FROM PIXELS TO PROPERTIES

EXPLORING THE POTENTIAL OF AR & VR IN THE REAL ESTATE INDUSTRY

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Abstract

This paper presents a cross-sectional case study that explores to what extent can Augmented Reality (AR) and Virtual Reality (VR) technologies be implemented within real estate firms. The aim of the study is simply to investigate how AR and VR can be successfully leveraged to improve the level of satisfaction and overall customer experience within the real estate industry. Hence, this study is not focusing on a specific agency, but on the industry itself. The study was carried out through the lens of an interpretivist while utilizing a mixed-method approach of both qualitative and quantitative research methods. An in-depth individual interview was conducted from the perspective of an expert, followed by an online customer survey. The findings reveal that the implementation of AR and VR technologies influences customer interaction, decision-making and emotional connection with properties positively. However, the study also identifies key success factors and potential areas of improvement for the real estate industry in incorporating AR and VR to enhance overall customer satisfaction. The findings of this study could potentially serve as a guide for real estate agencies, such as Ivan Eltoft Nielsen, seeking to embrace the technology of AR and VR as a tool for engaging customers and improving the market for property.

Table of Contents

1. Introduction

Real estate has always relied on agents showing clients potential homes. For both clients and agents, this can be time-consuming and often comes with financial costs such as travelling to the properties and, if far enough away, needing to pay for accommodation nearby (Boiko, 2022). However, the introduction of Augmented Reality (AR) and Virtual Reality (VR) could alter the real estate landscape forever. AR and VR can be used to create virtual representations of existing properties and 3D renders of future properties (Program-Ace, 2023).

In this paper, Augmented Reality (AR) is defined as a technology that seamlessly integrates computer-generated images on a screen with the actual object or scene you are observing (*Augmented Reality*, n.d.) and Virtual Reality (VR) is defined as computer-generated visuals that envelop the viewer and create a lifelike illusion of reality (*Virtual Reality*, n.d.). Major leaders within the real estate industry such as Zillow have already begun implementing VR into their services (*Capture 3D Virtual Tours With Free 3D Home App | Zillow*, 2023). A report from Goldman Sachs has forecasted the potential user base of registered real estate agents using VR in 2025 to be 1.4 million (Virtual and Augmented, 2016), showcasing the implementation of AR and VR technologies as an up-and-coming advancement within the real estate industry.

The aim of this research paper is to discuss how the real estate industry can incorporate AR and VR into its services. The gap model will be applied to explore how AR and VR can be incorporated to reduce gaps within the service process for both the client and the real estate agency.

Ivan Eltoft Nielsen is a Danish real estate agency with eleven branches across North Zealand (Ivan Eltoft Nielsen, 2022). As part of this paper, we conducted an interview with a real estate agent from Ivan Eltoft Nielsen.

1.1 Problem Formulation

Augmented reality (AR) and Virtual reality (VR) technologies hold great potential for the real estate industry by offering customers interactive and immersive experiences. The incorporation and adoption of AR and VR have garnered significant interest among real estate agencies, primarily due to the various benefits they offer, including remote property tours, improved visualization, and customization options. Therefore, the focus of this research paper is to explore and identify the opportunistic areas for the real estate industry to successfully implement AR and VR technologies, with the ultimate goal of enhancing customer satisfaction.

1.2 The Research Question

To what extent should Augmented Reality and Virtual Reality be incorporated as part of real estate companies' service experience?

1.3 The Sub Questions

How can the gap model be applied to identify gaps in the real estate service process?
What impact could this have on customer experience?

1.4 Delimitation

Assessing research papers and articles is vital to understanding their basis and their limitations in an academic context (pg.9, Veal & Darcy, 2014). It is also important to be analytical when selecting appropriate methods and techniques to conduct research (pg.127-128, Veal & Darcy, 2014). With this considered, the scope of the study has certain limitations in place.

Since the use of AR and VR is new within the real estate industry there are limited experts and clients who have experience with the technology, therefore the data collected is limited to participants' perception and willingness to use AR and VR in the future. Additionally, it is crucial to note the interview with a real estate agent from Eltoft Nielsen is based on their

expert opinion and predictions for the use of AR and VR in the industry, not their experience using the technology. Finally, it should be stated that AR and VR are being studied collectively within the research as both have significant potential to benefit the industry. Also, within our literature review, it was found that papers often combine the use of both AR and VR in their research.

1.5 Conceptual Framework

The role of the conceptual framework is to identify the key concepts and ideas within a study and the hypothesised relationships between them (67 pg. Veal & Darcy, 2014) Initially, the concepts and ideas most relevant to the study are listed and then defined to highlight their significance to the study. Finally, the concepts are operationalized and applied within the context of the study, including how concepts and information for the study might be identified, described, or assessed. Overall, the conceptual framework was created to illustrate the focus of the study and hypothesise the study's potential outcomes.

For this study, a conceptual framework has been created (Appendix 9.1) based on the researchers' concept map (appendix 9.2) to visualise how AR and VR can be incorporated into the real estate service experience. The main concepts and ideas are defined and outlined in the context of our research study, including “AR”, “VR” and “real estate”.

2. Literature Review

The exploratory review aims to identify and give insight into the pre-existing research within the area of focus of this paper, additionally aiding in the formation of the research question and sub-questions (176 pg. Veal & Darcy, 2014). The articles used in the literature review have been retrieved from LibSearch. Certain keywords associated with the theme of this paper were used such as; Real estate, Augmented Reality, Virtual Reality, relationships, and customer satisfaction. The method of obtaining literature has resulted in the use of these three articles, *Home Sweet Virtual Home (Sihi, 2018), Virtual Technology (VR) Attractiveness Attributes in Influencing House Buyers' Intention to Purchase* (Ibrahim et al, 2023), and *Non-immersive virtual reality technologies in real estate* (Pleyers & Poncin, 2020).

In the article *Home Sweet Virtual Home* Debika Sihi discusses the possibility that AR and VR digital technologies within the real estate industry can serve as a competitive advantage for sales agents. The focus of the article is on the purchase process and is analysed through the consumer's and the sales agent's perspectives to gain a well-balanced understanding. Information was gathered from thirteen real estate agents on their perspective of how AR and VR impact the customer's buying process. Prospective homebuyers were asked questions about their potential use of AR and VR technologies when buying a home. The results reflected a positive outlook on the use of digital technologies when buying a home, specifying certain issues that would be resolved, such as the time it takes to view a home if it is not local, as well as more accessible information. Some customer feedback reflected concerns about the accuracy of the AR and VR technology, therefore they would prefer to see the finished builds (Sihi, 2018). Sihi proposes the findings from this research will provide insight to managers in a range of industries in terms of how to improve their service delivery (Sihi, 2018).

