



The Use of Virtual Reality for the Real Estate and Hospitality Industries

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Introduction

- For entrepreneurs and small businesses, technology is one way to gain competitive advantages.
- Virtual reality (VR), artificial intelligence (AI), business analytics, electronic vehicles are examples of these popular technologies right now.

What is Virtual Reality?

- It is a “simulated experience that can be similar to or completely different from the real world.”
- [www.entrepreneur.com](https://www.entrepreneur.com/science-technology/12-amazing-uses-of-virtual-reality/281073) lists 12 amazing uses of virtual reality.



<https://www.entrepreneur.com/science-technology/12-amazing-uses-of-virtual-reality/281073>



Virtual Reality in Real Estate/Hospitality Industries

- A customer can wear a headset and feels that he is in a real environment.
- It allows customer to narrow down the right real estate properties he wanted.
- VR can help a customer make a hotel reservation.
- A gaming-like feature can be added to the virtual reality so that he can interact with the simulated system to know what he expects.
- Combined with AI, VR will have a significant value not only to marketing but also to employee training.

Virtual Realty Home Tour



Source: <https://visengine.com/virtual-reality-for-real-estate/>



The Purpose of this Research

- The research is to build a virtual reality marketing and training system for the real estate and hospitality industries (VRMTS-RH).
- Explore the effectiveness and efficiency use of virtual realty for real estate and hospitality industries.



Literature Review

- There is moderate discussion of virtual reality in literature but VR applications in marketing in real estate or hospitality industries are rare.
- There are a lot of discussion of virtual reality in teaching/training but there are only a few related to employee training in real estate and hospitality industries.
- In addition, the combination of AI and VR for data analytics is an emerging area for entrepreneurship practices.
- =====
- 12 Amazing Uses of Virtual Reality, <https://www.entrepreneur.com/science-technology/12-amazing-uses-of-virtual-reality/281073>
- Hu-Au* & Lee (2018), Virtual reality in education: a tool for learning in the experience age
- Surf Inc., (2017), Demonstrating network function virtualization (NFV) with virtual reality

Objectives

This research has the following objectives:

- Compare the performance of different use of marketing/training media
 - 1. Picture (such as a printed picture in the web or paper ad)
 - 2. Video
 - 3. Virtual Realty with 360 degree
- Explore the use of VR in Real Estate/Hospitality Industries:
 - A 360-degree camera will be used to capture instruction by the instructor and graduate assistants.
 - A headset will be used by a student/customer to view the video created by 360-degree camera.
 - A sample of an interactive VR gaming system for instruction will be developed will be built to train employees.
 - Explore VR for other business applications.



Virtual Reality Marketing and Training system (VRMTS-RH) Model Building

- The VRMTS systems, which will be developed and implemented by the investigator, is a virtually reality infrastructure that helps customers in real estate and hospitality industries in
 - 1) View real estate properties/motels before purchasing/reserve them
 - 2) Create game-like features for interaction with customers

Equipment to Building VR Systems:

○ VR Headsets:

- **Meta Quest 2** (initially sold as **Oculus Quest 2**) is a **virtual reality (VR) headset** developed by **Meta Platforms** (formerly Facebook, Inc.).
- It was released in October 2020.
- IT is standalone. It does not require PC.



○ 3D Camera:

Hardware

- A Powerful Gaming PC was used to develop the VR systems with the following Graphic Cards:
 - The minimum requirements for the graphics card are an NVIDIA GeForce GTX 1070Ti or an AMD Radeon RX Vega 64.
 - Meta (Oculus) Quest 2: a standalone VR headset that doesn't require a gaming PC.



Computer for the VR Project



Traditional Marketing Methods

Picture in the Ad





The difference between 360 degree's Video and Video

- The 360 degree's Video cannot be viewed on a normal computer.
- You must use the VR headset to view 360 degree's Video.



360 Video

- See the video show if we have time.



Hypotheses

- H1: There is no difference in end user's performance among different methods: picture, video, and video with 360 in satisfaction in end users.
- H2: There is no difference in end user's performance between VR method and traditional marketing method (picture) in satisfaction in end users.
- H3: There is no difference in end user's performance between VR with 360 degree's Video and traditional method (picture) systems in satisfaction in end users.
- H4: There is no difference in performance between Video with 360 degree in VR and Video without 360 in the VR.



Experiment Design

- Compare three different methods:
 - A) Picture
 - B) Video in the VR set
 - C) Video 360 in the VR set
- Sample:
 - 30 students (for training) from IS 350/650, IS 427/627, and IS 380/645.
 - Students are asked to watch VR both in Video and 360 Video for 25 minutes and then answer the questionnaire.

