage system along with development status on site and property views are highly positive correlated with each other. Visit of concerned authority official website and concerned official office along with checking of land use or zoning plan for confirmation of landuse of particular property all are affected with each other in a positive manner. Availability of loans and flexible installments in buying a property are influenced each other. While other variables have positive weak correlation or negative correlation.

Negative correlation means the value of one variable increases and value of other variable decreases. Visit of concerned authority official website and concerned official office along with checking of land use or zoning plan for confirmation of land use of particular property and approval status all are negative correlated with property buying or no. of property bought. Distance from open areas, playgrounds and concerns of safety and security negatively correlated the no. of properties bought. Most of the variables of digital marketing are negatively correlated with required area. Locational variables such as proximity to work, airport, public transport, safety and security concerns, availability of water, sewerage and drainage system and property views all are negatively correlated with required number of storeys. Land use of a property, time taken to buy it and majority of the variables of digital marketing are also negatively correlated with required number of storeys. Distance from city center, educational institutes, highway, airport, shopping center, open areas, playgrounds, availability of sewerage, water and drainage system, approval status of the scheme and majority of the variables of digital marketing all are negatively correlated with required no. of bedrooms.

Distance from city center, highway, airport, playgrounds, availability of drainage system, development status on site, property views, marketing through social media, newspaper and TV channels, flexible payments, land use of particular property, approval of scheme all are negative correlated with required no. of kitchen. Distance from healthcare, brand name marketing through social media, TV channels and internet access all are negatively correlated with distance from highway and airport.

Majority of the locational and digital marketing variables are negatively correlated with land use/zoning plan, visit of officials and approval status of scheme. Distance from public transport, playground, concerns of safety and security, availability of water, drainage and sewerage system, development status, agents used, marketing through celebrities, messages, TV channels, time taken to buy property and affordability all are negatively correlated with property visit before buying. Proximity to work, distance from highway, availability of water, sewerage and drainage and development status on site along with internet access and usage and brand name or repute are negatively correlated with alternative options while economic variables are also negative correlated with it. Less down payments is negatively correlated with distance from highway, city center, airport, shopping mall, development status on site, flexible payments, time to take property and marketing through TV channels.

Affordability is negatively correlated with distance from educational institutions and distance from highway.

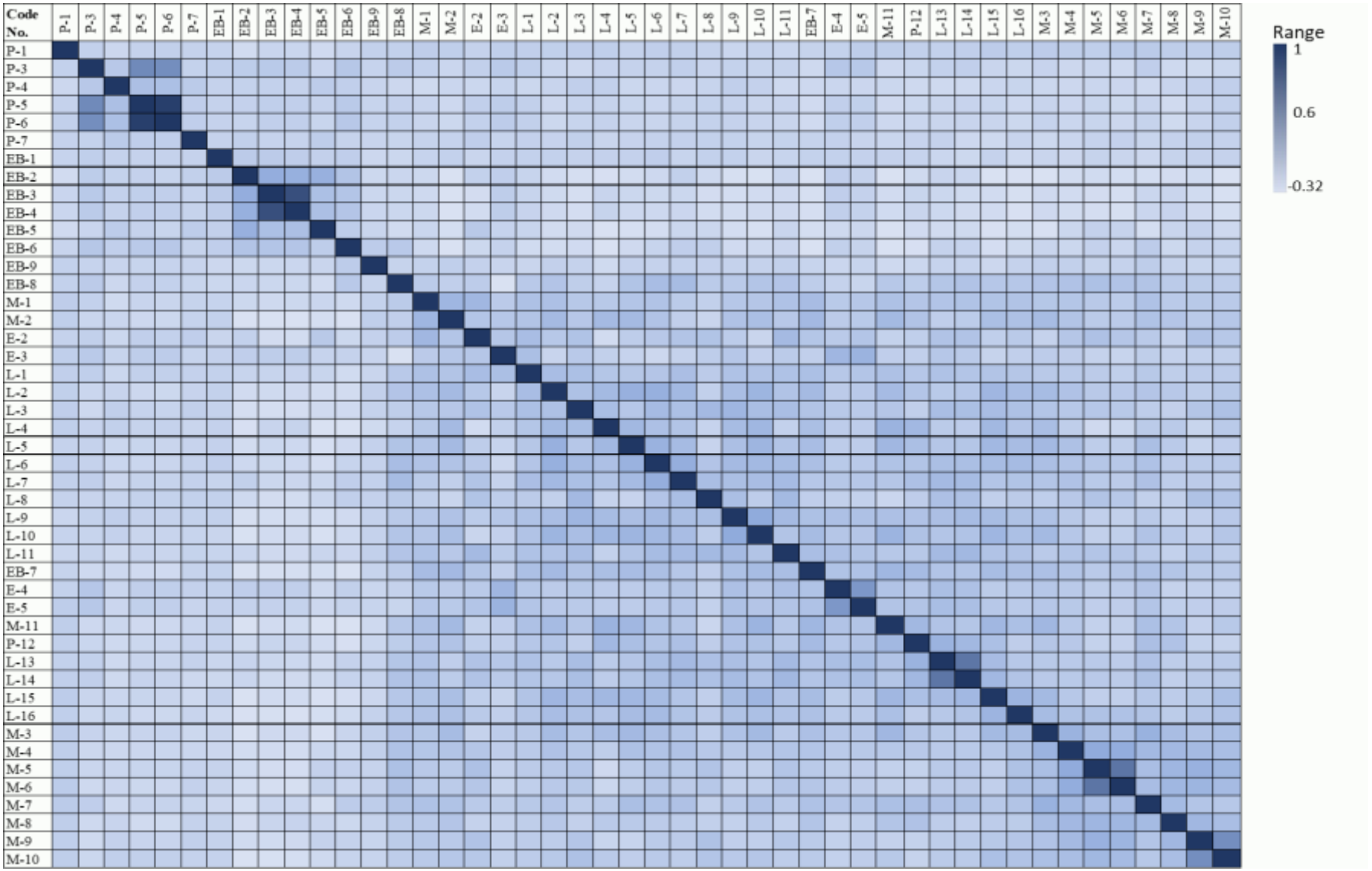


Figure 20: Correlation Matrix

4.4.3. Kaiser Meyer Olkin (KMO) and Bartlett's Test

The KMO and Bartlett test assess all available data together. A KMO value of 0.8 shows that there is a strong partial correlation among variables. A significance level for Bartlett's test below 0.05 recommend that there is a considerable correlation in the data and it has an identity correlation matrix. Both values recommend the data for further factor analysis, as shown in Table 4.

Table 4: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.815
Bartlett's Test of Sphericity	Approx. Chi-Square	12816.092
	Df	1035
	Sig.	.000

4.4.4. Communalities

The table of commonalities is the next output of PCA that shows variables with a communality value of more than 0.5 considered for further analysis.

Table 5: Descriptive statistics and communalities

Code	Factors	Mean	Std. Deviation	Initial	Extraction
P-1	Have you ever bought/rented any property?	.99	.124	1.000	.753
P-3	Required area	2.13	.812	1.000	.826
P-4	Required number of storeys	1.04	.185	1.000	.502
P-5	Required number of bedrooms	2.92	.838	1.000	.937
P-6	Required number of bathrooms	2.90	.842	1.000	.932
P-7	Required number of kitchens	1.01	.081	1.000	.573
L-1	Proximity to work influences you most in buying the property	2.12	.741	1.000	.472
L-2	Distance from the city center influences you most to buy the property	2.11	.840	1.000	.669
L-3	Distance from educational institutes influences you most in buying the property	1.68	.587	1.000	.662
L-4	Distance from the highway influences you most in buying the property	2.01	.770	1.000	.726

L-5	Distance from Airport influences you most in buying the property	2.49	1.032	1.000	.655
L-6	Distance from shopping malls influences you most to buy the property	1.94	.749	1.000	.704
L-7	Distance from public transport influences you most in buying the property	1.80	.726	1.000	.688
L-8	Distance from healthcare services influences you most in buying the property	1.69	.713	1.000	.651
L-9	Distance from open areas/parks influences you most in buying the property	1.86	.624	1.000	.691
L-10	Distance from playgrounds influences you most to buy the property	2.16	.835	1.000	.683
L-11	Safety and security influence you most in buying the property	1.64	.622	1.000	.598
L-12	Water availability and its infrastructure influence you most in buying the property	1.76	.724	1.000	.808
L-13	Nullah or sewage disposal or sewerage treatment plant influences you most to buy the property	1.61	.573	1.000	.837
L-14	Drainage system influences you most in buying the property	1.61	.568	1.000	.820
L-15	Development status on site influences you most in buying the property	1.86	.687	1.000	.740
L-16	Property views influence you most in buying the property	2.27	.882	1.000	.599
M-1	Agents provided complete information	1.97	.769	1.000	.644
M-2	Used platform provide any information about the approval status of the scheme	2.44	1.064	1.000	.693
M-3	Marketing from celebrities influences you most to buy the property	2.96	.932	1.000	.664
M-4	Newspaper advertisement influences you most to buy the property	2.58	.838	1.000	.674
M-5	Social media marketing influences you most to buy the property	2.41	.777	1.000	.823
M-6	Marketing through news/TV channels influences you most to buy the property	2.44	.791	1.000	.782