The article *Virtual Technology (VR) Attractiveness Attributes in Influencing House Buyers' Intention to Purchase* explores the relationship between a house buyer's response to digital technologies within VR and their intention to purchase (Ibrahim et al, 2023). The methodology for gathering data was through a survey questionnaire, which was structured using a Likert scale. The survey had one hundred respondents that were purposively sampled. A Pearson's correlation test was performed on the results and indicated 0.793 (Ibrahim et al, 2023). This suggests a possible correlation between the homebuyer's intention to purchase and the channel attributes of VR. The study concludes that homebuyers prefer to view their potential purchase through VR rather than traditional channels of mouse marketing, such as physical brochures or 3D Mock-ups. The findings of this study can benefit property developers, architects, and real estate agencies to adapt their marketing strategies to reach their customers' emotions and guide their behaviour and intention to purchase.

Non-immersive virtual reality technologies in real estate by Players and Poncin explores the impact of non-immersive VR on the customers' experience of and attitude towards the house or apartment, as well as the real estate agent. A study including 232 participants aimed to test how the use of VR and non-immersive VR compared when having an influence on the customers' experience. The researchers found that the participants who had visited properties through VR showed enhanced positive experiences which increased the feeling of presence

and playfulness (Pleyers & Poncin, 2020). The results also showed that the participants who visited through VR, not the non-immersive VR, positively affected their attitude towards the service provider and the product (Pleyers & Poncin, 2020). This research study has indicated that a VR experience could have positive impacts on the customers' perception of the service provider, and it is suggested that the use of VR could be an effective complementary service to real estate agencies.

3. Methodology

3.1 Research Philosophy

This study utilizes the Research Onion Model (Saunders et al., 2019, p. 130), which comprises multiple methodological layers that reflect the different decisions made throughout the research process. The primary aim of adopting the Research Onion (appendix 9.3) is to establish a framework that enables business students to structure and refine their study of research.

Within the framework of the research onion proposed by Saunders et al., the concept of the research philosophy presents a set of beliefs and assumptions that shape the acquisition of knowledge. It thereby enables the researchers to explore and gain knowledge within a specific research domain. (Saunders et al., 2019, p. 130). For this study in particular, the researchers have formulated a research question to establish a clear objective for their investigation. Specifically, they aim to examine to what extent the real estate industry should incorporate Augmented Reality and Virtual Reality into its service experience, simply to enhance customer satisfaction.

This research paper adopts an interpretivist perspective, which relies on the subjects' own accounts of their preferences and experiences (Veal & Darcy, 2014, p. 36). This specific perspective will be utilised with the aim of analysing the data gathered from both an in-depth individual interview, as well as a questionnaire survey. This approach will allow for the researchers to be provided with valuable insights from the perspective of an expert, as well as from the customer's point of view.

3.2 Research Approach

The research study adopts an explanatory research approach, seeking to understand the relationship between different variables. The main purpose of the study is to examine to what extent the real estate industry should implement AR and VR, considering both the perception and expectations of the service provider and the consumers. The collected data will be interpreted by the researchers, using a mixed-methods approach, combining both qualitative and quantitative methods. By employing this methodology, also referred to as triangulation, the researcher will have the ability to recognize any specific patterns, while effectively addressing the problem statement. (Veal & Darcy, 2013, p. 136). The researchers are performing a qualitative in-depth interview with a real estate expert, while also conducting a survey investigating the customer responses, proving them with quantitative data to be analysed. For this purpose, the researchers will be employing an inductive approach, as they aim to generate new insights, exploring new phenomena and relationships through the data gathered. The researchers will therefore not be relying on any predefined theories or hypotheses.

3.3 Sampling

Samples are used to make inferences about the population. Taking a sample of the population makes the research more cost and time efficient and allows the project to be well managed. In this research project, two types of sampling methods are used, expert sampling, and convenience sampling.

An expert sampling method was used to sample the participant for the individual interview. This sampling method requires the researcher to draw their sample from experts in the field of inquiry (Expert Sampling, n.d.). The researchers purposively sampled these participants as they had direct contact with them, and it would be appropriate given the time limit and accessibility constraints of this research project. An advantage of sampling an expert for this interview is the gain of their assessment of the area of study and the questions posed. A limitation of using the expert sampling method when obtaining their opinions on the area of research is that they may not always be accurate.

Convenience sampling was used as a non-probability sampling method for the purpose of obtaining the sample for the consumer survey (Convenience Sampling, n.d.). By it being a non-probability method, it signifies that the researchers sampled with subjectivity and that the sample was not random. The researchers sampled the participants through personal contact and shared the survey to their online social accounts, to reach their wider network. The convenience sampling method is appropriate to use for this survey as it has no monetary cost and is time efficient and is a simple method for gathering primary data. Concerns regarding this sampling method are that it is subject to selection bias and could therefore result in lower credibility in the data.

3.4 Limitations

It is crucial for the researchers to acknowledge and address possible limitations when performing a research study, simply to ensure transparency. For this paper, the researchers have been limited by the natural constraint of time, as well as resources and sample size. Due to the use of quantitative questionnaires, the researchers are aware of the limitation caused by the reliance on self-reporting, as it may result in inaccuracy. Additionally, the use of close-ended questions may also cause certain limitations by constraining the range of potential responses available to the participants. The chosen methodology of convenience sampling allowed for the researchers to reach a wider range of participants; however, it also carries the potential for bias, as the questionnaire was distributed through the researchers' personal online channels.

3.5 Time Horizon

This research paper is structured as a case study, which involves conducting an intensive investigation of a single case (Veal & Darcy, 2014, p. 370). The study of interest has been investigated and analysed in a period of approximately two weeks, simply following the constraints of time and available resources inherent in the exam format. The research study will focus solely on examining the case at a specific moment in time, which can be referred to as a cross-sectional study. Furthermore, the researchers have completed a timeframe (appendix 9.4) for the study, simply to conduct an efficient plan and to allocate appropriate time for each task.

3.6 Securing Quality Data

Ensuring quality data is gathered is a vital component of the research process, it enables confident conclusions to be drawn from the research. Credibility, transferability, conformability, and dependability are four factors that were considered throughout this research paper (Anney, 2014). These four considerations help to ensure the integrity of the paper and ultimately its acceptance in the academic world.

Triangulation has been implemented to increase the credibility and reliability of the paper's findings (Veal & Darcy, 2014). Specifically, methodological triangulation has been used in this paper as data has been collected via multiple methods, including an interview and a questionnaire (Anney, 2014).

4. Techniques and Procedures

4.1 Ethics

Ethical guidelines help to ensure valuable resources are not wasted, research results are not misleading, and participants' time is not wasted (Veal & Darcy, 2014, p. 111). An interview and a questionnaire were conducted as part of collecting primary data for this research paper. These methods rely on working with human participants and for that reason, certain ethical considerations should be made.

Importantly, the participants took part freely in the research and were not coerced into answering the questionnaire or taking part in the interview (Veal & Darcy, 2014, p.111). Both the interview and questionnaire included consent forms with the option to withdraw (Appendix 9.5) and an information sheet (Appendix 9.6) so the participants could give informed consent.

All the data collected from the questionnaire is stored digitally and is password protected. Participant’s data is anonymous and if at any point the participant wishes to remove their data

they can do so, as stated in the information sheet within the questionnaire (appendix 9.6). The interview is also stored digitally and stored behind a password (Veal & Darcy, 2014, p. 117).