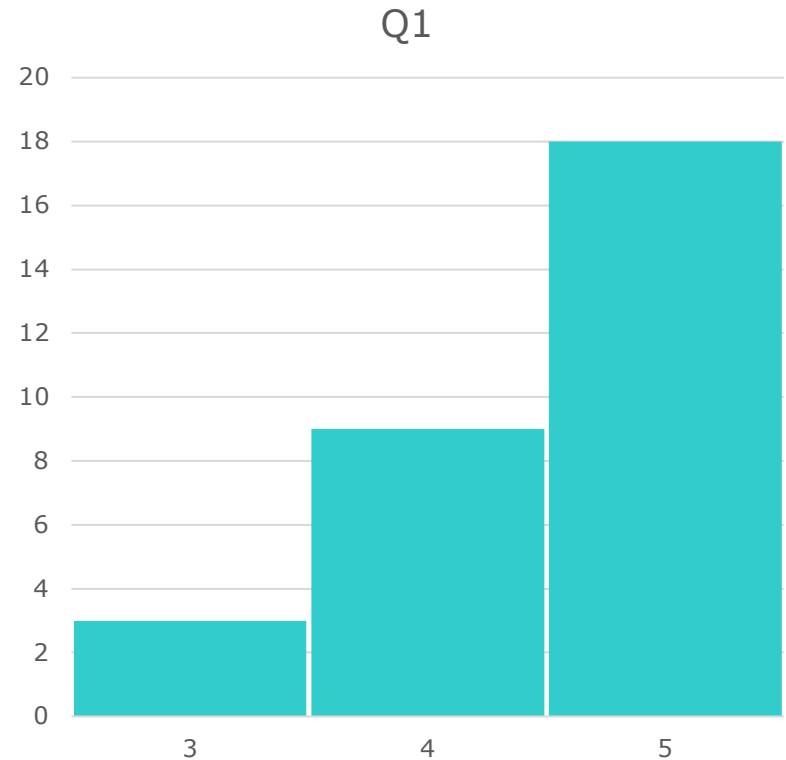


Experimental Results

Response for Q1

Virtual Reality (VR) video is a better choice than a picture for showing a hotel or a real estate property so that what you see is close to a real environment.

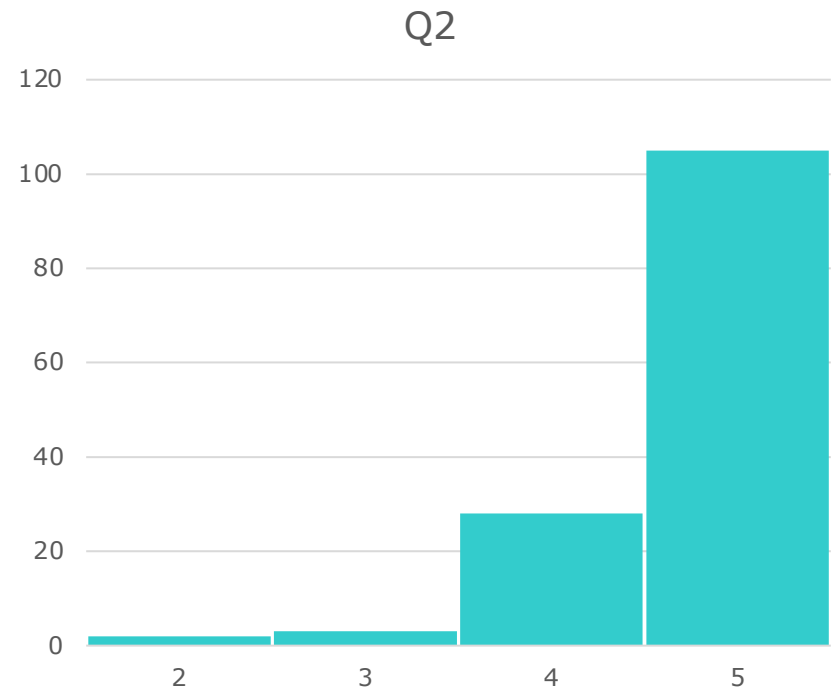
- 5 Strong Agree
- 4 Agree
- 3 Neutral
- 2 Disagree
- 1 Strong Disagree



Response for Q2

Virtual Reality (VR) with 360 degrees is a better choice than a Virtual Reality (VR) without 360 degrees for showing a hotel or a real estate property so that what you see is close to a real environment.