M-7	Marketing through messages/phone calls influences you most to buy the property	3.06	.934	1.000	.661
M-8	Marketing through billboards influences you most to buy the property	2.60	.809	1.000	.690
M-9	Internet access and internet usage enhance the speed of buying property and save time	2.29	.648	1.000	.768
M-10	Internet access and internet usage give you more choices to compare different properties and their prices	2.26	.702	1.000	.752
M-11	Brand Name/repute of developer influences you most to buy the property	2.29	.977	1.000	.637
E-2	Affordability influences you most in buying the property	1.68	.683	1.000	.752
E-3	Less down payments influence you most in buying the property	2.50	.876	1.000	.716
E-4	Readily availability of loans influences you most to buy the property	2.38	.917	1.000	.792
E-5	Flexible payments or flexible installment plans influence you most in buying the property	2.27	.840	1.000	.769
EB-2	Have you visited the website of the CDA to know the approval status of the housing scheme or property in the housing scheme layout plan?	.39	.492	1.000	.774
EB-3	Have you checked any zoning/land use plans of an area?	.36	.481	1.000	.857
EB-4	Is this property residential in the zoning/land use plan?	.34	.476	1.000	.841
EB-5	Have you visited the office of CDA to know the approval status of the housing scheme or property in the layout plan?	.21	.407	1.000	.624
EB-6	Do you know the approval status of the layout plan of the housing scheme?	.66	.476	1.000	.550
EB-1	Property visits before buying/renting	.99	.141	1.000	.781
EB-8	How much time did you take to buy/rent a property?	1.47	1.135	1.000	.602
EB-7	Approval of the scheme influences you most in buying the property	2	0.786	1.000	.576

EB-9	Have you considered some other alternative options?	.11	.309	1.000	.738

4.4.5. Total variance explained/eigenvalue and scree plot

The eigenvalue shows the number of extracted factors whose sum should equal the number of variables considered for factor analysis and arranged in descending order. There are 13 factors extracted from 46 factors with a greater value of 1, which is the common criteria for extraction of factors, as shown in Table 6. The graphical representation of eigenvalue is called a scree plot. It is seen that the curve begins to flat between 13 and 15 factors, as shown in figure 21, and the eigenvalue is less than one from factor 13 onwards.

Table 6: Total variance explained/Eigenvalues

Total variance explained									
Component	Initial Eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	9.222	20.048	20.048	9.222	20.048	20.048	5.564	12.095	12.095
2	3.616	7.860	27.908	3.616	7.860	27.908	4.194	9.118	21.213
3	3.375	7.338	35.246	3.375	7.338	35.246	2.973	6.464	27.677
4	2.675	5.815	41.061	2.675	5.815	41.061	2.933	6.376	34.053
5	2.423	5.267	46.329	2.423	5.267	46.329	2.592	5.634	39.687
6	2.188	4.756	51.084	2.188	4.756	51.084	2.561	5.566	45.253
7	1.788	3.887	54.972	1.788	3.887	54.972	2.435	5.294	50.548
8	1.608	3.496	58.468	1.608	3.496	58.468	2.374	5.162	55.709
9	1.388	3.016	61.484	1.388	3.016	61.484	2.295	4.989	60.699
10	1.200	2.608	64.092	1.200	2.608	64.092	1.221	2.654	63.352
11	1.095	2.380	66.472	1.095	2.380	66.472	1.209	2.629	65.981
12	1.088	2.364	68.837	1.088	2.364	68.837	1.206	2.621	68.602
13	1.022	2.222	71.058	1.022	2.222	71.058	1.130	2.456	71.058
14	.973	2.116	73.175						
15	.858	1.864	75.039						
16	.807	1.755	76.794						
17	.762	1.656	78.450						
18	.742	1.614	80.064						
19	.712	1.548	81.612						
20	.675	1.467	83.079						
21	.611	1.328	84.407						

22	.560	1.217	85.625
23	.547	1.189	86.814
24	.510	1.108	87.922
25	.479	1.041	88.963
26	.446	.969	89.932
27	.422	.918	90.850
28	.398	.866	91.716
29	.384	.834	92.550
30	.360	.783	93.333
31	.342	.743	94.077
32	.300	.653	94.730
33	.260	.566	95.296
34	.254	.553	95.849
35	.245	.532	96.381
36	.238	.517	96.898
37	.228	.496	97.394
38	.210	.456	97.850
39	.198	.431	98.281
40	.180	.390	98.671
41	.161	.350	99.021
42	.143	.312	99.333
43	.133	.289	99.622
44	.106	.231	99.853
45	.053	.115	99.968
46	.015	.032	100.000

Extraction Method: Principal Component Analysis.

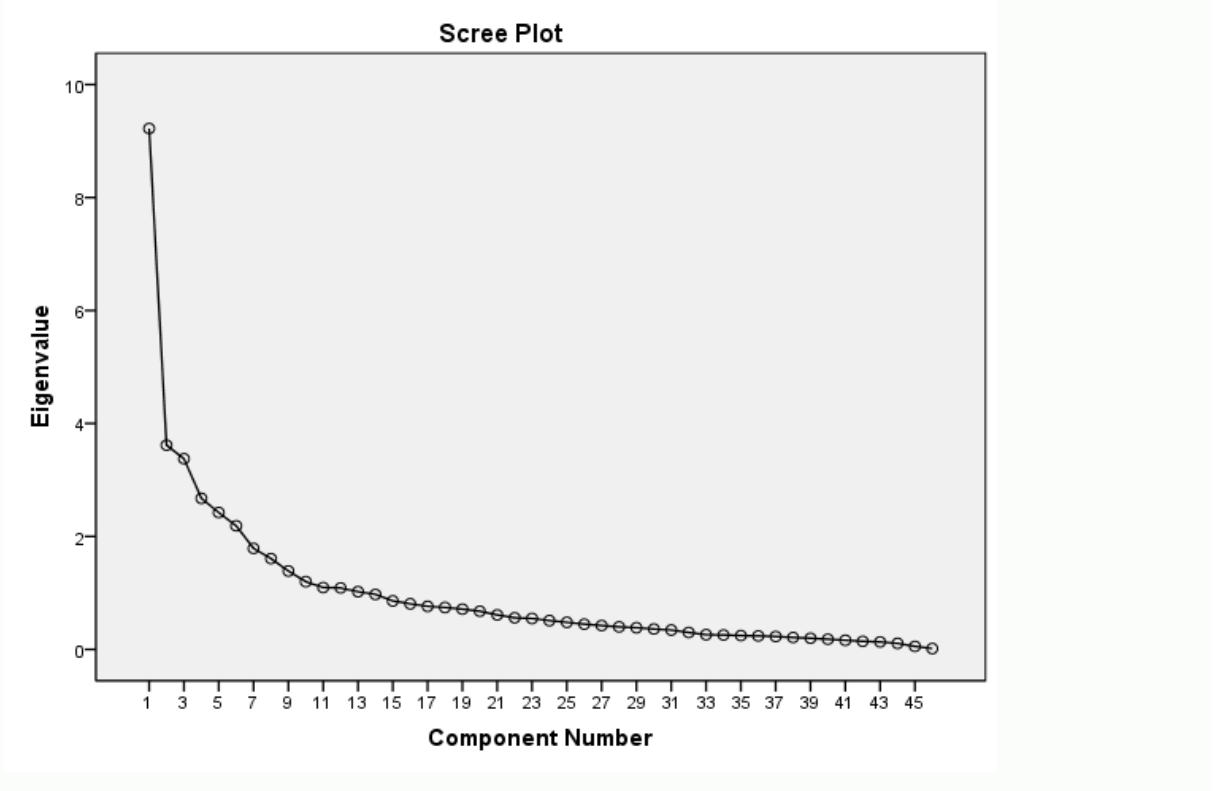


Figure 21: Scree Plot-Curve flatten between 13 and 15

4.4.6. Factor rotation and naming the factors

There are 13 factors extracted from this analysis whose naming has been done with respect to the nature of the variables included in respective factor. In factor-1, most of the variables are related to distance and then builder's repute due to which name of location/proximity and builder's repute assign to this factor. Variables in factor-2 are related to marketing medium and internet access due to which name of marketing strategy has been given to it. Factor-3 is related to checking of land use or zoning planning along with approval status due to which name of information about land use or approval status has been assigned to it. Variables of required number of bathrooms, bedroom and required area in factor-4 all are related to physical characteristics due to which this name has been allotted to it. Availability of loans, less down payments and flexible installment plans all are under factor-5 and assign name of payment module. Distance from educational and health institute is a factor-6 which indicates that distance from educational institutes and health care centers is an important factor. Before buying any property, distance from shopping mall and public transport is a factor of considerable importance due to which name of influence of proximity to shopping center and public transport has been given to factor-7. Factor-8 is related to affordability and factor-9 is related to availability of water, sewerage and drainage system due to which names of

affordability and accessibility to utility infrastructure have been to them. Likewise, naming of other factors have been done as shown in table-7.