4.2 Coding

An inductive coding approach has been used to derive the codes from the individual interview. The interview was grouped into categories, wherefrom the data was organized into coded information. The categories are as following; Expectation of AR/VR and customer, Opportunities, Concerns, Predictions. The coded information has been reviewed by all researchers to ensure validity and no researcher bias.

Categories	Coded information
Expectation of AR/VR and customer	Simple navigation (KISS model) Complementary to an agent Insight to layout Customer needs personal involvement
Opportunities	Establish search criteria View from a distance Effective and fast process Visualize potential
Concerns	Inaccurate representation Cost
Predictions/suggestions	Become standard tool More prepared buyers Creativeness

5. Theoretical Framework

5.1 The Gap Analysis Model

The gap analysis model, introduced by A. Parasuraman, Leonard L. Berry, and Valarie A. Zeithaml in 1985, provides a conceptual framework for identifying and reducing gaps in the service delivery process to improve service quality (Appendix 9.7). By analysing these gaps, marketers can focus on narrowing the disparities that exist.

The upper segment of the model primarily concentrates on Gap 5 (Appendix 9.7), which represents the variance between consumers' expected service and their perceived service. Consumers' expectations are shaped by their past experiences, personal needs, and word-of-mouth communications. This amalgamation forms their anticipated service. The perceived service quality gap (Gap 5) examines how consumers' expectations differ from their actual perceptions of the service. Marketers strive for consumers to experience a service of higher perceived quality than initially anticipated.

The lower portion of the model addresses internal gaps within the organization that can impact service perception. Gap 1 denotes the management perception gap, indicating a disconnect between management and consumer expectations. To minimize this gap, it is crucial for companies to conduct market research and thoroughly analyse their consumer base (Grönroos, C., 2016, p. 131).

Gap 2, the quality specification gap, pertains to the disparity between management's perception of quality and the specified service quality. Effective communication between management and customer-facing employees is instrumental in reducing this gap and ensuring a customer-centric approach (Grönroos, C., 2016, p. 131-132,).

Gap 3, the service delivery gap, arises when the service production and delivery process fails to meet the specified quality standards (Grönroos, C., 2016, p. 132).

Gap 4, the market communication gap, occurs when the company's marketing messages do not align with the service actually provided. Bridging this gap involves aligning service

operations with marketing communications regarding the nature and manner of service provision (Grönroos, C., 2016, p. 133-134,).

In the research paper, the gap model will be utilized to evaluate if AR and VR should be incorporated into the real estate industry and how the technologies can be used help to reduce service gaps within the service delivery process.

5.2 The Satisfaction/Repurchase Model

Understanding the connection between customer satisfaction and repurchase intent or willingness to recommend holds significant importance. The relationship between these variables is non-linear and encompasses varying levels of customer satisfaction. It is crucial to acknowledge that only customers who exhibit a state of 'very satisfied' show elevated rates of repurchasing and willingness to recommend. On the other hand, customers who are merely 'just satisfied' fall within the ‘zone of indifference’, rendering them unlikely to make future purchases or recommend the service. Consequently, it is insufficient for service providers to deliver a level of service that maintains customers within the ‘zone of indifference’. Instead, they should aspire to surpass customer expectations and offer a service of the utmost quality to secure loyalty. Furthermore, it is essential to differentiate between responses indicating ‘satisfied’ and those indicating 'highly satisfied’ when handling customer satisfaction data. In sum, enterprises should consistently strive to deliver exceptional service to attain the highest levels of customer retention and loyalty.

This paper will use the satisfaction/repurchase function to draw inferences on how the addition of AR and VR to real estate services can potentially raise customers' experiences above the ‘zone of indifference’. This could increase customer satisfaction and, therefore, increase the customer's intent to repurchase or recommend the real estate company's services.

5.3 The Seven Criteria of Good Perceived Service Quality

The seven criteria of good perceived service quality stem from a range of previous studies and research and is used as a basis for managers to achieve good service quality (Grönroos, C. 2016). The list of features and attributes is formed from a multitude of empirical bodies of research and is therefore shortened and not extensive. The criteria serve a beneficial purpose

for managerial roles to consider improving the perceived service quality for the customer. Selected principles of the seven criteria are applicable to the real estate industry, including professionalism and skills, reliability and trustworthiness, and reputation and credibility.

The consideration and use of these criteria will aid in guiding the improvement of the perceived service quality (Grönroos, C. 2016). With the incorporation of AR/VR technology in the real estate industry, the three selected criteria will be analysed for their influence on the customer's perception of the service.

6. Analysis of Data

Based on the findings from both the individual interview with a real estate agent from Ivan Eltoft Nielsen and the survey responses, gaps in service delivery have been identified. Due to some gaps not being successfully met, the service rendered to the consumer will lack effectiveness and thereby lead to varying perceptions of the service quality. This paper aims to investigate to what extent AR and VR should be implemented in the real estate industry and its service experience. A customer's experience is set to be satisfied when their expectations of the service meet their perception of the service, therefore the researchers have identified some instances where gaps are either met or not met. By identifying the specific areas where gaps occur in relation to the implementation of AR and VR technologies, the real estate industry can strategically focus on improving those areas to align with the customer's expectations. Worldwide real estate agencies, including Ivan Eltoft Nielsen, can leverage the insight derived from this research paper, to identify and bridge possible gaps between the service providers and customers. By doing so, they can effectively implement AR and VR technologies to simply enhance their operations and provide an improved customer experience.

The gap model is employed to discern the distinct expectations originating from the service provider, as reflected through an individual interview conducted with a real estate agent, while the expectations of the customers have been evidenced by the survey responses. Since VR and AR is not yet a prevalent technology available at most real estate agencies, the findings refer to the expectations that the service provider and the customer would have, not their existing experience with the technology. The paper aims to provide suggestions for how AR and VR technologies could effectively be implemented in the imminent future.

In the individual interview, the interviewee highlighted the advantages of incorporating AR and VR in the real estate industry, emphasizing that it would enable customers to explore the full potential of a property, allowing them to surpass the limitations of traditional viewing methods. It was stated that it would empower customers to unleash their creativity in envisioning their future home and seek solutions for any potential challenges (Appendix 9.10). This ability to visualize property remotely was a factor that was questioned in the survey in relation to which extent this feature would increase the customers' likelihood of using AR and VR when purchasing a home, which resulted in a mean of 4,64 out of 5 (Appendix 9.11). This feature, among others in question, resulted in being the most impactful regarding the customers' likelihood of using his technology. In this case, the researchers have determined that Gap 1 within the Gap Model has been successfully minimized due to the expectations of the customers aligning with the expectations expressed by the real estate agent. Both parties concur on the importance of remote property visualization as a significant factor influencing the home purchasing decision. When the expectations of both parties converge, it creates a favourable service experience, in which the implementation of AR and VR can prove to be highly effective.

