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The Impact of Interactive Digital Visualization Tools on Purchase Intention of Home Buyers

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Real Estate Marketing, Virtual tours, Cosumer Decision making, Purchase Intention, Customer Engagement, AR/VR.

ABSTRACT

The adoption of virtual tours for real estate marketing gained momentum during the pandemic. This study highlights the impact of virtual tours in real estate marketing in influencing Consumer decision making related to purchase. Based on the responses of the potential home buyers who were exposed to the virtual tours, the effectiveness of the virtual tour related to product knowledge, quality aspects and purchase intention was captured through a survey. Although the virtual interactivity significantly enhances understanding and engagement, it alone is insufficient for final purchase decisions; particularly among first-time and low-budget buyers who prefer physical site visits for assurance. The study also finds a strong correlation between virtual interactivity and purchase intention in mid to high-budget segments. Two-way communication and neighbourhood simulation were identified as features that can significantly improve VR's effectiveness. This technology has the potential to change the traditional customer journey of real estate sector and also reach out to wider base of customers like NRIs through e-commerce or digital platforms.

1. INTRODUCTION

In recent years, the usage of digital technologies aided by virtual reality (VR) and augmented reality (AR) has increased in the real estate market. With these interactive digital tools, real estate marketing has adopted different types of interactive virtual tours of the property to reach out to the customers. These digital technologies are now widely being used across various real estate projects enabling the consumers to digitally engage with the future environment, allowing them to make smarter decisions and change the future of home buying.

Technologies based on Artificial reality (AR) and Virtual Reality (VR) have been widely used in various industries primarily for product design and testing. Interactive digital technologies have also been used in various fields of sales and marketing for quite some time. These tools were used in e-commerce, interior designing, medical demonstrations, etc. The pandemic brought in the adoption of these technology to a large extent in the domain of real estate marketing.

Digital visualization tools can be used as an interactive tool in the marketing environment due to its ability to merge virtual components such as images and information with real time physical environment. This in turn creates a strong connect between the consumers and product finally making users purchase them. Some of the major sectors in which digital tools like AR/VR have started playing an important role in marketing are beauty, healthcare, tourism, and real estate. The most used interactive digital visualization application is Ikea which not only gives uses a wide range of products but also allows user to place the digital furniture around your home thus making visualization and purchase intention much stronger. Other example is Sephora that allows users to see how they look after applying certain beauty products. In the recent past companies such as TOMS shoes and Oreo have been able to maximize their product sale with the help of these visualization tools in marketing the product. According to them it creates an emotional connect with consumers and turns the purchase journey into enjoyment. The major areas of application of these technology in the domain journey of a home buyer is listed below.

- Property Selection: Many real estate companies are providing virtual walkthrough for smart phone users using VR headsets. With the help of this technology, consumers are fully immersed in the environment and get a better visualization of their future properties thus making their buying decision easy.

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- Locality or neighbourhood identification: AR apps would enable users to determine the locality where they would purchase their property. It helps buyer to link their basic need from the locality (for example office, commercial buildings and transportation facility) with the property. Here virtual bike tours also play an important role.
- Interior design: Furniture, home decor, and other settings in a home can be visualised using VR/AR-based mobile apps. They can be configured to apply virtual styling capabilities to real-time physical spaces in order to convince the purchasers to make a more confident and quick decision.
- Virtual walkthrough supported by agent: VR tours aided with agent either live or pre-recorded make the experience much better. It creates an interactive environment and user gets completely engaged in the process.

The association of interactive digital tools in developing customer purchase behaviour is the most highlighted element of this study. The aim of this study is to improve the data driven strategy based on statistical outputs that may in turn be used to make the interactive technologies for customer purchase more efficient. Based on current market scenario, both aspects Real estate management and Marketing have a need for further research and study

2. LITERATURE REVIEW

There exists very limited literature which highlights the impact of interactive technology on the purchase decision of home buyers. However, a few studies highlighted its adoption in other industries. Along with that we tried to identify the various factors which play an important role in the purchase intention of the consumers from the literature.

Sihi (2018) and Azmi et al. (2021) studied the impact of VR tools on purchase intention of homebuyer and observed that VR technology plays an important role in the alternate evaluation stage. Moreover, the main features that drive purchase intention were found to be pleasure, homebuyer's emotion and consumer behavior. According to ***Sihi (2018)***, people will prefer real estate agents with this feature.