Table 7: Factors extracted from rotation component matrix

Code No	Factors	Values	Factor Name
	Factor-1		
L-4	Distance from the Highway influences you most in buying the property	.785	Location/Proximity and builder's repute
L-10	Distance from playgrounds influences you most to buy the property	.732	
L-5	Distance from Airport influences you most in buying the property	.701	
M-11	Brand Name/repute of developer influences you most to buy the property	.693	
L-2	Distance from City Center influences you most to buy the property	.676	
L-15	Development status on site influences you most in buying the property	.620	
M-3	Marketing from celebrities influences you most to buy the property	.564	
M-2	Used platform provide any information about the approval status of the scheme	.561	
P-9	Distance from open areas/parks influences you most in buying the property	.502	
	Factor-2		
M-5	Social media marketing influences you most to buy the property	.848	Marketing Strategy
M-6	Marketing through news/TV Channels influences you most to buy the property	.823	
M-9	Internet access and internet usage enhance the speed of buying property and save time	.745	
M-4	Newspaper advertisement influences you most to buy the property	.731	
M-8	Marketing through billboards influences you most to buy the property	.710	
M-10	Internet access and internet usage give you more choices to compare different properties and their prices	.622	
	Factor-3		

EB-3	Have you checked any zoning/land use plans of an area?	.893	Information about land use and approval status
EB-4	Is this property residential in the zoning/land use plan?	.887	
EB-2	Visit of CDA Website before buying/renting	.794	
EB-5	CDA Visit regarding approval status of housing scheme	.571	
	Factor-4		
P-5	Required no. of bedrooms	.964	Physical Characteristics of property
P-6	Required no. of bathrooms	.961	
P-3	Required Area	.858	
	Factor-5		
E-4	Readily availability of loans influences you most to buy the property	.854	Payment Module
E-5	Flexible payments or flexible installment plans influence you most in buying the property	.833	
E-3	Less down payments influence you most in buying the property	.741	
	Factor-6		
L-3	Distance from Educational Institutes influences you most in buying the property	.703	Distance from Educational and Health Institutions
L-8	Distance from healthcare services influences you most in buying the property	.680	
	Factor-7		
EB-8	How much time did you take to buy/rent a property?	.663	Influence of Proximity to shopping malls and public transport
P-7	Distance from Public Transport influences you most in buying the property	.620	
L-6	Distance from shopping malls influences you most to buy the property	.580	
	Factor-8		
E-2	Affordability influenced you most in buying the property	.780	Affordability
M-1	Agents provided complete information	.705	
	Factor-9		
L-12	Water availability and its infrastructure influence you most in buying the property	.774	Accessibility to utility infrastructure
L-13	Nullah or sewage disposal or Sewerage Treatment Plant influences you most to buy the property	.752	

L-14	Drainage system influences you most in buying the property	.685	
	Factor-10		
EB-9	Have you considered some other alternative options?	.841	Alternative Option
	Factor-11		
P-7	Required no. of kitchen	.738	Kitchen Requirements
	Factor-12		
P-1	Have you ever bought/rented any property?	.855	Past Experience
	Factor-13		
EB-1	Property visits before buying/renting	.852	Personal Inspection

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 46 iterations.

4.5. Ordinal Regression Analysis

Before going into ordinal regression analysis, reliability test and multi-collinearity tests have been performed on all variable to check the internal consistency of data and correlation among independent variables.

4.5.1. Reliability Test

In previous sections, it is clearly mention that value below 0.6 for Cronbach's alpha is considered as poor for further analysis. The value of Cronbach's alpha of economic factors, physical factors, social factors and experienced-based factors are 0.367, 0.543, 0.10 and 0.070. Hence, hypothesis H-1, H-2, H-5 and H-6 are rejected due to not having consistency in data for further analysis. While the value of Cronbach's alpha for locational and marketing factors are 0.860 and 0.807 respectively. These two factors have undergone multi-collinearity test and ordinal regression analysis to assess the relationship between the dependent and independent variables.

4.5.2. Multi-collinearity Test

Marketing and locational factors has undergone multi-collinearity test to check the correlation between dependent and independent variables. The tolerance value should be more than 0.1 and VIF value should be less than 10 for further analysis. Table 8 shows that the values of VIF ranges from 1 to 5 and tolerance 0.2 to 0.7 which means that there exist minimum or low collinearity between dependent and independent variables.

Table 8: Multi-collinearity Statistics

Dependent Variable	Have you regretted buying/renting a property?		
Locational Factors			
Code	**Variables**	**Collinearity Statistics**	
		Tolerance	**VIF**
L-1	Proximity to work influences you most to buy the property	.723	1.383
L-2	Distance from city center influences you most to buy the property	.440	2.274
L-3	Distance from educational institutes influences you most in buying the property	.485	2.060
L-4	Distance from highway influences you most to buy the property	.452	2.211
L-5	Distance from airport influences you most to buy the property	.483	2.071
L-6	Distance from shopping mall influences you most to buy the property	.401	2.493
L-7	Distance from public transport influences you most to buy the property	.466	2.146
L-8	Distance from healthcare services influences you most to buy the property	.608	1.646
L-9	Distance from open areas/parks influences you most to buy the property	.389	2.570
L-10	Distance from playgrounds influences you most to buy the property	.388	2.575
L-11	Safety and security influence you most to buying the property	.591	1.693
L-12	Water availability and its infrastructure influence you most to buy the property	.471	2.124
L-13	Nullah or sewage disposal or Sewerage Treatment Plant influences you most to buy the property	.234	4.266
L-14	Drainage system influences you most to buy the property	.259	3.861
L-15	Development status on site influences you most to buy the property	.439	2.277
L-16	Property views influence you most to buying the property	.645	1.550
Marketing Factors			
Code	**Variables**	**Collinearity Statistics**	
		Tolerance	**VIF**
M-1	Agents provided complete information	.689	1.451
M-2	Used platform provide any information about the approval status of the scheme	.631	1.586

M-11	Brand Name/repute of developer influences you most to buy the property	.635	1.575
M-3	Marketing from celebrities influences you most to buy the property	.464	2.154
M-4	Newspaper advertisement influences you most to buy the property	.415	2.409
M-5	Social media marketing influences you most to buy the property	.242	4.140
M-6	Marketing through news/TV Channels influences you most to buy the property	.277	3.612
M-7	Marketing through messages/phone calls influences you most to buy the property	.587	1.704
M-8	Marketing through billboards influences you most to buy the property	.605	1.654
M-9	Internet access and internet usage enhance the speed of buying property and save time	.309	3.240
M-10	Internet access and internet usage give you more choice to compare different properties and their prices	.363	2.751

4.5.3. Ordinal Regression Analysis

In ordinal regression analysis, an overall model fit can be assessed by using R2 and significance of F-value. The table 9 and table 10 are the case processing summary of locational or marketing factors and dependent variable in which number of responses and percentages have been mentioned against each option of each and every variable. 58% disagreed and 36% strongly disagreed that have regret after buying a property. In location factors, 65% of the respondent agreed that proximity influences them to buy a property. More than 50% of the respondents agreed that distance from city center, educational institutes, health care, playgrounds along with presence of utility infrastructure (water, sewerage, drainage) and safety concerns influence them to buy a property. Almost 60% or more than 60% of the respondents agreed that distance from highway, shopping center, public transport, open areas along with development status on site influence them most to buy a property. Distance from airport influences them least to make a property buying decision.

Table 9: Case Processing Summary-Locational factors

Code	Variable		N	Marginal Percentage
Dependent Variable	Have you regretted buying/renting a property?	Agree	17	3.8%
		Neutral	8	1.8%
		Disagree	261	58.0%

		Strongly Disagree	164	36.4%
L-1	Proximity to work influences you most to buy the property	Strongly Agree	67	14.9%
		Agree	293	65.1%
		Neutral	58	12.9%
		Disagree	32	7.1%
L-2	Distance from city center influences you most to buy the property	Strongly Agree	100	22.2%
		Agree	236	52.4%
		Neutral	78	17.3%
		Disagree	36	8.0%
L-3	Distance from educational institutes influences you most in buying the property	Strongly Agree	170	37.8%
		Agree	260	57.8%
		Neutral	16	3.6%
		Disagree	4	.9%
L-4	Distance from highway influences you most to buy the property	Strongly Agree	102	22.7%
		Agree	268	59.6%
		Neutral	52	11.6%
		Disagree	28	6.2%
L-5	Distance from airport influences you most to buy the property	Strongly Agree	84	18.7%
		Agree	162	36.0%
		Neutral	105	23.3%
		Disagree	99	22.0%
L-6	Distance from shopping mall influences you most to buy the property	Strongly Agree	105	23.3%
		Agree	299	66.4%
		Neutral	12	2.7%
		Disagree	34	7.6%
L-7	Distance from public transport influences you most to buy the property	Strongly Agree	148	32.9%
		Agree	270	60.0%
		Neutral	7	1.6%
		Disagree	25	5.6%
L-8	Distance from healthcare services influences you most to buy the property	Strongly Agree	182	40.4%
		Agree	244	54.2%
		Neutral	9	2.0%
		Disagree	11	2.4%
		Strongly Disagree	4	.9%

L-9	Distance from open areas/parks influences you most to buy the property	Strongly Agree	108	24.0%
		Agree	308	68.4%
		Neutral	22	4.9%
		Disagree	11	2.4%
		Strongly Disagree	1	.2%
L-10	Distance from playgrounds influences you most to buy the property	Strongly Agree	85	18.9%
		Agree	251	55.8%
		Neutral	74	16.4%
		Disagree	39	8.7%
		Strongly Disagree	1	.2%
L-11	Safety and security influence you most to buying the property	Strongly Agree	193	42.9%
		Agree	232	51.6%
		Neutral	20	4.4%
		Disagree	5	1.1%
L-12	Water availability and its infrastructure influence you most to buy the property	Strongly Agree	167	37.1%
		Agree	244	54.2%
		Neutral	22	4.9%
		Disagree	16	3.6%
		Strongly Disagree	1	.2%
L-13	Nullah or sewage disposal or Sewerage Treatment Plant influences you most to buy the property	Strongly Agree	192	42.7%
		Agree	245	54.4%
		Neutral	11	2.4%
		Disagree	1	.2%
		Strongly Disagree	1	.2%
L-14	Drainage system influences you most to buy the property	Strongly Agree	189	42.0%
		Agree	249	55.3%
		Neutral	10	2.2%
		Disagree	1	.2%
		Strongly Disagree	1	.2%
L-15	Development status on site influences you most to buy the property	Strongly Agree	129	28.7%
		Agree	268	59.6%
		Neutral	40	8.9%

		Disagree	13	2.9%
		Strongly Agree	77	17.1%
L-16	Property views influence you most to buying the property	Agree	223	49.6%
		Neutral	103	22.9%
		Disagree	44	9.8%
		Strongly Disagree	3	.7%
	Valid		450	100.0%
	Missing		0	
	Total		450	

In marketing factors (table 10), 62.7% of the respondent agreed that agents provide complete information. Almost 50%or above of the respondents agreed that marketing through social media, TV channels, billboards along with internet access and usage gives more choices to make comparison and enhance speed of searching properties before making a final decision. 39.6% of the respondents agreed that brand repute or developer's name influence the people to buy a particular property. More than 40% of the respondents agreed that marketing through newspaper advertisement influences them to buy a property and used platform provide information about the approval status of the property. 34.7% of the respondents disagreed that they did not influence from marketing through celebrities while 40% of the people disagreed that marketing through messages or phone calls did not influence them to buy a property.

