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Research Article

The Relationship Between Trust In Technology Measures (TTM) And System Usability Scale (SUS) In The Subjective Measures Of VR Products

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ABSTRACT

In various fields, like web shopping,e-health, and information systems trustand usability have been found to be linked. Technology trust is based on beliefs about a technology's characteristics. According to research, trust is a vital aspect in the success of various systems, such as e-markets, e-commerce, and social networks.The perceived utility of technology can help or hurt trust in it. As a result, a low level of usability may jeopardise a user's trust in their technology, which may cause a negative attitude toward the product. Although this link is critical in the areas mentioned above, empirical research on trust and usability in virtual reality is scarce.The purpose of this article is to present the first collection of statistics on the relationship between usability and trust in virtual reality. Three distinct virtual reality systems were employed to acquire this data: a CAVE, a desktop 3D application, and a flying simulator.The findings suggest that i) the most well-known survey for assessing trustand usability could be used to virtual reality, and (ii) There is a high correlation between people's satisfaction and trust in virtual reality usage, and (iii) there is a link betweentrustand usability for various systems.

Keywords: Usability; System usability scale;Trust;Virtual reality;Trust in technology measures

1. Introduction

Trust is a basic idea in daily life, influencing a variety of interactions ranging from interpersonal to group behaviour, economic to political. It is reasonable to believe that trust is required in any circumstance where people interact. As a result, many scholars have examined the idea of trust in several domains during the last few decades, including inter-organizational trust [1]. With the advancement of technology, the nature of engagement has shifted. Thus, in addition to interactions with human, numerous interactions happen between technologies and human, and trust is vital in this type of relationship as well. It is obvious that trust inhuman and trustintechnologies is not the same thing [2].Human-to-human trust is described as "a psychological condition characterised by a readiness to endure harm in exchange for the favourable consequence of another's behaviour purpose."Because technology has no "intention," this term cannot be used to trust in technology. As a result of this premise, some authors claim that only individuals can be trusted.Several scholars, on the other hand, argue that certain aspects of human-to-human trust can be applied to technology trust [3].By and large, trust in technology is viewed as a more complicated form of relationship than trust in people, owing to the fact that technologies may not provide users with the same level of confidence or assistance in completing tasks (e.g., paying for a service, filling out a form) that a human being can provide. [4].When it comes to technology, trust situations develop when one must put oneself in a vulnerable position by depending on another person or thing, regardless of that person's or object's will. However, in any interactive setting, confidence in technology, defined as a set of beliefs about how to utilise a product (in its functionality, reliability, and safety), is a critical component of a positive user-product interaction [5]. The use of personal data to purchase things on internet is a clear example of the necessity of confidence in technology. Furthermore, researchers have demonstrated that trust is a critical component in the development of technologies in a variety of sectors, including the choice to buy an onlineproduct.Trust,in the business-to-consumer sphere, directly impacts on dealer perception and an indirectly impacts on consumer intent to purchase.Simultaneously, researchers discovered that trust-building technological aspects [6] are more essential like relational trust in social networks.In terms of the definition of technological trust, it represents at least three basic ideas about a technology's characteristics: i) believe in the product's functionality, which refers to a technology's ability to accomplish specified tasks; (ii) belief in the technology's utility.(iii) Belief in the technology's reliability, resulting in the notion that it functions properly [7].Despite the fact that research on technology trust is increasing, there is still no defined framework of the factors that influence users' trust during interactions with various technologies. Several theories, however, have demonstrated that the perceived usefulness of a system can help or hurt trust in technology.In numerous fields, likeinformation systems,web retail, and e-health, a link between faith in technology and usability has been highlighted [8].Usability refers to an individual's ability to utilise a service with precision, efficacy, and satisfaction within a specific context of usage. Inadequate usability can jeopardise a user's interaction with a service, diminishing their faith in the functioning, dependability, and value of the technology.Despite the fact that there is a known link between usability and technology trust in HCI, there is currently no systematic work examining the link between usability and trust while dealing with virtual reality (VR) environments[9]. Virtual reality [10] is defined as an engagement in which a person is immersed in three-dimensional environment technological advances and is able to interact with it.VR systems are now widely used in a variety of contexts, including phobia therapy, pain reduction, and teaching. Nonetheless, these systems are very expensive, and many researchers are keenly verifying the functionality of their systems that they overlook issues like perceived trust and usability, which may be explored with standardised instruments.