Bleize & Atheunis (2017); Juan et al. (2018) and Lin et al. (2018) are of the view that attitude of buyers, cost of use and usefulness of the VR system are important parameters while developing an effective interactive digital visualization tool. Moreover, the level of immersion the VR can generate among users plays a key role in driving purchase intention. According to ***Bleize & Atheunis (2017)*** social influence impact purchase in case of low value purchase but the impact of this factor with respect to the high-level purchase is yet to be studied. According to ***Lin et al. (2018)*** the content of VR was associated with VR experience. ***Lee et al. (2018)*** found that authentic experience is directly proportional to cognitive and affective response i.e. enjoyment and emotional involvement. To take a step further ***Wang et al. (2021)*** identified that behavioural control and cognitive control acts as mediators between VR and consumer behaviour. Further interactivity was found to have positive impact on cognitive control but negative impact on behavioural control.

Delgedo et al. (2020) and Poushneh(2021) are of the opinion that in order to increase stakeholders engagement the VR should have features such as neighbourhood experience and two-way communication but there are very limited papers studying its impact on purchase intention. To add to this VR system with perceived feedback mechanism will enable users to make a better-informed decision.

The insights from the literature is summarized in Table 1 below.

Table 1: Literature Support on the impact of interactive digital technology on purchase decision across industries

Sl. No	Study	Product	Sub Area	Impact	Key Factor
1	Sahi (2018)	Real Estate	Information search	Positive	Interactivity, higher on search engine
			Alternative evaluation	Positive	
			Staging process	Negative	
2	Azmi et al. (2021)	Real estate	-	Positive	Atmosphere quality
					Pleasure, consumer behaviour
3	Juan et al. (2018)	Real estate	Completed property	Positive	Ease of use Usefulness
			Uncompleted property	Low	

					User's intention and attitude Immersion interaction
4	Bleize and Atheunis (2017)	Beauty products	Ease of use	Positive	Consumer attitude towards product, consumption values and flow
			Purchase intention	Positive	
					Social influence Performance expectance Emotional connect
5	Pinsonneault et al. (2017)	Eyewear	-	Positive	Telepresence Flow Social presence Sense of control Attachment
6	Lee et al. (2018)	Destination booking	Realistic VR	Positive	Authentic experience attachment
			Unrealistic VR	Negative	
7	Wang et al. (2021)	Beauty products	Positive feedback	Positive	Vividness interactivity
			Negative feedback	Positive	
8	Delgedo et al. (2020)	Real estate	Stakeholder	Positive	User experience Inclusivity
9	Javorik (2017)	Retail shop	Two way Communication-in app missing	Negative	Immersive environment Social engagement
			Fully immersive environment	Positive	
10	Leung et al(2019)	Hotel	Purchase intention	Positive	Reduced distraction Brand attitude
			Brand awareness	Negative	
11	Lin et al.(2018)	Beauty products	Ease of use maximum	Positive	Ease of VR use Application content
			Minimum	Negative	
12	Poushneh(2021)	Retail shopping	Higher perceived proximity	Positive	Perceived proximity General proximity Feedback mechanisms
			Low	Negative	

13	Hiken et al .(2018)	Beauty product	-	Positive	Realistic experience Flow
14	Scholz and Duffy(2018)	Furniture	Utilitarian VR environment	Positive	Relaxing atmosphere Attachment Utilitarian nature
			No utilitarian	Low	
15	Patterson et al.(2018)	Real estate locality	-	Negative	Neighbourhood experience Consumer segmentation
16	Nahdi et al.(2016)	Real estate	Strong behavioural factor	Positive	Attitude Social influence
			Weak	Negative	
17	Kamil et al.(2021)	Home interior decor	-	Positive	User friendliness Realistic visualization
18	Alaseeri et al. (2020)	Real estate	Low age groups	Positive	Visualization High graphical quality
			Old age groups	Negative	
19	Ozacar et al .(2017)	Interior architecture		Positive	User friendly interaction

3. RESEARCH METHODOLOGY

3.1 RESEARCH QUESTIONS

Based on the study of literature review, the key factors and their impact on the virtual experience are found out.