Table 10: Case Processing Summary-Marketing factors

Code	Variables		N	Marginal Percentage
Dependent Variable	Have you regretted buying/renting a property?	Agree	17	3.8%
		Neutral	8	1.8%
		Disagree	261	58.0%
		Strongly Disagree	164	36.4%
M-1	Agents provided complete information	Strongly Agree	106	23.6%
		Agree	282	62.7%
		Neutral	31	6.9%
		Disagree	30	6.7%
		Strongly Disagree	1	.2%
M-2	Used platform provide any information about the approval status of the scheme	Strongly Agree	79	17.6%

		Agree	215	47.8%
		Neutral	38	8.4%
		Disagree	117	26.0%
		Strongly Disagree	1	.2%
M-11	Brand Name/repute of developer influences you most to buy the property	Strongly Agree	103	22.9%
		Agree	178	39.6%
		Neutral	104	23.1%
		Disagree	65	14.4%
M-3	Marketing from celebrities influences you most to buy the property	Strongly Agree	28	6.2%
		Agree	119	26.4%
		Neutral	146	32.4%
		Disagree	156	34.7%
		Strongly Disagree	1	.2%
M-4	Newspaper advertisement influences you most to buy the property	Strongly Agree	30	6.7%
		Agree	200	44.4%
		Neutral	149	33.1%
		Disagree	70	15.6%
		Strongly Disagree	1	.2%
M-5	Social media marketing influences you most to buy the property	Strongly Agree	30	6.7%
		Agree	255	56.7%
		Neutral	116	25.8%
		Disagree	48	10.7%
		Strongly Disagree	1	.2%
M-6	Marketing through news/TV Channels influences you most to buy the property	Strongly Agree	29	6.4%
		Agree	248	55.1%
		Neutral	119	26.4%
		Disagree	53	11.8%
		Strongly Disagree	1	.2%
M-7	Marketing through messages/phone calls influences you most to buy the property	Strongly Agree	19	4.2%
		Agree	123	27.3%
		Neutral	123	27.3%
		Disagree	182	40.4%

		Strongly Disagree	3	.7%
M-8	Marketing through billboards influences you most to buy the property	Strongly Agree	15	3.3%
		Agree	227	50.4%
		Neutral	132	29.3%
		Disagree	75	16.7%
		Strongly Disagree	1	.2%
M-9	Internet access and internet usage enhance the speed of buying property and save time	Strongly Agree	34	7.6%
		Agree	265	58.9%
		Neutral	139	30.9%
		Disagree	11	2.4%
		Strongly Disagree	1	.2%
M-10	Internet access and internet usage give you more choice to compare different properties and their prices	Strongly Agree	52	11.6%
		Agree	241	53.6%
		Neutral	144	32.0%
		Disagree	12	2.7%
		Strongly Disagree	1	.2%
Valid			450	100.0%
Missing			0	
Total			450	

4.5.3.1. Model fitting

Table 11 displays that the model has significantly improved over the baseline intercept-only model as indicated by the chi-square value of less than 0.0005 which is considered significant.

Table 11: Model Fitting Information-Locational and Marketing Factors

Locational factors				
Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	649.760			
Final	392.380	257.380	52	.000
Marketing factors				
Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	723.472			
Final	423.80	299.652	36	.000

Link function: Logit.

4.5.3.2. Goodness of fit

For goodness of fit model, significant value-p value for both Pearson and Deviance should be more than 0.05. In this case, the p-value is less than 0.05 for Pearson test (as shown in table 12) due to which Pseudo R^2 tells about the variation in the data.

Table 12: Goodness of Fit

Locational factors			
Test	Chi-Square	Df	Sig.
Pearson	1501.854	713	.000
Deviance	333.492	713	1.000
Marketing factors			
Test	Chi-Square	Df	Sig.
Pearson	9058.126	783	.000
Deviance	394.566	783	1.000
Link Function: Logit			

4.5.3.3. Pseudo R^2

The value of R^2 ranges from 0 to 1 while 0.5 is the satisfactory value to indicate the association strength between dependent and independent variable. The value of Nagelkerke is 0.5 while the remaining two have value lower than satisfactory value as shown in table 13. Nagelkerke value of 0.526 and 0.597means that 52.6% and 59.7% variation exist between respondents related to regret level.

Table 13: Pseudo R-Square

Locational Factors	
Cox and Snell	.436
Nagelkerke	.526
McFadden	.325
Marketing Factors	
Cox and Snell	.486
Nagelkerke	.597
McFadden	.379
Link function: Logit.	

4.5.3.4. Parameter Estimates

Parameter estimates is the final data test obtained from ordinal regression analysis. In Parameter Estimates table, coefficients, standard errors, wald test, p-value and 95% confidence

interval have been observed. Negative sign reflects that those variables have negative effect on satisfaction level of respondents. Table 14 shows that proximity to work, distance from city center, educational institutes, highway, public transport, healthcare center, parks along with concerns of safety and security and availability of drainage system as well as property views are the factors that have negative impact on regret level. It is also shown that on-site development status, water availability, distance from playground, shopping mall, airport and proximity to work have positive effect on regret level of the respondents as shown in table 14. Distance from city center, concerns of safety and security and availability of sewerage disposal infrastructure have positive impact on regret level to some extent. The wald statistics is calculated as the square of the ratio of the coefficient with significant (sig.) heading (<0.05) that shows the significance of the predictor variables in the model. A higher wald statistic suggests that the corresponding predictor variable has a greater impact on the outcome variable and is considered more significant. The wald sig. value reflects that the regret level of respondents is associated with distance from park, airport as well as with availability of water supply infrastructure and property views. The independent variables that have no significant (p>0.05) association with regret level of respondents are proximity to work, distance from city center, educational institutes, highway, public transport, shopping mall, health care facilities, playgrounds as well as availability of safety and security, sewerage and drainage system and on-site development status.

Table 14: Parameter Estimates- Locational Factors

Variables		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Threshold	[Regret_level_with_buying_renting = 2]	-60.12	3674.65	.000	1	.987	-7262.29	7142.06
	[Regret_level_with_B=buying_renting = 3]	-59.70	3674.65	.000	1	.987	-7261.88	7142.48
	[Regret_level_with_buying_renting= 4]	-54.84	3674.65	.000	1	.988	-7257.02	7147.34
Location	[Proximity_to_work_influence_to_buy_property=1]	.76	.71	1.131	1	.288	-.64	2.16
	[Proximity_to_work_influence_to_buy_property=2]	.71	.55	1.659	1	.198	-.37	1.80
	[Proximity_to_work_influence_to_buy_property=3]	1.64	.65	6.459	1	.011	.38	2.91
	[Proximity_to_work_influence_to_buy_property=4]	0[a]	.	.	0	.	.	.