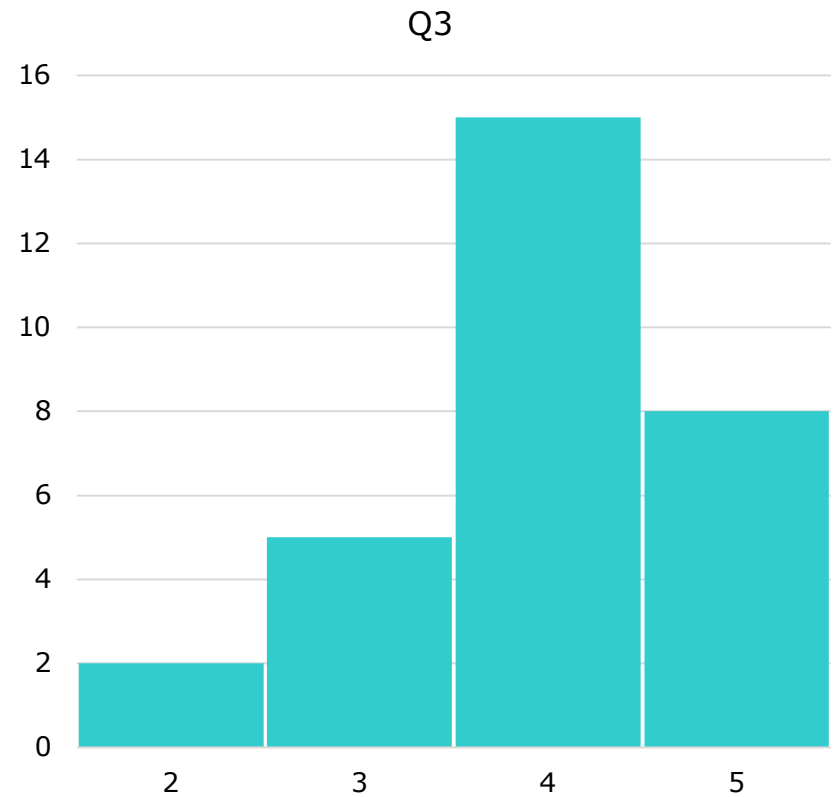
5 Strong Agree
4 Agree
3 Neutral
2 Disagree
1 Strong Disagree



Q3

The VR device is easy to use.

- 5 Strong Agree
- 4 Agree
- 3 Neutral
- 2 Disagree
- 1 Strong Disagree



Q4-a

For three different ways to view a hotel or a real estate property. Provide a score for each method:

Picture

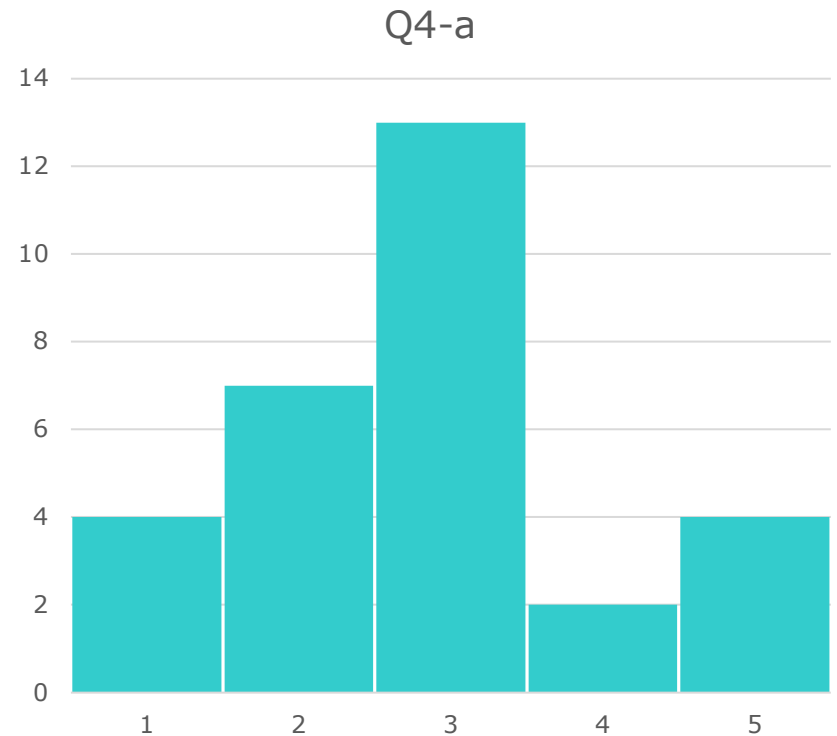
5 Best

4

3

2

1 Worse



Q4-b

For three different ways to view a hotel or a real estate property. Provide a score for each method:

VR without 360

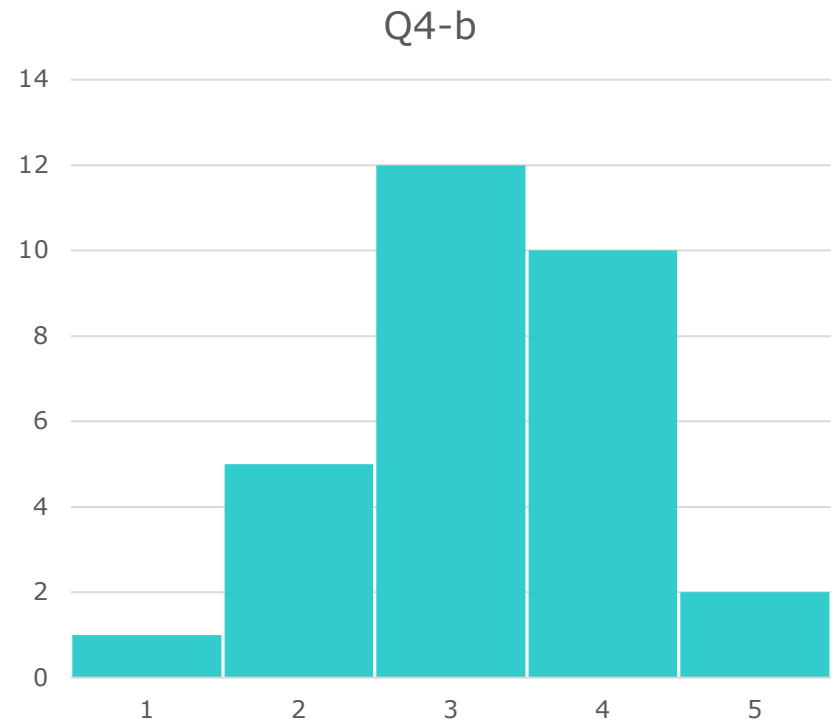
5 Best

4

3

2

1 Worse



Q4-c

For three different ways to view a hotel or a real estate property. Provide a score for each method:

VR with 360

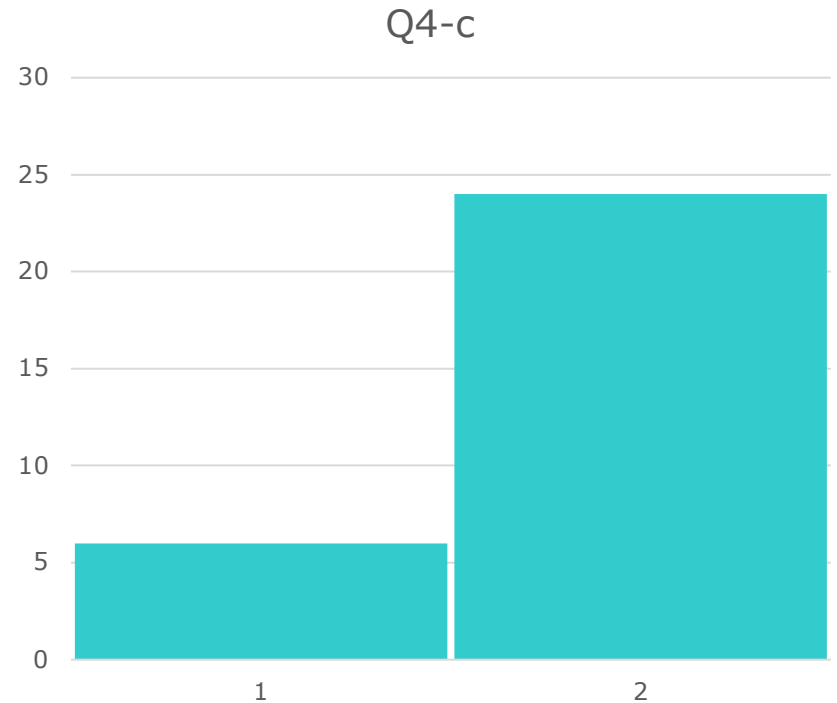
5 Best

4

3

2

1 Worse



Q5

I have VR experience before.