Based on these key factors, main research questions have been formed. These questions are :

1) Is there any impact of virtual experience on product knowledge?
2) Is there any influence of quality of virtual tool on the virtual experience?
3) Does VR enable product knowledge has its influence on the purchase decision?
4) Is having a completely guided tour same as the traditional methods for influencing the purchase intention?
5) Can virtual experience help in shortlisting of properties over traditional methods?
6) Is there any influence of ease of use of virtual tour the purchase intention?

3.2 HYPOTHESES FORMULATION

Based on the literature review following research hypothesis are formed to answer the research questions:

1: The virtual interactivity has significant association with product knowledge

2: Quality of virtual tool has significant influence on the virtual experience.

3: Product knowledge has significant association with purchase decision.

4: Having a completely guided tour has significant influence on the purchase intention.

5: Virtual experience can help in shortlisting of properties.

6: Ease of use of virtual tour has significant influence on the purchase intention.

After the research questions are formed, the research hypothesis is formed and based on this research hypothesis, the statistical hypothesis is formed.

Hypothesis 1:

H_{1o} : There is no significant association between VR interactivity and product knowledge.

H_{1a} : There is significant association between VR interactivity and product knowledge.

Hypothesis 2:

H_{2o} : There is no significant association between product knowledge and purchase decision.

H_{2a} : There is significant association between product knowledge and purchase decision.

Hypothesis 3:

H_{3o} : Complete guided tour has no significant association with purchase intention.

H_{3a} : Complete guided tour has significant association with purchase intention.

Hypothesis 4:

H_{4o} : There is no significant association between VR authenticity and shortlisting of properties.

H_{4a} : There is significant association between VR authenticity and shortlisting of properties.

Hypothesis 5:

H_{5o} : Ease of use of virtual tour has no significant influence the purchase intention.

H_{5a} : Ease of use of virtual tour has significant influence the purchase intention.

Hypothesis 6:

H_{6o} : Quality of virtual tool has no significant influence on the VR experience.

H_{6a} : Quality of virtual tool has significant influence on the VR experience.

3.3 Questionnaire Design

The first section of the questionnaire consisted of both closed and open-ended questions that required general information such as name of respondent, age, profession. The prospective home buyers were inquired about their budget and preferred typology. The typologies were classified into three types:

1. Low Budget 1bhk Kolkata (0-0.5 cr),
2. Medium Budget 3 bhk Kolkata (50-1 cr),
3. High Budget 3bhk Kolkata (above 1 cr).

On the basis of the preferred typology, the respondents were embarked in an experiential virtual tour experience of the same. In the following section, the questionnaire was designed on a 5-point scale to study the influence or impact on the respondents of the virtual walkthrough tour experience.

Analytical Framework

To analyse the impact of the interactive technology on the respondents, chi square test and RII are the best suitable tools for the analysis.

Chi-Square Test

Chi-square test has two data samples coming from the same distribution. The chi-square test is based on binned data. The basic idea behind the chi-square test is that the observed number of points in each bin (this is scaled for unequal sample sized) should be similar if the two data samples come from common distributions.

Test Statistic: For the chi-square test, the data is divided into k bins and the test statistic is defined as

$$\chi^2 = \sum_{i=1}^{k} \frac{(K_1 R_i - K_2 S_i)^2}{R_i + S_i}$$

where the summation is for bin 1 to k,

R_i is the observed frequency for bin i for sample 1, and

S_i is the observed frequency for bin i for sample 2.

K_1 and K_2 are scaling constants that are used to adjust for unequal sample sizes.

$$K_1 = \sqrt{\frac{\sum_{i=1}^{k} S_i}{\sum_{i=1}^{k} R_i}}$$

$$K_2 = \sqrt{\frac{\sum_{i=1}^{k} R_i}{\sum_{i=1}^{k} S_i}}$$

Significance Level: α = 0.01, 0.05, 0.1 based on the confidence levels of 99%, 95%, 90% respectively.

Example - For hypothesis 1, hypothesis testing is done between VR interaction and product knowledge. The parameters that are considered are Budget of purchase, interactivity of the VR tool and product knowledge. Then the Chi Square test is conducted to get the required result of hypothesis testing.

Similarly, the remaining hypotheses are also tested using Chi Square test and the final observations and conclusions are made on the key parameters of designing the virtual tool and its impact on the purchase intention of home buyers in the next chapter.