[Distance_from_city_center_influence_to_buy_property=1]	-.54	.83	.431	1	.512	-2.17	1.08
[Distance_from_city_center_influence_to_buy_property=2]	.30	.60	.245	1	.621	-.89	1.48
[Distance_from_city_center_influence_to_buy_property=3]	.76	.76	.999	1	.318	-.73	2.24
[Distance_from_city_center_influence_to_buy_property=4]	0[a]	.	.	0	.	.	.
[Distance_from_Educational_Institutes_influence_to_buy_property=1]	-1.54	1.64	.885	1	.347	-4.76	1.67
[Distance_from_Educational_Institutes_influence_to_buy_property=2]	-.81	1.58	.262	1	.609	-3.91	2.29
[Distance_from_Educational_Institutes_influence_to_buy_property=3]	-1.06	1.76	.362	1	.547	-4.50	2.38
[Distance_from_Educational_Institutes_influence_to_buy_property=4]	0[a]	.	.	0	.	.	.
[Distance_from_highway_influence_to_buy_property=1]	.86	.97	.793	1	.373	-1.03	2.75
[Distance_from_highway_influence_to_buy_property=2]	-.75	.81	.849	1	.357	-2.34	.84
[Distance_from_highway_influence_to_buy_property=3]	-1.24	.94	1.743	1	.187	-3.09	.60
[Distance_from_highway_influence_to_buy_property=4]	0[a]	.	.	0	.	.	.
[Distance_from_Airport_influence_to_buy_property=1]	1.52	.75	4.138	1	.042	.06	2.99
[Distance_from_Airport_influence_to_buy_property=2]	1.11	.43	6.616	1	.010	.26	1.96
[Distance_from_Airport_influence_to_buy_property=3]	.772	.545	2.007	1	.157	-.30	1.84
[Distance_from_Airport_influence_to_buy_property=4]	0[a]	.	.	0	.	.	.
[Distance_from_Shopping_Mall_influence_to_buy_property=1]	1.70	.95	3.235	1	.072	-.15	3.56

[Distance_from_Shopping_Mall_influence_to_buy_property=2]	1.03	.61	2.888	1	.089	-.16	2.22
[Distance_from_Shopping_Mall_influence_to_buy_property=3]	.89	1.15	.601	1	.438	-1.36	3.14
[Distance_from_Shopping_Mall_influence_to_buy_property=4]	0[a]	.	.	0	.	.	.
[Distance_from_Public_Transport_influence_to_buy_property=1]	-1.12	.90	1.548	1	.213	-2.88	.64
[Distance_from_Public_Transport_influence_to_buy_property=2]	-.59	.64	.827	1	.363	-1.85	.68
[Distance_from_Public_Transport_influence_to_buy_property=3]	4.75	2.56	3.444	1	.063	-.27	9.77
[Distance_from_Public_Transport_influence_to_buy_property=4]	0[a]	.	.	0	.	.	.
[Distance_from_Healthcare_Center_influence_to_buy_property=1]	-19.35	3674.64	.000	1	.996	-7221.52	7182.82
[Distance_from_Healthcare_Center_influence_to_buy_property=2]	-18.21	3674.64	.000	1	.996	-7220.38	7183.97
[Distance_from_Healthcare_Center_influence_to_buy_property=3]	-20.64	3674.65	.000	1	.996	-7222.81	7181.53
[Distance_from_Healthcare_Center_influence_to_buy_property=4]	-16.56	3674.65	.000	1	.996	-7218.73	7185.61
[Distance_from_Healthcare_Center_influence_to_buy_property=5]	0[a]	.	.	0	.	.	.
[Distance_from_Parks_influence_to_buy_property=1]	-18.70	1.18	249.946	1	.000	-21.01	-16.38
[Distance_from_Parks_influence_to_buy_property=2]	-19.75	1.07	340.218	1	.000	-21.85	-17.65
[Distance_from_Parks_influence_to_buy_property=3]	-20.76	1.32	246.719	1	.000	-23.35	-18.17
[Distance_from_Parks_influence_to_buy_property=4]	-19.93	.00	.	1	.	-19.93	-19.93

[Distance_from_Parks_influence_to_buy_property=5]	0[a]	.	.	0	.	.	.
[Distance_from_Playground_influence_to_buy_property=1]	.70	.87	.654	1	.419	-1.00	2.40
[Distance_from_Playground_influence_to_buy_property=2]	.50	.61	.685	1	.408	-.69	1.69
[Distance_from_Playground_influence_to_buy_property=3]	.39	.83	.216	1	.642	-1.24	2.02
[Distance_from_Playground_influence_to_buy_property=4]	0[a]	.	.	0	.	.	.
[Distance_from_Playground_influence_to_buy_property=5]	0[a]	.	.	0	.	.	.
[Safety_security_influence_to_buy_property=1]	-.37	1.29	.084	1	.772	-2.90	2.15
[Safety_security_influence_to_buy_property=2]	.06	1.27	.002	1	.964	-2.43	2.54
[Safety_security_influence_to_buy_property=3]	-.80	1.45	.303	1	.582	-3.63	2.04
[Safety_security_influence_to_buy_property=4]	0[a]	.	.	0	.	.	.
[Water_availability_influence_to_buy_property=1]	3.98	1.05	14.481	1	.000	1.93	6.03
[Water_availability_influence_to_buy_property=2]	4.17	1.14	13.497	1	.000	1.95	6.40
[Water_availability_influence_to_buy_property=3]	3.72	1.28	8.409	1	.004	1.21	6.24
[Water_availability_influence_to_buy_property=4]	4.25	.00	.	1	.	4.25	4.25
[Water_availability_influence_to_buy_property=5]	0[a]	.	.	0	.	.	.
[Water_availability_influence_to_buy_property=1]	.79	2.96	.072	1	.789	-5.02	6.60
[Water_availability_influence_to_buy_property=2]	-1.70	2.92	.338	1	.561	-7.42	4.03
[Sewerage_disposal_influence_to_buy_property=3]	.69	3.15	.048	1	.827	-5.48	6.85
[Sewerage_disposal_influence_to_buy_property=4]	0[a]	.	.	0	.	.	.

[Sewerage_disposal_influence_to_buy_property=5]	0[a]	.	.	0	.	.	.
[Drainage_system_influence_to_buy_property=1]	-2.55	3.39	.564	1	.453	-9.20	4.10
[Drainage_system_influence_to_buy_property=2]	-1.26	3.46	.133	1	.716	-8.05	5.53
[Drainage_system_influence_to_buy_property=3]	-1.28	3.91	.106	1	.744	-8.95	6.40
[Drainage_system_influence_to_buy_property=4]	0[a]	.	.	0	.	.	.
[Drainage_system_influence_to_buy_property=5]	0[a]	.	.	0	.	.	.
[On_site_development_status_influence_to_buy_property=1]	1.56	.99	2.501	1	.114	-.37	3.50
[On_site_development_status_influence_to_buy_property=2]	.42	.90	.219	1	.639	-1.34	2.19
[On_site_development_status_influence_to_buy_property=3]	-.33	1.07	.096	1	.756	-2.43	1.76
[On_site_development_status_influence_to_buy_property=4]	0[a]	.	.	0	.	.	.
[Property_views_influence_to_buy_property=1]	-20.53	.63	1046.12	1	.000	-21.77	-19.29
[Property_views_influence_to_buy_property=2]	-21.17	.48	1927.72	1	.000	-22.11	-20.22
[Property_views_influence_to_buy_property=3]	-20.50	.54	1433.50	1	.000	-21.57	-19.44
[Property_views_influence_to_buy_property=4]	-21.46	.00	.	1	.	-21.46	-21.46
[Property_views_influence_to_buy_property=5]	0[a]	.	.	0	.	.	.

Link function: Logit.

a. This parameter is set to zero because it is redundant.

Table 15 shows that brand name/developer's repute, marketing from celebrities, TV Channels and internet access and usage enhance speed to buy properties are the factors that have negative impact on regret level. It also reflects that agents provide complete information, used platform provides information about approval status, marketing through messages, billboards and internet access to give choice to compare properties have positive effect on regret level of the respondents as shown in table 15. Marketing through social media and newspaper advertisement have both positive and negative impact on regret level. The wald sig. value

reflects that the regret level of respondents is associated with used platform provide information about approval status, marketing through celebrities, internet access and usage enhances the speed of buying properties. The independent variables that have no significance ($p>0.05$) association with regret level of respondents are agents provide complete information about approval status, brand name/developer's repute, marketing through newspaper advertisement, social media marketing, TV channels, messages or phone calls, billboards and internet access give choices to make comparison among properties before buying a property.

Table 15: Parameter Estimates-Marketing Factors

	Variable	Estimate	Std. Error	Wald	Df	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Threshold	[Regret_level_with_buying_renting = 2]	-17.080	3.593	22.591	1	.000	-24.123	-10.037
	[Regret_level_with_buying_renting = 3]	-16.619	3.591	21.418	1	.000	-23.657	-9.581
	[Regret_level_with_buying_renting = 4]	-11.422	3.609	10.015	1	.002	-18.496	-4.348
Location	[Agents_provide_complete_information=1]	3.336	3.157	1.117	1	.291	-2.851	9.523
	[Agents_provide_complete_information=2]	2.861	3.119	.841	1	.359	-3.253	8.975
	[Agents_provide_complete_information=3]	4.323	3.177	1.852	1	.174	-1.903	10.550
	[Agents_provide_complete_information=4]	1.817	3.107	.342	1	.559	-4.273	7.906
	[Agents_provide_complete_information=5]	0[a]	.	.	0	.	.	.
	[Used_platform_provide_approval_status_information=1]	1.716	.601	8.167	1	.004	.539	2.893
	[Used_platform_provide_approval_status_information=2]	1.016	.366	7.691	1	.006	.298	1.734
	[Used_platform_provide_approval_status_information=3]	1.160	.614	3.567	1	.059	-.044	2.364
	[Used_platform_provide_approval_status_information=4]	0[a]	.	.	0	.	.	.
	[Used_platform_provide_approval_status_information=5]	0[a]	.	.	0	.	.	.
	[Brand_name_repute_influence_to_buy_property=1]	1.320	.547	5.810	1	.016	.247	2.393
	[Brand_name_repute_influence_to_buy_property=2]	-.306	.437	.491	1	.483	-1.163	.550