From the survey, a positive perception of AR and VR can be identified among the participants as 86.67% stated they have a positive view of AR and VR and would be open to using the technologies (Appendix 9.11). Within the gap analysis model, Gap 5 denotes the discrepancy between consumers' expected service and their perceived service (Appendix 9.7). 75.58% of participants stated they believe the use of AR and VR within the real estate process could enhance property visualisation. This could be applied to Gap 5 to showcase that the use of AR and VR can lessen the gap between the consumers' expectations of a property and their actual perception of the property in person.

However, the researchers happened to identify a gap, in which the expectations and perceptions between the service provider and the customers are not aligned. Based on the insights gathered from the interview with a real estate agent, representing the perspective of the service provider, it is emphasized that adopting a KISS model (Keep It Simple Stupid), is rather crucial when designing the navigation and user technology of AR and VR systems. (Appendix 9.10).

According to the interview with a real estate agent, giving the perspective of the service provider, a KISS model (Keep It Simple Stupid) would be an important mindset to have when designing the navigation and user-friendliness aspect of AR and VR technologies (Appendix 9.10). On the contrary, the response of potential customers in the survey suggests that simplicity and user-friendly navigation do not have a strong impact on their likelihood of using this technology, as the mean rank on the Likert scale was 3,6 (Appendix 9.11). This indicates that the service provider might possess certain pre-existing perceptions that may be inaccurate regarding the needs and abilities in relation to new technology. The researchers have identified gap 1; the management perception gap, of not being fully met, as the service providers' perception does not align with the customers.

The potential customers were questioned on what factors would be a cause for concern regarding the use of AR/VR in the home purchasing process, and interestingly a minor percentage of respondents were concerned about their lack of understanding for new technology, with a result of 8,47% (Appendix 9.11). This again indicates a gap between the service provider and the customers' expectations and perceptions of using that technology. The survey included participants primarily aged between 18 and 24, gathered through the convenience sampling approach employed by the researchers. The age of customers could potentially serve as an explanation for their relatively lower level of concern compared to other factors as a younger demographic is generally more comfortable with new technologies compared to an older demographic (Vogels, 2019).

The researchers acknowledge a significant barrier to implementing AR/VR in real estate businesses is the high setup cost. However, an opportunity has been established in which the implementation would be most effective, allowing for a competitive advantage. There were gaps in expectations and perceptions between the service provider and the customers relating to the user complexity and navigation of the technology. A real estate agency such as Ivan Eltoft Nielsen could use this information to adapt their marketing strategy and implement AR and AR technology that may not be too simple and includes more advanced features to meet their potential customers' expectations. A clear positive result of using AR and VR in the home buying process is that customers can visualize the property remotely, allowing them to become more creative in envisioning their home and be more prepared when viewing it physically. As stated by the interviewee from the service provider's perspective, a customer will rarely purchase a home without having a physical experience of it (Appendix 9.10).

Therefore, the implementation of the technology would serve as a complementary service along with the physical face-to-face service and relationship with a real estate agent, improving the overall service experience for the customer.

6.2 Analysis of customer satisfaction/repurchase function:

The customer satisfaction/repurchase function examines how customer satisfaction relates to the customer's willingness to repurchase or recommend the service. Incorporating AR and VR as part of the real estate service process is expected to enhance service quality. According to the survey findings, 86.67% (Appendix 9.11) of respondents had a positive perception of AR and VR with an additional 55% (Appendix 9.11) believing the addition of AR and VR options could positively influence their decision-making process within the real estate industry. Therefore, it could be deduced that customer satisfaction would increase, due to the addition of AR and VR technologies, to a point above the zone of indifference. In line with the customer satisfaction/repurchase function (appendix 9.8), it is anticipated that an improvement in customer satisfaction will lead to a higher probability of customers repurchasing or recommending the services offered by real estate agencies.

6.3 The seven criteria for good perceived service quality

Three of the seven criteria of good perceived service quality are relevant to discuss in relation to the customer experience with the use of AR and VR in purchasing a home. Professionalism and skills are the first criteria, which involves the service provider having the knowledge and skills required to problem solve. With the introduction of AR and VR technologies alongside the real estate agent, challenges may occur, in which it is critical that the service provider is fully equipped to solve the issue. This requires a real estate agent to be capable of understanding and using the technology from the customers' perspective and gauge where their professional guidance is necessary.

The second criteria with relevance are reliability and trustworthiness. This entails the security of knowing that promises are kept and that the customers feel that their best interests are the priority when using AR and VR technologies. As the expert real estate agent Ivan Eltoft Nielsen mentioned, customers are making significant purchases, so it is vital they feel secure in and trust their service provider (Appendix 9.7).

The third criteria are reputation and credibility, including how the customer believes and trusts the business and that it gives a valuable service which can be shared with other customers (Grönroos, C. 2016). This criterion is valuable to recognize for real estate businesses, as customers with trust in and a good experience using AR and VR technologies along with a real estate agent in their home buying process, will repeat their experience to others. Attracting other individuals to become potential customers in the future as a result of positive word-of-mouth about the service quality and experience.

As discussed, all three criteria need to be considered when delivering the service to the customer. To ensure a high perceived service quality in the home buying process through the incorporation of AR and VR technology, it is imperative for the service provider to be trained in the technology, keep customers' best interests at heart and build their trust. This, in turn, has the potential of attracting prospective customers in the future.

7. Conclusion

This study aimed to answer the research question “To what extend should Augmented Reality and Virtual Reality be incorporated as part of real estate companies’ service experience?” and was guided by answering the following sub-questions: How can the gap model be applied to identify gaps in the real estate service process? And What impact could this have on customer experience?

As addressed in the sub-questions above, a key model throughout our research paper was the gap analysis model of service quality. Primary data was collected via an interview and a survey. The service gap analysis model was then applied to the data collected to identify and examine the gaps in the real estate service process.

Overall, it can be concluded that AR and VR are beneficial developments in technology that could radically innovate the real estate service process. This can be achieved since the use of AR and VR has the potential to reduce gaps in the perception of service quality. In the analysis (6. Analysis of Data) it was found that Gap 5 (Appendix 9.5) could be reduced with the implementation of AR and VR as it could bring the customers' expectation of the property they are looking to purchase closer to the actual perceived service of viewing the home in person.

However, it could also be concluded that real estate firms should revise their perception of customers’ expectations, Gap 1 (Appendix 9.5). As the real estate expert from the survey (Appendix 9.10) states that consumers might not find AR and VR technologies user friendly, however, the data from the survey suggests otherwise since only 16.95% of participants are concerned about not being able to operate AR and VR technologies.