Cramer's V coefficient was used to compare chi square test statistics across contingency tables. Since, it is unaffected by sample size, it is highly useful in instances when a statistically significant chi-square is suspected to be the consequence of a large sample size rather than any substantial link between the variables. It is understood as a measure of the relative (strength) of two variables' associations. The coefficient has a value between 0 and 1. (perfect association). In practice, a Cramer's V of.10 may be an acceptable minimum threshold for indicating a significant link between two variables.

$$V = \sqrt{\frac{\chi^2}{n(q-1)}}$$

Where**,** q = smaller value of rows or columns

Relative Importance Index

RII, Relative Importance Index, is the mean for a factor which gives it weight in the perceptions of respondents. The factor with the highest weight has RII = 1, while the next factor with lower weight has RII = 2, and so on.

$$\frac{\Sigma w}{AN} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{5N}$$

Where w is the weighting given to each factor by the respondent, ranging from 1 to 5.

For example, n_1 = number of respondents for less important

n_2 = number of respondents for some important

n_3 = number of respondents for quite important

n_4 = number of respondents for important

n_5 = number of respondents for very important

A is the highest weight (i.e., 5 in this study) and N is the total number of respondents. The relative important index ranges from 0 to 1.

4. ANALYSIS AND RESULTS

The demographic details of the respondents to the form are taken in account. These respondents were given three variations in budget and based on their response; their respective property VR experience was provided. All the responses were taken into consideration as mentioned in the Appendix III for the data interpretation and analysis.

4.1Observations

It was observed that majority of the respondents expressed their interest in a virtual walkthrough at the upcoming phase of the project since that it would be easy for the potential buyer to imagine the layout and interiors of the property with the help of virtual tour. The respondents were of the opinion that virtual tours helped in saving time, provided better visualization and

product knowledge. It was also observed that given an option, majority of the potential buyers would prefer virtual tours over traditional site visits for viewing and shortlisting of the real estate properties. Additionally, almost all respondents felt that there would be better understanding of the property with a complete guided tour. Further, it was observed that all the potential buyers or respondents would want to have a virtual experience of the guided tour in the neighbourhood area of the property as it would give them a better idea of the exact location and accessibility of the property and the basic amenities surrounding it which would let them shortlist the property based on their neighbourhood requirements.

4.2. Analysis

4.2.1 Hypothesis 1

H_{1o} : There is no significant association between VR interactivity and product knowledge.

H_{1a} : There is significant association between VR interactivity and product knowledge.

Table 4.1: Crosstabulation of Interactivity & Product knowledge with respect to Budget for purchase

Budget	Interactivity	Product knowledge					Pearson's Chi Square Significance
		No	Barely	Moderately	Highly	Extremely	
Upto 0.5 cr	No	1	0	1	1	0	<.001***
	Barely	0	1	0	0	0	
	Moderately	0	0	3	1	0	
	Highly	0	0	3	2	2	
	Extremely	0	0	0	2	7	
	Total	1	1	7	6	9	
	Cramer's V					.675	
0.5-1cr	No	0	0	0	0	0	.001***
	Barely	0	0	1	0	0	
	Moderately	0	1	15	10	0	
	Highly	1	0	13	33	10	
	Extremely	0	0	1	9	9	
	Total	1	1	30	52	19	
	Cramer's V					.326	

Above 1 cr	**No**	1	0	0	0	0	
	Barely	0	0	0	0	0	
	Moderately	1	0	2	1	3	
	Highly	0	1	4	16	4	**<.001*****
	Extremely	0	0	0	11	7	
	Total	2	1	6	28	14	
	Cramer's V					**.502**	

The chi square test is done for the hypothesis 1 as per the data in Appendix IV and the following observations can be deduced from the results shown in the table above. We analyzed the impact of VR interactivity and Product Knowledge categorized into three strata based on the preferred budget of the potential customers. Based on the chi square test of association, we can reject the null hypothesis H_{1o} at 99% level of confidence and infer the existence of a significant association between VR interactivity and product knowledge. Further based on Cramer's V values, we can infer a strong association across all the three budget categories.

4.2.2 Hypothesis 2

H_{2o} : There is no significant association between product knowledge and purchase decision.

H_{2a} : There is significant association between product knowledge and purchase decision.