[Brand_name_repute_influence_to_buy_property=3]	-.385	.473	.661	1	.416	-1.313	.543
[Brand_name_repute_influence_to_buy_property=4]	0[a]	.	.	0	.	.	.
[Marketing_from_celebrity_influence_to_buy_property=1]	-13.882	1.024	183.640	1	.000	-15.890	-11.874
[Marketing_from_celebrity_influence_to_buy_property=2]	-15.673	.480	1067.764	1	.000	-16.613	-14.733
[Marketing_from_celebrity_influence_to_buy_property=3]	-16.140	.501	1036.048	1	.000	-17.123	-15.157
[Marketing_from_celebrity_influence_to_buy_property=4]	-17.036	.000	.	1	.	-17.036	-17.036
[Marketing_from_celebrity_influence_to_buy_property=5]	0[a]	.	.	0	.	.	.
[Newspaper_advertisement_influence_to_buy_property=1]	2.354	1.487	2.506	1	.113	-.561	5.268
[Newspaper_advertisement_influence_to_buy_property=2]	-.152	.505	.090	1	.764	-1.141	.837
[Newspaper_advertisement_influence_to_buy_property=3]	.976	.637	2.347	1	.125	-.272	2.224
[Newspaper_advertisement_influence_to_buy_property=4]	0[a]	.	.	0	.	.	.
[Newspaper_advertisement_influence_to_buy_property=5]	0[a]	.	.	0	.	.	.
[Social_media_marketing_influence_to_buy_property=1]	-1.158	2.020	.329	1	.566	-5.116	2.800
[Social_media_marketing_influence_to_buy_property=2]	.298	.764	.152	1	.697	-1.201	1.796
[Social_media_marketing_influence_to_buy_property=3]	.153	.981	.024	1	.876	-1.770	2.077
[Social_media_marketing_influence_to_buy_property=4]	0[a]	.	.	0	.	.	.
[Social_media_marketing_influence_to_buy_property=5]	0[a]	.	.	0	.	.	.
[TV_Channel_influence_to_buy_property=1]	-1.931	2.070	.871	1	.351	-5.988	2.126
[TV_Channel_influence_to_buy_property=2]	-.434	.697	.387	1	.534	-1.800	.932
[TV_Channel_influence_to_buy_property=3]	-.350	.940	.138	1	.710	-2.192	1.493
[TV_Channel_influence_to_buy_property=4]	0[a]	.	.	0	.	.	.

[TV_Channel_influence_to_buy_property=5]	0[a]	.	.	0	.	.	.
[Messages_marketing_influence_to_buy_property=1]	.318	1.907	.028	1	.868	-3.419	4.055
[Messages_marketing_influence_to_buy_property=2]	.822	1.813	.205	1	.650	-2.731	4.374
[Messages_marketing_influence_to_buy_property=3]	.740	1.831	.163	1	.686	-2.849	4.329
[Messages_marketing_influence_to_buy_property=4]	.424	1.807	.055	1	.815	-3.118	3.965
[Messages_marketing_influence_to_buy_property=5]	0[a]	.	.	0	.	.	.
[Billboards_marketing_influence_to_buy_property=1]	3.409	1.450	5.529	1	.019	.567	6.250
[Billboards_marketing_influence_to_buy_property=2]	.620	.453	1.874	1	.171	-.268	1.507
[Billboards_marketing_influence_to_buy_property=3]	.855	.632	1.828	1	.176	-.384	2.094
[Billboards_marketing_influence_to_buy_property=4]	0[a]	.	.	0	.	.	.
[Billboards_marketing_influence_to_buy_property=5]	0[a]	.	.	0	.	.	.
[Internet_access_enhance_speed_to_buy_properties=1]	-2.911	1.331	4.788	1	.029	-5.519	-.303
[Internet_access_enhance_speed_to_buy_properties=2]	-3.329	1.090	9.334	1	.002	-5.465	-1.193
[Internet_access_enhance_speed_to_buy_properties=3]	-2.213	1.065	4.315	1	.038	-4.301	-.125
[Internet_access_enhance_speed_to_buy_properties=4]	0[a]	.	.	0	.	.	.
[Internet_access_enhance_speed_to_buy_properties=5]	0[a]	.	.	0	.	.	.
[Internet_access_give_Choice_to_compare_properties=1]	.832	1.189	.489	1	.484	-1.499	3.162
[Internet_access_give_Choice_to_compare_properties=2]	1.588	1.007	2.489	1	.115	-.385	3.561
[Internet_access_give_Choice_to_compare_properties=3]	1.536	.985	2.432	1	.119	-.394	3.466
[Internet_access_give_Choice_to_compare_properties=4]	0[a]	.	.	0	.	.	.

[Internet_access_give_Choice_to_compare_properties=5]	0[a]	.	.	0	.	.	.

Link function: Logit.

a. This parameter is set to zero because it is redundant.

CHAPTER:5 DISCUSSION

Descriptive statistics reveals that the availability of a drainage system is the primary consideration for consumers when purchasing a property. This is followed by distance from educational institutes, public transportation, water availability, water infrastructure, distance from parks, proximity to work, shopping centers, and airports. Neighborhood characteristics, especially proximity and distance from workplaces, schools, universities, shopping centers, parks, or daily transportation routes, have considerable importance in determining property purchases. The distance from public transportation has a significant relationship with residential purchasing decisions for transportation to and from different locations. Distance and neighborhood characteristics are crucial criteria upon which consumers base their decisions to purchase a house or property. Household needs such as area and number of rooms are associated with family composition or household size and can meet the needs of an average family seeking a house. Most individuals prefer homes with a size greater than 10 marlas (300 sq. yds.) or equal to 15 marlas (453 sq. yds.) with three bedrooms. It is noteworthy that gender played no role in this case study, although it may vary in other regions of the world. The study also revealed that marketing through billboards had the greatest influence on individuals' decisions to purchase a particular property. This was followed by social media engagement, brand reputation of the developer/builder, marketing through television channels, and newspaper advertisements. In contrast, marketing or promotion through celebrities had the least impact. Furthermore, the study identified affordability as the most critical factor in the property purchase decision-making process, followed by flexible payment plans and the ready availability of loans. In contrast, fewer down payments were found to have the least impact on individuals' decisions to purchase a property.

Factor analysis extracted 13 factors that affect the consumer behaviour while making a decision about buying or renting a property. Location is a key variable of any real estate asset i.e; house, flat, apartment, commercial building, hotel, fuel station, restaurant, etc. Locational characteristics include distance from highway, airport, playground, city center and open areas or parks. It also includes reputable or developed housing areas. If property is located nearby to the mentioned features or network, the prices or property value will be the highest one. If one of these are not present, the property prices will be compromised. As a result, end users/people will become more satisfied if they find good enough location. Physical characteristics of a property explain the area of property along with no. of bedrooms and bathrooms. It varies from property to property and from consumer to consumer. The required physical characteristic of

the property depicts the socio-economic indicators of consumers such as household size, income level, etc. A kitchen is the hub or heart of a house that potential buyers take into consideration while making a decision for buying a property. Kitchen view is considered as the best selling point of a property (Allison Halliday, 2016).

Education and basic health facilities are the basic needs of any consumer to live in. Average school trip distance lies between 1.6-3.4 miles (13-25mints) (Department for Transport, 2014). Patients can travel an average distance of 8 miles in case of an emergency to reach nearest health facility (Tolpadi et al., 2022). Distance from educational and health centers should also incorporate in the marketing campaigns or in marking strategies. Proximity to shopping mall is an important indicator for the people to select property as average daily purchase(food, clothing, fuel) travel time for a consumer is equal to or less than 20 minutes (Gary Toyn, 2021). Public transportation increases the functionality and attractiveness of a neighborhood. It increases walkability and livability within dense downtown areas. Public transport to travel is a reasonable mean of transport to move from home to shopping mall, educational institutes, offices or workplaces and vice versa.

Utility infrastructure means availability of water supply system, sewerage, and drainage system along with electricity, gas and communication as these are the essential component for development or growth of any new community. Accessibility to utility infrastructure enhances quality of life and improves health and safety. Housing affordability and family income are the main factor in making choice of residential location(Masoumi et al., 2022). It means housing cost not more than 40% of the annual income of household (López-Alcalá, 2016). Property value and payment module is the important variable for the consumer before buying or renting a property. Nowadays, installment products (3-5 years installments) with down payments are more effective for buying rather than full property buying with full payment. Online payment transaction methods or payment automation prevent people from becoming a victim of any fraudulent activity. The legal status of any property is as important as location is. Most of the scams fall in the legal issues in any property such as permitted land use, zoning regulations and applicable bylaws, type of property and ownership clearance, etc. The concerned regulatory authority of that area addresses all these issues. Visit to website of an authority and meeting with officials of the concerned authority can save investment of the consumer. There is a need to aware people with types of legal issues of any property. It also affects the property value such as registered or cleared property also have higher prices than those un-registered or illegal properties.

Personal inspection of a property covers all aspects such as interior works (plumbing, electrical, heating, ventilation and air conditioning-HVAC, kitchen appliances, fire safety, laundry rooms, etc.), spacing, facade, availability of utility infrastructure, etc. It overall impacts the purchase price if find any issue in personal inspection as it is long term or lifetime investment. After inspection, an individual can prioritize the options, estimate the budget accordingly and then make a list of what he/she can compromise or what cannot. In every decision-making, relevant past experience matters a lot. Experience is associated with several changes in information search and selection behaviour of an individual. People with past experience will consider all those factors affecting their lives after buying the property and become a cause of their regret. Internet access and usage provides individuals to search and evaluate alternative options. People can decide after comparison among alternative options on the basis of affordability, payment module, accessibility to infrastructure, proximity to educational and health care centers, proximity to shopping mall and public transport and nearby open areas or parks.