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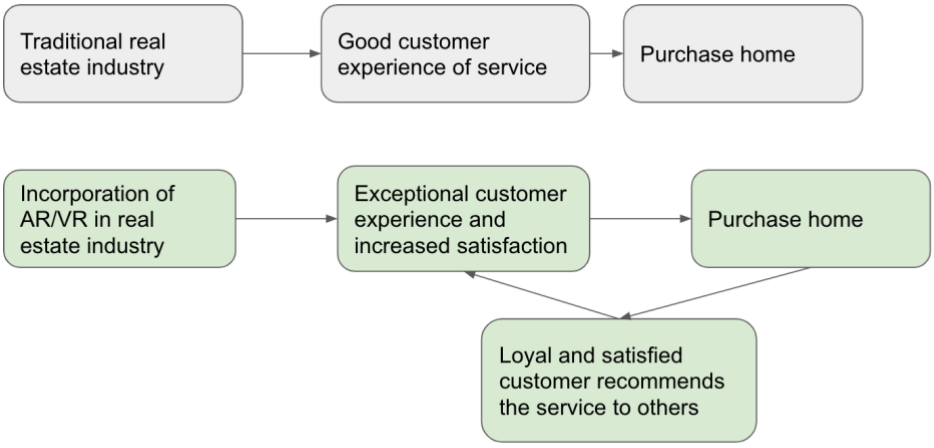
9. Appendix

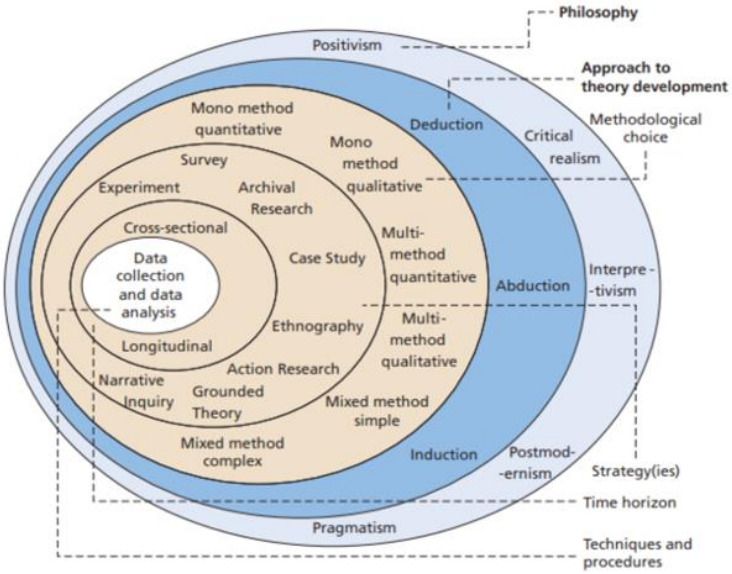
9.1 Conceptual framework (Own source, 2023)

Concepts	Definition	Operationalization
AR	Augmented Reality (AR) is defined as a technology that seamlessly integrates computer-generated images on a screen with the actual object or scene you are observing (Augmented Reality, n.d.)	AR can enhance property viewing experiences by overlaying digital information, such as property details or virtual furnishings, onto the real-world environment.
VR	Virtual Reality (VR) is defined as computer-generated visuals that envelop the viewer and create a lifelike illusion of reality (Virtual Reality, n.d.).	VR can simulate immersive virtual property tours, allowing potential buyers to explore properties remotely as if they were physically present.
Real estate	Real property, an available space or capacity (Real Estate, 2023).	Real estate pertains to the industry involved in the buying, selling, and renting of land, buildings, and properties.
Satisfaction	a measurement that determines how happy customers are with a company's products, services, and capabilities (What Is Customer, 2023).	Satisfaction relates to the level of contentment experienced by customers when engaging with real estate services or utilizing AR/VR technology in property-related interactions.
Loyal customer	Customer loyalty describes an ongoing emotional relationship between you and your customer, manifesting itself by how willing a customer is to engage with and repeatedly purchase from you versus your competitors (Customer Loyalty, 2023).	A loyal customer would refer to individuals who exhibit sustained engagement and repeat business with real estate agents or firms incorporating AR effectively, as well as recommending the service to potential buyers.

9.2 Concept map (Own source, 2023)



9.3 Research onion (Saunders et al, 2019, 130)



9.4 Time plan (Own source, 2023)

Daily schedule	1	2	3	4	5	6	7	8	9	10	11	12	13
Reviewing literature													
Defining research question													
Conceptual framework													
Choice of methodology													
Clearance of ethics													
Conduct individual interview													
Conduct survey													
Coding and analyzing													
Writing report													

9.5 Consent form (Own source, 2023)

Informed consent form for individual interview

Copenhagen Business School: Students of Business Administration and Service Management

I confirm that I have read and understood the research project information sheet for the "How can the Real estate industry effectively incorporate Augmented Reality/Virtual Reality" research and have had any questions answered to my satisfaction.

I understand that my participation in the study is voluntary, and I can choose to not take part at any time.

I agree to participate in the study as described in the information sheet.

I agree that quotations from interviews/discussions may be used in publications. If I wish for the quotations to be anonymous, I will contact the administrator or any members of the research team.

First Name: Mathias Last Name Nilsson

Date: 20/05/2023

Signature

(Own Source, 2023, Adapted from Veal, 2018)

9. 6 Information sheet (Own source, 2023)

Information Sheet

CBS COPENHAGEN BUSINESS SCHOOL HANDELSHØJSKOLEN

Copenhagen Business School, Students of Business Administration and Service Management

This is an information sheet describing and explaining the study that the researchers are currently conducting.

Purpose of the study

This study aims to explore how the real estate industry can effectively incorporate Augmented Reality/Virtual Reality. Insights from industry experts, will contribute to a wider understanding of the subject matter.

Nature of involvement

Participants will participate in a structured individual interview. The individual interview will be sent via email and responded to in written form.

Risks

The nature if the individual interview does not pose direct risk, yet the participant may feel uncomfortable answering some questions that may be sensitive and/or personal. The researchers will aim to ensure a comfortable experience and withdraw data, or make the answers anonymous at the request of the participant.

Voluntary nature of participation

All participants must give voluntary written consent to participate in the research. All participants are allowed to withdraw their answers and their participation from the interview at any point. In this situation, the recorded information will be disposed of and the participant will not be considered for any analysis or results of the study.

Privacy and security of data

The interviews will be coded to analyze the data. The researchers will adhere to all CBS and European GDPR guidelines to properly store your data. The only individuals with access to the data are the researchers of this study and it will not be shared with anyone outside.