Table 4.2: Crosstabulation of Product knowledge & Purchase decision with respect to Budget for purchase

Budget	**Product Knowledge**	**Purchase Decision**			**Pearson's Chi Square Significance**
		No	**Maybe**	**Yes**	
Upto 0.5 cr	**No**	1	0	0	**.713**
	Barely	1	0	0	
	Moderately	3	3	1	
	Highly	2	3	1	
	Extremely	7	1	1	
	Total	14	7	3	
	Cramer's V			**.136**	
	No	1	0	0	**.014****

0.5-1cr	**Barely**	1	0	0	
	Moderately	11	9	10	
	Highly	12	16	24	
	Extremely	14	1	4	
	Total	39	26	38	
	Cramer's V			**.306**	
Above 1 cr	**No**	1	1	0	**.044****
	Barely	0	1	0	
	Moderately	4	1	1	
	Highly	11	2	15	
	Extremely	9	1	4	
	Total	25	6	20	
	Cramer's V			**.395**	

The chi square test is done for the hypothesis 2 as per the data in Appendix IV and the following observations can be deduced from the results shown in the table above. We analyzed the impact of Product Knowledge and Purchase Decision. Based on the chi square test of association, for the stratum upto 0.5 crores we failed to reject the null hypothesis H_{2o} and infer that there is no significant association between product knowledge and purchase decision and for the other two strata above 0.5 crores we can reject null hypothesis H_{2o} at 95% level of confidence and infer the existence of a significant association between product knowledge and purchase decision. Further based on Cramer's V values, we can infer a weak association in the lower budget category and strong association in the higher budget categories.

4.2.3 Hypothesis 3

H_{3o} : Complete guided tour has no significant association with purchase intention.

H_{3a} : Complete guided tour has significant association with purchase intention.

Table 4.3: Crosstabulation of Guided Tour & Purchase Intention with respect to Budget for purchase

Budget	**Guided Tour**	**Purchase Intention**					**Pearson's Chi Square Significance**
		No	**Barely**	**Moderately**	**Highly**	**Extremely**	
	No	1	0	0	0	1	

Upto 0.5 cr	**Barely**	0	0	0	0	0	**.049****
	Moderately	2	0	1	0	0	
	Highly	0	0	2	2	0	
	Extremely	6	5	2	0	2	
	Total	9	5	5	2	3	
	Cramer's V					**.541**	
0.5-1cr	**No**	1	0	0	0	0	**<.001*****
	Barely	0	0	1	0	0	
	Moderately	2	0	17	5	0	
	Highly	3	3	8	28	0	
	Extremely	16	5	5	5	4	
	Total	22	8	31	38	4	
	Cramer's V					**.405**	
Above 1 cr	**No**	0	0	0	0	0	**.076***
	Barely	0	0	0	0	0	
	Moderately	1	0	1	0	0	
	Highly	4	3	6	8	3	
	Extremely	11	2	1	3	8	
	Total	16	5	8	11	11	
	Cramer's V					**.374**	

The chi square test is done for the hypothesis 3 as per the data in Appendix IV and the following observations can be deduced from the results shown in the table above. We analyzed the impact of Guided Tour and Purchase intention. Based on the chi square test of association, for all three strata we can reject the null hypothesis H_{3o} at 95%, 99%, 90% level of confidence

respectively and infer the existence of a significant association between Complete Guided Tour and Purchase Intention. Further based on Cramer's V values, we can infer a strong association across all the three budget categories.

4.2.4 Hypothesis 4

H_{4o} : There is no significant association between VR authenticity and shortlisting of properties.

H_{4a} : There is significant association between VR authenticity and shortlisting of properties.

Table 4.4: Crosstabulation of VR Authenticity & Shortlisting of Properties with respect to Budget for purchase

Budget	VR Authenticity	Shortlisting of Properties					Pearson's Chi Square Significance
		No	Barely	Moderately	Highly	Extremely	
Upto 0.5 cr	No	0	0	0	0	0	.005***
	Barely	0	1	0	0	0	
	Moderately	0	1	5	1	1	
	Highly	0	0	2	2	2	
	Extremely	0	0	0	2	7	
	Total	0	2	7	5	10	
	Cramer's V					.570	
0.5-1cr	No	0	0	0	0	0	<.001***
	Barely	1	0	0	1	0	
	Moderately	1	3	13	13	0	
	Highly	1	0	12	29	5	
	Extremely	0	0	3	9	12	
	Total	3	3	28	52	17	
	Cramer's V					.416	
	No	0	0	0	0	0	
	Barely	0	0	0	0	0	

Above 1 cr	**Moderately**	1	1	2	3	1	**.003*****
	Highly	0	0	4	15	3	
	Extremely	0	0	0	10	11	
	Total	1	1	6	28	15	
	Cramer's V					**.474**	

The chi square test is done for the hypothesis 4 as per the data in Appendix IV and the following observations can be deduced from the results shown in the table above. We analyzed the impact of VR Authenticity and Shortlisting of Properties. Based on the chi square test of association, we can reject the null hypothesis H_{4o} at 99% level of confidence and infer the existence of a significant association between VR Authenticity and Shortlisting of Properties. Further based on Cramer's V values, we can infer a strong association across all the three budget categories.