Marketing strategy defines the overall progress of any real estate project. How it will influence the customers or end user by incorporating their needs or desires. There are different means of marketing such as social media, TV channels, newspaper advertisement and placement of billboards. Internet access and usage provide alternative Options to customer to make comparison and select property for them. Nowadays, artificial intelligence (AI) or virtual reality (VR) will make people see the property before going into the site physically. It saves time, reduces costs and enhanced decision-making mechanism.

Location and marketing factors come out to be reliable for ordinal regression analysis after passing through reliability and multi-collinearity test. Findings of ordinal regression analysis reflects that proximity to work, distance from city center, educational institutes, highway, public transport, healthcare center, parks along with concerns of safety and security and availability of drainage system, brand name/developer's repute, marketing from celebrities, TV Channels and internet access and usage enhance speed to buy properties are the factors that reduces the regret level of people after buying a property. People prefer to live nearby city center, office space, and educational institutions specially schools or colleges. They want to have healthcare center (clinic, hospital, pharmacy) at minimum distance in the neighborhood in order to reach in case of any emergency. For ease of movement, access to main road and public transport are important elements to and fro movement specially when price of fuel becomes high and high. For recreational activity, park or open spaces at walking distance is preferable when someone is going to buy a house. Safe and secure neighborhood is a priority

to all for all of the people before buying a house. Reputation of brand or developer is nowdays very common in making scams with people. Marketing through celebrities and TV channels make people to become a victim because they trust that the schemes or properties are right one for them as they are marketed by celebrities or TV channel irrespective of consideration of all mentioned factors. Nowadays, in the era of digitalization, internet access and its use enhance the speed of people to buy a property in just one click. It is beneficial from one side and has cons on the other side. It enhances speed to buy property but unfortunately provides less information available online to make an informed right decision in order to minimize post-purchase regret level. Some of the factors that impact negatively to the regret level of consumer are on-site development status, water availability, distance from playground, shopping mall, airport, agents provide complete information, used platform provides information about approval status, marketing through messages, billboards and internet access to give choice to compare properties. Distance from playground, shopping mall and airport all are factors that are not related to kids or age below 15 years. Playground is for young adults for cricket, football, volleyball, etc. and it can be compromised in making a decision of buying a property. Shopping mall mostly caters upper middle income or high-income group due to which accessibility to city center gives importance rather than shopping mall. Airport is for international and domestic flight of long distances and upper middle income group travel once in a year or in a lifetime. While high income group travel frequently but they don't want to live nearby due to its nuisance. Marketing through messages and billboards do not impact regret level people because they don't buy a property through these means. It means consumer mostly disagree that these factors may become a cause of their regret during or after buying a property. Reduction or minimization of regret level of consumers is important for long term success, profitability, internal or mentally satisfaction. The summary of the results of the study is shown in figure 22.

This study contributes to theoretical research in different ways. In the previous studies, consumers consider various factors to make a decision about the property such as price and location, attributes of particular property, layout design and specification, reputation of the builder (Gajera & Malek, 2018; Maoludyo & Aprianingsih, 2015), proximity to markets, educational institutes, health centers, amenities, utilities and infrastructural developments, (Gajera & Malek, 2018), time to buy property (Gajera & Malek, 2018; Tobergte & Curtis, 2013), amount and method of payment (Maoludyo & Aprianingsih, 2015)and precious experience(Tobergte & Curtis, 2013), etc. This study adds value in the exiting literature by

adding the variables or factors of information about land use or approval/legal status of particular property before reaching out any decision to buy/rent a property. This will save the lifetime investment of people to become a capital trap. These outcomes strengthen the need to consider the positively impacted factors in marketing campaigns or to make an informed decision in order to minimize post-purchase regret. The results show that accessibility to infrastructure, educational institutions and health centers are the most important factors that the end user must check before making any decision to buy or rent a property. Therefore, the real estate agents must know all these details for making it easy for the end users or consumers to make decisions or make comparison among different properties. Marketing strategy must incorporate the status of land use and approval status of particular property to realize the people that this property is clear from any disputes. This study also provides directions to design houses as per preferences given by the consumers. This is, in turn, fulfills the need of the consumers and demand of an area. This study becomes the baseline study to make a checklist or points of consideration or points of interest before making buying decision in order to reduce regret level of consumers. The study becomes a benchmark for developers to purchase a land or develop a project in line with all mentioned variables. This study is helpful for policy makers to introduce the mentioned elements in the regulatory documents as mandatory requirements for approval of the project.

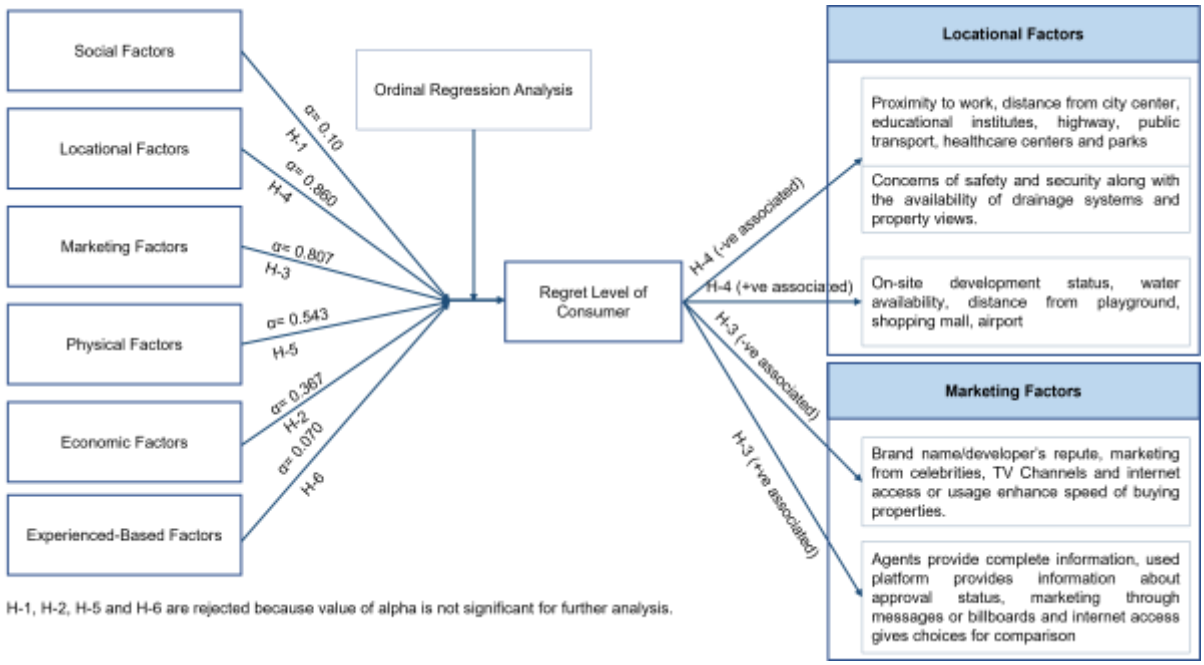


Figure 22: Analytical Framework

CHAPTER:6 CONCLUSION AND RECOMMENDATIONS

Real estate development involves the intricate process of transforming ideas into physical spaces that are occupied by consumers, tenants, or owner-occupants. Real estate is the profession to buy, rent or sell a building or land. It involves high transaction cost, land use regulations and demand-supply changes that make it different from other assets. As housing is the basic need of all human beings, home buying is generally perceived as a risky investment, given the high financial stakes involved, and the negative reputation of the real estate sector amplifies the uncertainty of home buyers. To understand and predict consumer behaviour, it is necessary to examine the factors that influence consumer behaviour to change. Consumer behavior involves the study of how individuals, groups, or organizations select, purchase, use and dispose of goods and services to meet their needs and desires. This study highlights the analytical framework or findings applicable in the process of home buying decision-making to minimize the regret level as home buying is long-lasting, important, irreversible, risky and complicated decision. This study identifies a set of factors that are considered in the home buying decision process, aiming to mitigate post-purchase regrets among consumers. Consumers are focal point in real estate market. The incorporation of concepts of consumer behaviour in traditional real estate improves the understanding of decision-making of individuals. It helps in understanding market segments and evolve strategies to effect penetration. The study of consumer behaviour investigates that how and why preferences of people change over time. The purpose of this study is to explore the effect of social, locational, physical, economic, marketing and experienced-based factors that affect the decision-making or buying behaviour of consumers in real estate investment. This study undertakes all these mentioned factors that affect the decision of a customer to buy or rent a property and serves as a reference study in real estate.

Question design was based on selected factors such as social, economic, locational, physical, marketing and experienced-based. The questionnaire included 57 close ended questions. Data from 450 households has been collected from different housing schemes of Islamabad-Pakistan. The study results identified location, proximity to open areas, shopping centers, educational and health centers, marketing strategy as important factors that affect the most of the consumer behaviour in decision-making process. Locational attributes define the pricing and affordability of an area along with payment modes. These factors are then followed by approvals status, regulatory information, physical characteristics of the property, accessibility to the utility infrastructure and transport network that impact the decision of consumers while

buying a property. In every decision-making process, past experience of an individual always matters a lot as it makes the cumbersome process an easy one. The consumers are keen to get information about mentioned variables/factors that enable them to make right choice for them by using approach of cognitive, affect and behavior.