Contact details

In case a participant has any questions or issues at any time, they can ask the supervisor Felix Eggers for any additional information via the following details:

Felix Eggers, fe.marktg@cbs.dk

(Own Source, 2023, adopted from Veal, 2018)

9.7 Gap-model (Grönroos, C. 2016)

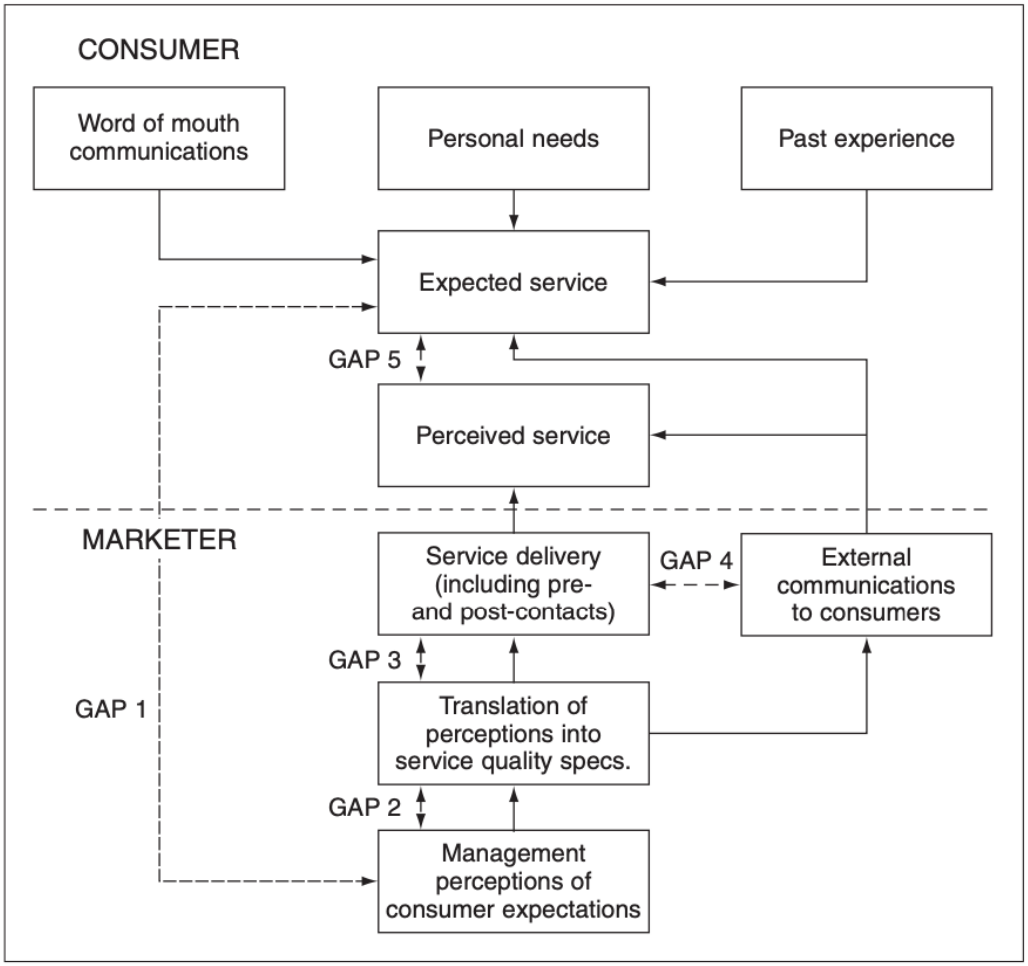


FIGURE 5.1

The gap analysis model of service quality.

9. 8 Satisfaction/repurchase function (Grönroos, C. 2016)

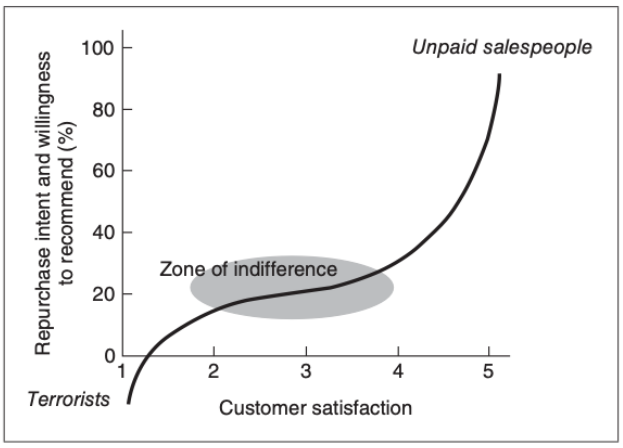


FIGURE 6.1

The satisfaction/repurchase function.

9. 9 Seven criteria of good perceived service quality (Grönroos, C. 2016)

1. **Professionalism and Skills**
   Customers realize that the service provider, its employees, operational systems, and physical resources have the knowledge and skills required to solve their problems in a professional way (outcome-related criteria).
2. **Attitudes and Behaviour**
   Customers feel that the service employees (contact persons) are concerned about them and interested in solving their problems in a friendly and spontaneous way (process-related criteria).
3. **Accessibility and Flexibility**
   Customers feel that the service provider, its location, operating hours, employees, and operational systems are designed and operate so that it is easy to get access to the service and are prepared to adjust to the demands and wishes of the customer in a flexible way (process-related criteria).
4. **Reliability and Trustworthiness**
   Customers know that whatever takes place or has been agreed upon, they can rely on the service provider, its employees and systems, to keep promises and perform with the best interest of the customers at heart (process-related criteria).
5. **Service Recovery**
   Customers realize that whenever something goes wrong or something unpredictable happens the service provider will immediately and actively take action to keep them in control of the situation and find a new, acceptable solution (process-related criteria).
6. **Servicescape**
   Customers feel that the physical surrounding and other aspects of the environment of the service encounter support a positive experience of the service process (process-related criteria).
7. **Reputation and Credibility**
   Customers believe that the service provider's business can be trusted and gives adequate value for money, and that it stands for good performance and values which can be shared by customers and the service provider (image-related criteria).

9.10 Interview Data

Dear participant, please answer these questions to the best of your ability as they will form the basis of our understanding from an expert's experience and opinion. Please ensure you have consented to partake in this interview.

Interview questions below;

1) What is your title/position within Ivan Eltoft Nielsen? What are your primary responsibilities and tasks? How long have you worked there?
My title is "Real Estate Agent".

My primary and overall responsibilities/tasks as a real estate agent is to get listings and sell them. More specifically, it's my job to manage all my listings and making sure they are sellable, and of course show them to potential buyers.
When a potential buyer is found it's my job to make sure that my client, the seller, is getting the best price for their property and simultaneously navigate them through the process. There's a lot of legal aspects you have to be aware of when selling a house, and it's my job to create a legally secure deal for my client.

I've worked at Ivan Eltoft Nielsen for almost 7 years.

2) Do you currently use (Augmented Reality)AR/VR (Virtual Reality) within Ivan Eltoft Nielsen, if so please describe what it is and what it consists of?
No.

3) Can you share any success stories or positive feedback from clients who have utilized AR/VR in their property search or selling process?
Since we don't use AR/VR I personally don't have any feedback on this. But some real estate agents use AR/VR on their website and my generally understanding is that people seem to like these features.

As an example, look a Nybolig. They have created the possibility to move around the house you're looking at like you were there yourself. This gives the potential buyer a much better insight into the layout and possibilities of that house.

4) What steps do/would you take to educate and familiarize your clients with the Augmented Reality (AR) technology you incorporate into your property listings or presentations?
Clients don't have the time, or the energy, to learn how to operate a whole new technology. Therefore I would create the AR technology with the KISS-mindsted (Keep It Simple Stupid). In my opinion, for this to really work and become beneficial for the clients, it must be simple and easy to navigate. Otherwise, it won't work and this great and useful technology will become redundant.