The purpose of this study is to ascertain the most critical components of trust and to validate a model for measuring trust in the context of virtual reality use.The fundamental notion postulates that at least three significant factors impact VR trust: i) Acceptance (ii) Presence and (iii) Usability.

The objective of this study is to provide and discuss findings about the relationship between trust and usefulness in a range of virtual reality contexts [11]. Three virtual reality systems – a
Cave Automatic Virtual Environment (CAVE), a 3D Desktop tool, and a flight simulator – were examined using 25 volunteers – ten for the 3D Desktop, ten for the CAVE, and five for the simulator – to collect data.

The framework of trust is depicted in figure 1.

From the frame work,

Usability (u) is directly proportional to the trust (t) .ie)

$u\ \alpha\ t$ .... (1)

Presence (p) is directly proportional to the trust (t) .ie)

$p\ \alpha\ t$ .... (2)

Availability (a) is directly proportional to the trust (t) .ie)

$a\ \alpha\ t$ .... (3)

Usability

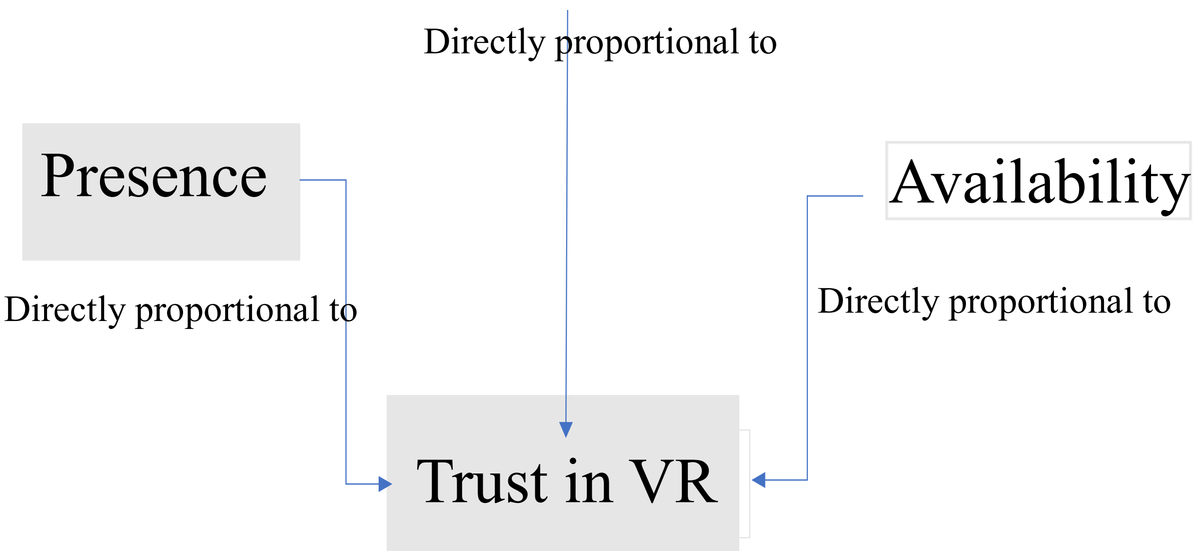

Figure 1: The framework of trust in virtual reality

2. Virtual reality:

Virtual reality (VR)[12]–[16]is a modern tech in development that includes software that provides graphics and sounds as close to the real world as possible. Virtual reality prioritises each user's visual perception in order to elicit strong imaginative responses to the software's moving images and sounds.Or, to put it another way, it's a portal or a gate into a new universe, a virtual world. Virtual reality is achieved by wearing a special device that is attached to the head, and then watching a show that is displayed inside a special gadget. Such instruments usually have a screen field of vision that is carefully tailored to our eyes so that we can see it clearly.VR technology has sparked a lot of research and development in the field of education, such as assisting teachers in teaching students about optical waves, teaching in medical classes, which gives medical interns a huge advantage when it comes to entering the field of medicine, and so on.Because the students are in the 3D domain, it is easier to teach anatomy to them so they are comfortable with it, which saves a lot of money on experimental materials. It is also easier to teach sign language more effectively because the students are in the 3D domain. It has also been employed in the development of driver skills for security verification test platforms using a learning vehicle simulation platform.