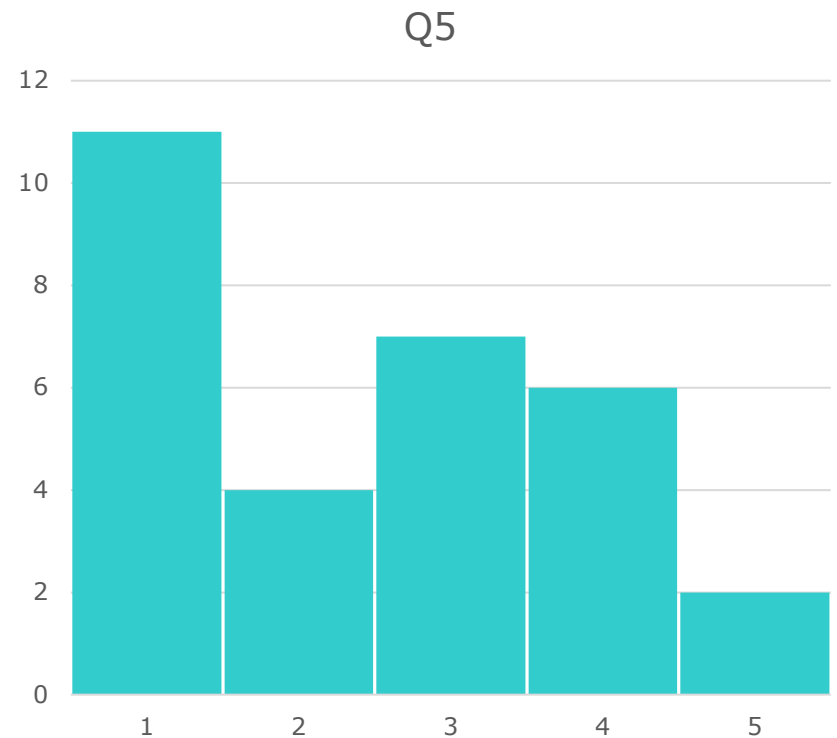
5 Play a VR device very often

4

3

2

1 Never use a VR device before



ANOVA test

```
              Df Sum Sq Mean Sq F value    Pr(>F)
x              2  60.71   30.356    36.68 3.55e-12 ***
Residuals     84   69.52    0.828
---
signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

ANOVA test

▼ result	list [13] (S3: aov, lm)	List of length 13
▶ coefficients	double [3]	4.79 -1.93 -1.55
▶ residuals	double [87]	-1.862 -1.862 -1.862 0.138 0.138 2.138 ...
▶ effects	double [87]	-33.879 5.079 -5.909 0.521 0.521 2.521 ...
rank	integer [1]	3
▶ fitted.values	double [87]	2.86 2.86 2.86 2.86 2.86 2.86 ...
assign	integer [3]	0 1 1
▶ qr	list [5] (S3: qr)	List of length 5
df.residual	integer [1]	84
▶ contrasts	list [1]	List of length 1
▶ xlevels	list [1]	List of length 1
▶ call	language	aov(formula = y ~ x, data = data2)
▶ terms	formula	y ~ x
▶ model	list [87 x 2] (S3: data.frame)	A data.frame with 87 rows and 2 columns

T-test Picture & VR without 360

Paired t-test

```
data: data$Q4Pic and data$Q4video
t = -1.2495, df = 28, p-value = 0.2218
alternative hypothesis: true mean difference is not equal to 0
95 percent confidence interval:
 -1.001137  0.242516
sample estimates:
mean difference
 -0.3793103
```

T-test Picture & VR with 360 Video

Paired t-test

```
data: data$Q4Pic and data$`Q4-360V`  
t = -7.9538, df = 28, p-value = 1.159e-08  
alternative hypothesis: true mean difference is not equal to 0  
95 percent confidence interval:  
 -2.428352 -1.433717  
sample estimates:  
mean difference  
 -1.931034
```

T-test VR with 360 & VR without 360

Paired t-test

```
data: data$Q4video and data$`Q4-360v`  
t = -8.8131, df = 28, p-value = 1.449e-09  
alternative hypothesis: true mean difference is not equal to 0  
95 percent confidence interval:  
 -1.912386 -1.191062  
sample estimates:  
mean difference  
 -1.551724
```



Conclusions

- 360 Video is clearly best than other choices. Video is the second choice. Picture is the last one.
- A small business should try to put a video into their web site.
- While VR set with 360 video is the best one, the implementation of VR should be improved and make it as user friendly as possible.



Question?