5) How would you ensure a seamless integration of Augmented Reality (AR) technology into your real estate services without compromising the personal touch and value of building client relationships?
The implementation of AR technology in the real estate is in my opinion not a threat to the "personal touch and value of building client relationships". The reason is that the client will always have to see the property in real life and not only in AR (though it does happen from time to time that clients buy properties without even being there. But it's rare). For most people buying a home is the biggest investment in their life. In these situations you always want some degree of personal involvement and relationship with the parties involved, to feel secure throughout the process and to answer questions.

6) How do you address any concerns or skepticism that clients may have regarding the accuracy or reliability of Augmented Reality (AR) representations of properties?
I would just inform the clients that there may be some inaccuracy when using AR and that what they see may not be possible in reality. This could be because of pipes in the walls, bearing walls ect. That should be enough, in my opinion.

7) In what ways can Augmented Reality (AR) help prospective buyers in making more informed decisions about a property without physically visiting it?
Through AR prospective buyers can create their dream home from the comfort of their own home. When they find a house they like, they can, through AR, implement all their needs, wants and dreams and see if it's possible. Let's say that they want a pool in the backyard. By the use of AR they can put the pool in and see if it fits and/or looks good. Without AR this would only be possible to find out by being there in person or having great skills in Photoshop or similar software.

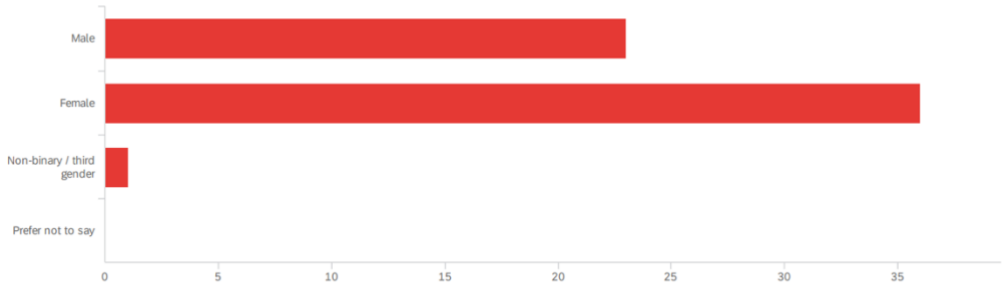
9) Have you managed to attract and reach a new market (perhaps of foreign buyers) through the use of AR/VR viewings?
No, since we don't use any AR/VR. Yet.

10) How do you foresee the future of AR in the real estate industry? Do you think it will become a standard tool for property marketing and sales? Why or why not?
My personal take on this is that it will become a standard tool in the industry. As I've mentioned above it helps both buyers and sellers reach a final agreement quicker and easier. It will also have a tremendous impact on the number of showings and the seriousness of these. With the right AR/VR tools I would argue that the number of showings on a house before it's sold will fall noticeably. This because the buyers are much more prepared when visiting a house.

A surprising number of people can't see the possibilities that lies within a property. A lot of times the house fits all their criteria's, but they still don't buy it, because they lack the creativeness and the mental image of the final project. AR and VR would be a fantastic tool in these kind og situations and probably generate a lot more income for real estate agents.
The reason it's not a common technology found everywhere is because of the cost of development and implementation.

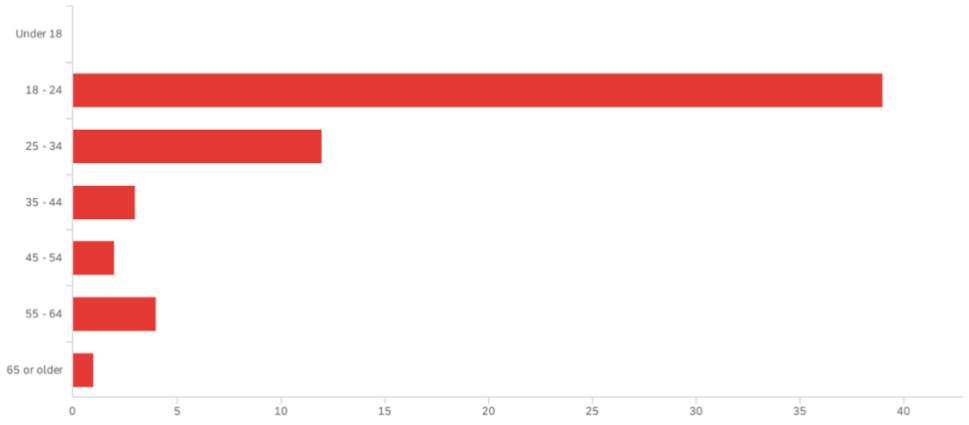
9.11 Survey Response

Q1 - Gender:

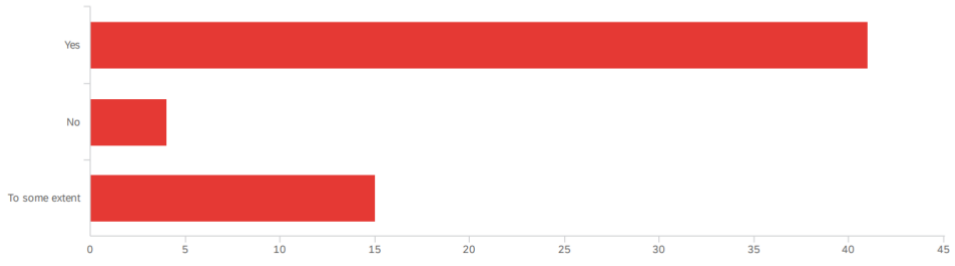


#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Gender:	1.00	3.00	1.63	0.52	0.27	60

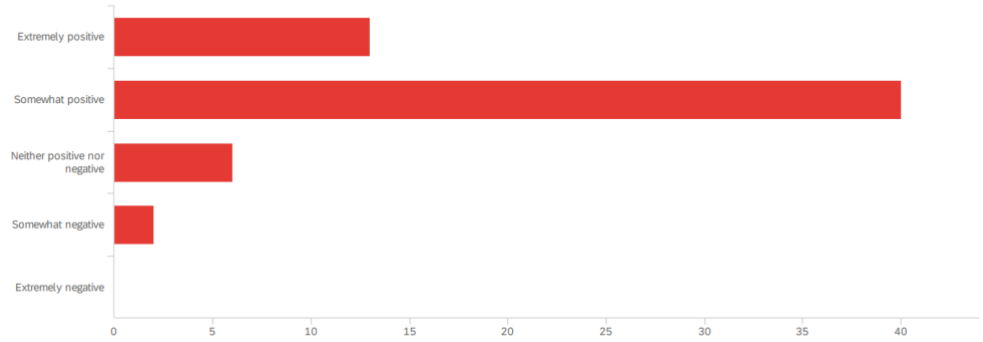
Q2 - Age:



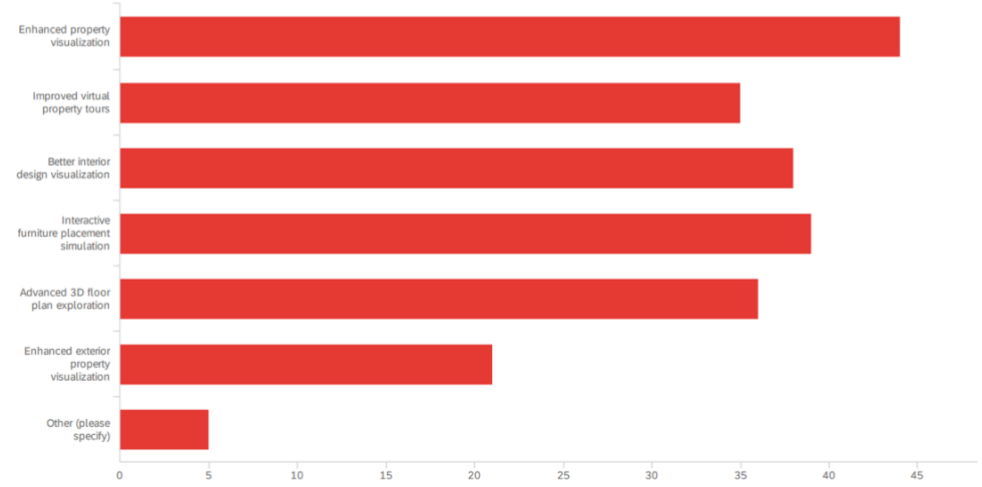
Q3 - Are you familiar with Augmented Reality (AR) and Virtual Reality (VR) technologies?



Q4 - Based on your understanding or knowledge of AR/VR, how would you perceive the use of AR/VR in the real estate industry?



Q5 - What potential benefits do you think AR/VR could bring to the real estate industry? (Select all that apply)

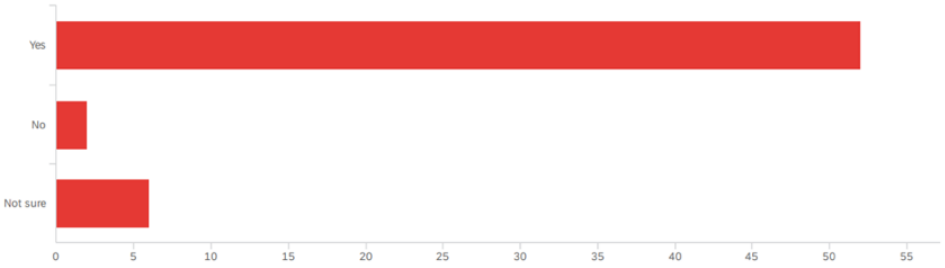


Q5_7_TEXT - Other (please specify)

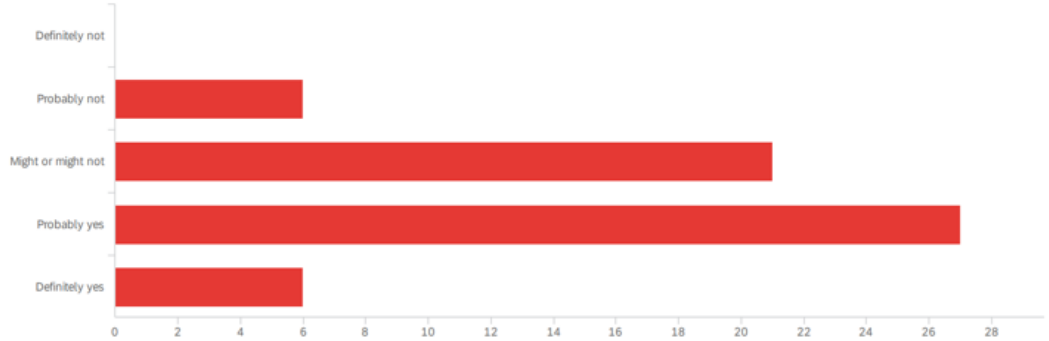
Other (please specify)

Provide the opportunity to view projects which are not finished yet

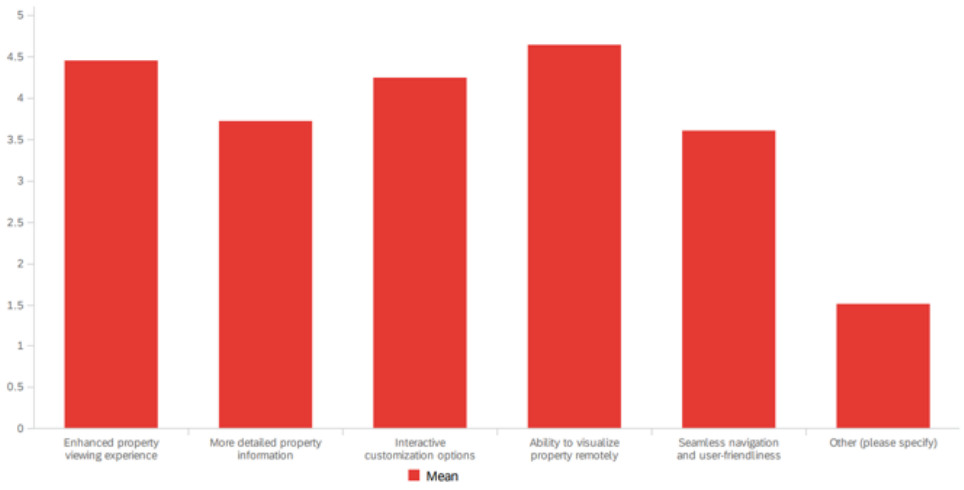
Q6 - If given the opportunity, would you be willing to use AR/VR technologies for real estate-related activities?



Q7 - Do you think AR/VR technologies could positively impact your decision-making process in real estate?



Q8 - Which factors would make you more likely to consider using AR/VR in the real estate industry? (Rate the impact they would have from 1-6)



Q9 - If you are not willing to use AR/VR in the real estate industry, what are the main reasons for your hesitation? (Select all that apply)

#	Field		Choice Count
1	Lack of trust in technology	8.47%	5
2	Concerns about privacy and security	8.47%	5
3	Limited access to AR/VR devices	32.20%	19
4	Lack of understanding of how to use AR/VR	16.95%	10
5	Prefer traditional property viewing methods (face-to-face meeting)	32.20%	19
6	Other (please specify)	1.69%	1
			59

Q9_6_TEXT - Other (please specify)

Other (please specify)
I use ar/vr daily as I work in the IT sector. The issue with Ar/VR is that it's highly expensive and the software is generally bespoke and therefore extremely expensive. So it's impossible for regular businesses to use these AR/VR methods

Q10 - Please provide any additional comments or suggestions regarding the use of AR/VR technologies in the real estate industry.

Please provide any additional comments or suggestions regarding the use of...
Construction workers using robots for dangerous maneuvers
Might have implications for reducing carbon footprint of real estate
Although AR/VR is really useful and helpful I do still think you should visit the property in person if possible
It would have to work very seamlessly and be good quality, otherwise it's not better than photos or a video
It would be a good at home tool