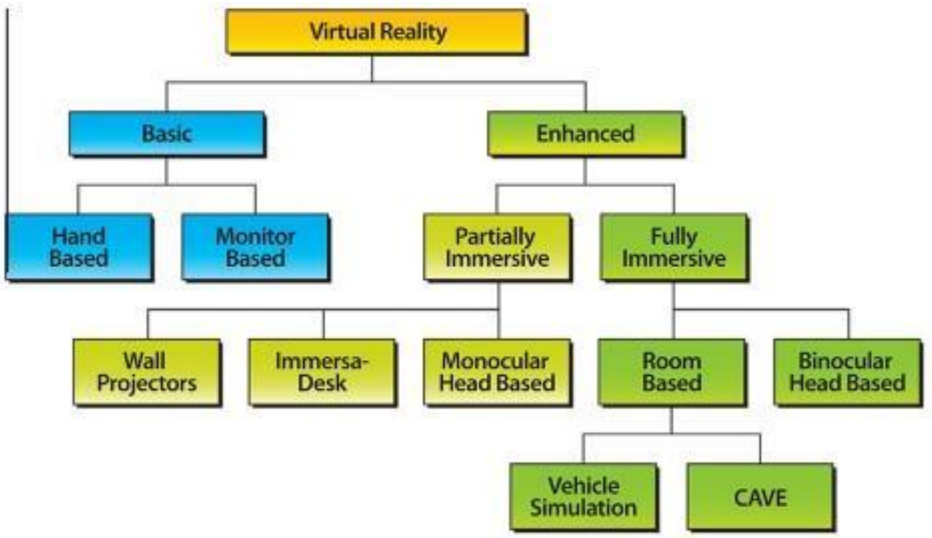

Fig 2: Taxonomy of VR The most important aspects of a virtual reality experience

a. A virtual world:

It is a computer-generated environment in which one or more people interact with one another. It can be understood as a set of items in a place with norms and relations, or as avatars, which are 2D, 3D, or other graphical representations.This space does not exist in real life and is created via the use of a media.

b. Immersion:

Immersion is a psychology term for being completely absorbed in something while executing a task. Or, it's a condition in which an individual becomes so absorbed in a virtual environment of an action that his or her mind becomes detached from the real world.One can immerse themselves in a variety of realworld activities. For instance, many books transport readers to another reality in which they experience a sense of belonging, sympathise with the characters, and lose track of their own lives and surroundings.Mental immersion is the term used by scientists to describe this form of immersion.Other examples of this type of immersion are: Daydreaming, watching a movie, and listening to music. Another sort of immersion is physical immersion, which occurs when we become physically involved in an activity. Participants are those who complete a physical immersion.In a virtual reality interaction, mental absorption varies. This form of mental immersion can be partial or comprehensive, with complete mental immersion in a virtual reality encounter being experimental at the moment.

c. Feedback:

Another important aspect of a VR experience is feedback, or sensory feedback. Participants can see the outcomes (or outputs) of their activity thanks to feedback (or inputs). For example, a virtual display should. The projected picture is refreshed when a participant moves his or her head. In other words, when a participant in a virtual environment looks to the right, the screen should represent what the person sees to the right, and so forth.This should be completed within a fair time frame and without incident.While the word sensory feedback is used in a range of fields, such as medicine and engineering, it refers to the same process or function.Sensory feedback, for example, is a communication mechanism within the sensory system used in medicine.