4.2.5 Hypothesis 5

H_{5o} : Ease of use of virtual tour has no significant influence the purchase intention.

H_{5a} : Ease of use of virtual tour has significant influence the purchase intention.

Table 4.5: Crosstabulation of Comfort level & Purchase Intention with respect to Budget for purchase

Budget	**Comfort level**	**Purchase Intention**					**Pearson's Chi Square Significance**
		No	**Barely**	**Moderately**	**Highly**	**Extremely**	
Upto 0.5 cr	**No**	0	0	0	0	0	**.029****
	Barely	0	0	0	0	0	
	Moderately	0	2	3	2	0	
	Highly	0	0	2	3	5	
	Extremely	0	0	0	1	6	
	Total	0	2	5	6	11	
	Cramer's V					**.542**	
	No	0	0	0	0	0	
	Barely	0	0	1	0	0	

0.5-1cr	**Moderately**	0	3	15	6	0	**<.001*****
	Highly	0	0	11	47	16	
	Extremely	0	0	0	2	2	
	Total	0	3	27	55	18	
	Cramer's V					**.368**	
Above 1 cr	**No**	0	0	0	1	1	**.030****
	Barely	0	0	0	0	0	
	Moderately	0	0	3	3	2	
	Highly	0	0	1	17	15	
	Extremely	1	0	0	2	5	
	Total	1	0	4	23	23	
	Cramer's V					**.348**	

The chi square test is done for the hypothesis 5 as per the data in Appendix IV and the following observations can be deduced from the results shown in the table above. We analyzed the impact of Ease of use/Comfort level and Purchase Intention. Based on the chi square test of association, we can reject the null hypothesis H_{5o} at 95% level of confidence for lowest and highest strata and we can reject the null hypothesis H_{5o} at 99% level of confidence for mid-level strata and infer the existence of a significant association between Ease of use/Comfort level and Purchase Intention. Further based on Cramer's V values, we can infer a strong association across all the three budget categories.

4.2.6 Hypothesis 6

H_{6o} : Quality of virtual tool has no significant influence on the VR experience.

H_{6a} : Quality of virtual tool has significant influence on the VR experience.

Table 4.6: Crosstabulation of VR Experience & Interactivity with respect to Budget for purchase

Budget	**VR Experience**	**Interactivity**					**Pearson's Chi Square Significance**
		No	**Barely**	**Moderately**	**Highly**	**Extremely**	
	No	0	0	0	0	0	
	Barely	0	0	0	1	0	

Upto 0.5 cr	**Moderately**	2	1	3	2	0	**.013****
	Highly	0	0	1	4	1	
	Extremely	1	0	0	0	8	
	Total	3	1	4	7	9	
	Cramer's V					**.593**	
0.5-1cr	**No**	0	0	0	0	0	**<.001*****
	Barely	0	1	1	0	0	
	Moderately	0	0	20	8	2	
	Highly	0	0	4	41	2	
	Extremely	0	0	1	8	15	
	Total	0	1	26	57	19	
	Cramer's V					**.649**	
Above 1 cr	**No**	0	0	0	0	0	**<.001*****
	Barely	0	0	0	0	0	
	Moderately	1	0	3	4	0	
	Highly	0	0	2	16	4	
	Extremely	0	0	2	5	14	
	Total	1	0	7	25	18	
	Cramer's V					**.495**	

The chi square test is done for the hypothesis 6 as per the data in Appendix IV and the following observations can be deduced from the results shown in the table above. We analyzed the impact of VR Experience and Quality of virtual tour /Interactivity. Based on the chi square test of association, we can reject the null hypothesis H_{6o} at 95% level of confidence for lowest budget strata and 99% level of confidence for the other two strata and infer the existence of a significant association between VR Experience and Quality of virtual tour. Further based on Cramer's V values, we can infer a strong association across all the three budget categories.