The results of ordinal regression analysis reflect that 58% people disagreed and 36% strongly disagreed that have regret after buying a property. 65% of the respondent agreed that proximity influences them to buy a property. More than 50% of the respondents agreed that distance from city center, educational institutes, health care, playgrounds along with presence of utility infrastructure (water, sewerage, drainage) and safety concerns influence them to buy a property. Almost 60% or more than 60% of the respondents agreed that distance from highway, shopping center, public transport, open areas along with development status on site influence them most to buy a property. Distance from airport influences them least to make a property buying decision. 62.7% of the respondent agreed that agents provide complete information. Almost 50%or above of the respondents agreed that marketing through social media, TV channels, billboards along with internet access and usage gives more choices to make comparison and enhance speed of searching properties before making a final decision. 39.6% of the respondents agreed that brand repute or developer's name influence the people to buy a particular property. More than 40% of the respondents agreed that marketing through newspaper advertisement influences them to buy a property and used platform provide information about the approval status of the property. 34.7% of the respondents disagreed that they did not influence from marketing through celebrities while 40% of the people disagreed that marketing through messages or phone calls did not influence them to buy a property.

The findings show that proximity to work, distance from city center, educational institutes, highway, public transport, healthcare center, parks along with concerns of safety and security and availability of drainage system as well as property views, brand name/developer's repute, marketing from celebrities, TV Channels and internet access and usage enhance speed to buy properties are the factors that have negative impact on regret level. It is also shown that on-site development status, water availability, distance from playground, shopping mall, airport, agents provide complete information, used platform provides information about approval status, marketing through messages, billboards and internet access to give choice to compare properties are the factors have positive effect on regret level of the respondents.

The findings of this study have significant implications for real estate stakeholders, such as developers, agents, architects, and public policymakers, in understanding the home buying behaviour of people. Planners need to identify what needs to be created, and developers should know how to tailor housing products to satisfy the needs of consumers to make informed decisions. Additionally, the insights of this study can assist sellers, agents, and policymakers in developing effective advertising and marketing strategies that target consumers' preferences. It can give direction to the real estate sector to design housing products that match the specific requirements or preferences of customers. For academicians, this research contributes to a better understanding of the factors affecting the buying decision process of consumers. Overall, this study has the potential to serve as a future reference in the domain of real estate and consumer behavior.

The real estate system needs innovated or digitalized system that provides information about variables on just one click that makes easier for them to do smart investments. Digital real estate is continuously shaping the industry operations and customer behaviors in the real estate market. Digital technologies provide numerous decision support tools and services to various stakeholders, enhancing the proficiency and effectiveness of day-to-day operations, decision-making, cooperation, and monitoring. This study has reviewed digital technologies, data collection methods, network techniques, and decision-making tools in the real estate literature. This study contributes to the body of literature by addressing the possible barriers and benefits of adopting particular digital technology in real estate. This study is helpful for practitioners, scholars, and policymakers to consider it as a benchmark to carry out their work in the field of digital real estate. This study reviewed digital technologies essential for the digital real estate transformation. Digital transformation will make accessibility easier for home buyers. To prevent people from scams, regulatory framework should be made and strengthened in an any area. Regulations and its implementation should be made in such a way that roles are defined against each and every stakeholder involved in this industry. Digitalization & innovation, regulatory framework and stakeholder engagement should be developed in real estate development to make decisions liveable, sustainable, resilient and affordable.

However, it is essential to consider the limitations of this study. This study is limited to the published literature on digital technologies used in real estate. This study takes the first step to undertake qualitative and quantitative research by compiling and analyzing all the research work related to digital technologies of real estate through thematic and bibliometric analysis. This research can be extended to collecting primary data from real estate experts of the market

through structured or unstructured interviews to know the implication of digital technologies in the real estate industry. Based on the expert's opinion, the adoption mechanism of digital technologies can be contextualized. This study can also be extended to know the impact of digital technology on the decision-making of consumers about purchasing a property through questionnaires. This study covers the selected housing schemes of Islamabad and uses random sampling technique to collect data. Therefore, the results can be generalized to other cities. Therefore, the findings of this study may vary from other cities if this study is replicated. Future studies should consider different sampling methods in different areas to enhance the value of this study. The study highlighted the major sources of regret and provides the list of factors that should be considered at time of buying or renting a property to avoid post-purchase regret. The findings of this study may vary across different areas of Pakistan. This study is limited to regret level of people only. This study offers valuable insights of the factors that influence the intention to purchase property, making it a valuable reference for future research in the field of real estate. This study is limited to the social, locational, physical, economic, marketing and experienced-based factors that affect consumer buying-behaviour or process of decision-making in Islamabad only. It can extend by taking phycological and cultural factors to measure its effect on consumer behaviour. This study did not take gender equality in data collection from field due to cultural values.

Annexures

Annexure-A: Factors Affecting Consumer Behaviour In Real Estate In Islamabad

This questionnaire is meant for data collection that will be used only for research purpose. No personally identifiable information will be collected. Please feel free to not answer if you are not comfortable. Thank you.

Q.No_____ Date: -----/------/----------

Housing Scheme Name_____

1	Your Age: _____	5	Education Level: Illiterate ☐ Matriculation ☐ Intermediate ☐ Graduation ☐ Post Graduation ☐		
2	Gender: Male ☐ Female ☐	6	Marital Status: Single ☐ Married ☐ Divorced ☐ Widow ☐		
3	Occupation: _____	7	Nature of Employment: Private Sector ☐ Public Sector ☐ Semi-Govt. Sector ☐		
4	Monthly Income: _____	8	Household Size_____	9	No. of Children_____
10	No. of Adults _____	11	No. of Old Age People_____	12	No. of people with disabilties or needs_____
13	Type of Family: Joint Family ☐ Nuclear ☐ Family				

14	Have you ever bought/rented any ☐ property? Yes No ☐	15	If yes, how many properties did you buy/rent_____
16	What is the purpose of your purchase? a) Staying b) Investment c) Buyback	17	What is the property type you rented/bought? House ☐ Plot ☐ Flat ☐ Apartment ☐ Others_____
18	Platform Used for buying/renting a property a) Websites b) Real estate agents/ brokers c) Family and friends d) Newspaper e) Internet f) Hoardings g) Property expos h) Others_____		
19	Why did you choose this particular platform for buying/renting a property?	20	What are your requirements for buying/renting a property?

	Which thing attracts you to choose this platform to buy/rent this property? a) Better Paperwork b) Trustworthy c) One Window Solution d) Others _____		a) Required Area/Size_____ b) No. of Storeys_____ c) No. of Bedrooms _____ d) No. of Bathrooms_____ e) Kitchen Type_____
21	Have you visited the property before buying/renting? Yes ☐ ☐ No	22	Have you visited the website of the CDA to know the approval status of the housing scheme or property in the housing scheme layout plan? Yes ☐ No ☐
23	Have you checked any zoning/land use plan of an area? Yes ☐ ☐ No	24	If yes, what is the use of this particular property in the zoning/land use plan?---------- ----------
25	Have you visited the office of CDA to know the approval status of the housing scheme or property in the layout plan? Yes ☐ No ☐	26	If Yes, how's your experience? 1. Very Satisfied ☐ 2. Satisfied ☐ 3. ☐ Neutral 4. ☐ Dissatisfied 5. ☐ Very dissatisfied
27	Do you know the approval status of the layout plan of the housing scheme? Yes ☐ No ☐	28	How much time did you take to buy/rent a property? (In months) _____
29	Have you considered some other alternative options? Yes ☐ No ☐	30	If Yes, why select this property option?---------- ----------

5-Point Likert Scale means 1. Strongly Agreed 2. Agreed 3. Neutral 4. Disagree 5. Strongly Disagreed		1	2	3	4	5
31	Agents provided complete information					
32	Used platform provide any information about the approval status of the scheme					
33	Affordability influenced you most to buy the property					
34	Less down payments influence you most to buy the property					
35	Proximity to work influences you most to buy the property					
36	Distance from City Center influences you most to buy the property					
37	Distance from Educational Institutes influences you most in buying the property					
38	Distance from Highway influences you most to buy the property					
39	Distance from Airport influences you most to buy the property					

40	Distance from shopping mall influences you most to buy the property					
41	Distance from Public Transport influences you most to buy the property					
42	Distance from healthcare services influences you most to buy the property					
43	Distance from open areas/parks influences you most to buy the property					
44	Distance from playgrounds influences you most to buy the property					
45	Safety and security influence you most to buying the property					
46	Approval of the scheme influences you most to buy the property					
47	Readily availability of loans influences you most to buy the property					
48	Flexible payments or flexible installment plans influence you most to buy the property					
49	Brand Name/repute of developer influences you most to buy the property					
50	Water availability and its infrastructure influence you most to buy the property					
51	Nullah or sewage disposal or Sewerage Treatment Plant influences you most to buy the property					
52	Drainage system influences you most to buy the property					
53	Development status on site influences you most to buy the property					
54	Property views influence you most to buying the property					
55	Marketing from celebrities influences you most to buy the property					
56	Newspaper advertisement influences you most to buy the property					
57	Social media marketing influences you most to buy the property					
58	Marketing through news/TV Channels influences you most to buy the property					
59	Marketing through messages/phone calls influences you most to buy the property					
60	Marketing through billboards influences you most to buy the property					
61	Internet access and internet usage enhance the speed of buying property and save time					
62	Internet access and internet usage give you more choice to compare different properties and their prices					
63	Have you been satisfied with buying/renting a property?					
64	Have you regretted buying/renting a property?					
65	Do you plan to move/change a property in the next 1-year? Yes ☐ No ☐					
66	Have you faced any other challenges during buying/renting a property?					

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67	Any Suggestion: ---------- ---------- ----------

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