4.3 Relative Importance Index Analysis

Based on the literature review, the key elements involved in designing an effective interactive tool was listed. Furthermore, to study the priority of each of these factors with respect to the quality of the VR system, a RII analysis was conducted based on the responses received through questionnaire as mentioned in the Appendix V. The results of the test shown in the table above indicates that neighbourhood experience and guided tour with two-way communication are the topmost parameters. The very minimal difference between all six parameters shows that all the parameters are considerably significant.

Table Relative Importance Index Analysis

FACTORS	No (1)	Barely (2)	Moderately (3)	Highly (4)	Extremely (5)	Total	N	A*N	RII	Rank
Comfort level	2	2	117	468	95	684	178	890	0.77	**6**
Knowledge	4	6	129	344	210	693	178	890	0.78	**5**
Authentic Experience	0	6	138	300	270	714	178	890	0.80	**3**
Interactivity	4	4	111	356	230	705	178	890	0.79	**4**
Guided Tour	3	2	87	280	375	747	178	890	0.84	**2**
Neighbourhood Experience	0	6	84	272	395	757	178	890	0.85	**1**

Based on the results obtained through these analyses we can draw certain trends that leads to the purchase intention of the potential customers and their opinions on the interactive tools. These findings provide a deeper insight about the effectiveness of the interactive digital technologies in moulding the purchase behaviour of home buyers.

5. DISCUSSIONS AND IMPLICATIONS

In the Indian context, most of the prevailing digital visualization tools do not provide a complete guided tour with neighbourhood experience. As per the inference of the literature review, it is found that two-way communication enabled tool plays an important factor in the success of VR. From the data collected, RII test has been done to see the importance of the factors or priority of the factors to be followed for better view of the property. From this analysis it is implied that the guided tour is one of the important factors that influence the purchase decisions. However, from the RII analysis it is also implied that the neighbourhood experience is also essential for the home buyers as it would be easy to know the surroundings of the property and this feature would increase the purchase intention or shortlisting intention of the purchasers.

Post pandemic, the need for an alternative technology to view and shortlist the real estate properties was felt much more in real estate marketing as it was difficult for people to shortlist the properties based on their requirement and it was a time taking process. From the responses received, it can be interpreted that the advantages like Time saving, better product knowledge and easier visualization, together accounts for the advantages of the virtual tour over traditional visits. Here we can stress on the point that interactive tool plays a prominent role in shortlisting the properties. However, the virtual tours cannot be the sole criteria for making the purchase decision as per the respondents' view. This scenario can be improved by making the virtual tour more interactive and realistic.

It can be concluded that even though there are budget variations, the whole experience was presented in more realistic way such that the VR interactivity helped potential buyers to get better knowledge on the property and gave them the sense of presence and attachment to it.

Usually in the low budget properties, the area is less. So, purchasers would want to be physically present to visualize the properties and enhance the product knowledge besides verifying that it can meet all their needs. Apart from this usually the buyers in the low range are mostly the first-time buyers. As they are new to the real estate market, they are not completely aware of the technologies and cannot trust it completely. It will take a site visit for them to get proper assurance of the

property. In addition to this, the VR quality is a little low for the low budget properties which makes it difficult for the buyers to get proper knowledge on the property. Thus, it can be concluded that although there was a significant association between VR interactivity and product knowledge among all the three categories, the product knowledge still has no association with purchase intention in low categories and very strong association in the might and high range strata.

Further, from our study it can be inferred that most of the VR tools prevailing in the market do not have enhanced features such as two way communication (guided tour) and realistic neighbourhood experience but on the basis of our results we have found that most of the respondents want these features in their VR experience added that this will also highly influence their purchase decision since it has the ability to make the visuals immersive and attached to the potential buyers.

Overall, it is implied that interactive tools help the potential buyers to understand the property while generating purchase intention by providing guided tour and neighbourhood experience, but it cannot be the sole reason for purchase decision making. Even if customers may not be completely comfortable in using these VR platforms owing to the high investment associated with this decision, these tools will definitely help consumers in shortlisting the properties. The interactivity and realistic nature of the virtual too will also aid the NRI investors to make quick and better purchase decisions and this action will also have significant impact on the global reach of the real estate sector since the total addressable market becomes larger. In the long run, these technological adoptions may even bring in real estate sector to e-commerce platforms.

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