Virtual versus Real Interactions

When people are involved in VR, something totally exceptional happens: they can be observed acting in ways that would be appropriate in parallel real-world scenarios. As a result, even the earliest SVR systems encouraged participants to engage in socially desirable behaviours such as holding hands, peer group formation, and other non-verbal actions.These behaviours imply interaction between users, and several research have examined the components that contribute to this link [18]. Historically, one technique has been to compare in-person and virtual group cooperation. The standard is that performance in virtual SVR, or collaborative scores, should be equivalent to those in real-world scenarios.

Evaluation of trust:

Trust is one aspect of social interaction that has been highlighted. We believe it is a helpful metric since it generates a somewhat greater degree of reaction than gestures or verbal acts yet can be investigated in controlled trials.Although we note that [14] suggests that the well-known survey to gauge trust and usability might be extended to VR, we will refer to behavioural answers. They also discovered a link between user happiness and trust in VR use, as well as a link between usability and trust for various VR technologies.Because they are examined in commercial and economic contexts, behavioural actions that are based on trust are fascinating.In our SVR experiments, we used two trust approaches from those domains: trust by information seeking and trust via a game with rewards contingent on entire faith in the other (s).Although consumers may behave differently when portrayed by virtual avatars than they do in real life, such tools may undoubtedly be used to investigate any bias between various channels of communication. As a result, one of our current research interests in this field is determining the extent to which specific virtual reality settings, such as avatar representation and interface usability, influence the development of these higher-level attitudes and interactions [19] [20].

3 Experimental Design

3.1 Materials:

Three experiments were conducted. To collect data on perceived usefulness and trust, each experiment used a same set of standardised evaluation methods (queries).

System Usability Scale (SUS): The SUS consistsof two factors: Learnability and Usability.
Trust in Technology Measures (TTM) queries were created to look into people's faith in technology.

Assumptions:

The following were the study's assumptions:
1. For subjective measurements of VR products, the trust and SUS evaluations are reliable.
2. There is a link between usability and trust.
3. This relationship can be found in a variety of VR systems.

Research 1:Desktop Virtual System [21]

Consolidation aims to shift the load of high-performance graphics workstations from several high-end PCs to enterprise-class servers in the data centre.Similar to a thin-client computer, a laptop computer, and a local interface, or a commodity-class workstation with a lower price tag, the device with a display and a mouse/keyboard acts as the device with a display and a mouse/keyboard. In both cases, we want to send tasks from the local station to the remote desktop environment and offer users with a remote desktop environment. Rather of stacking workstations in the data centre and enabling one-to-one remote access, desktop virtualization consolidates several desktop PCs utilising virtualization techniques onto a single server. VMware, a virtualization pioneer, has formed a collaboration with OEMs and service providers to promote what the company has dubbed the Virtual Desktop Infrastructure (VDI).
On a single hardware server, many OS images and accompanying software packages are hosted. A virtual computer is a term that refers to each instance (VM). A VMware ESX server, for example, can simultaneously host virtual machines running Windows 7/8, Microsoft Windows Server family, Microsoft Windows XP, and Linux. A remote desktop protocol, in its simplest form, enables any user to interface with a single virtual computer. Having a dedicated virtual computer for each user, on the other hand, is frequently impracticable, unneeded, and cumbersome. As a result, most VDI solutions incorporate a connection agent to link users to accessible VMs. Connection agents are section of a fastestevolving portfolio of solutionsmanagement that aids to reduce a VDI solution's maintenance expense.
Some of the advantages of virtual desktop infrastructure are listed below.

• **Desktop management** - In a normal corporate environment, PCs are managed by remote software like Altiris. If you manage PCs in your corporate infrastructure, you know how difficult it is to manage hundreds of them. VDI enables you to manage all of your PCs centrally and maintain total control over what is installed and utilised on them. Virtual desktop deployment is lightning quickly when compared to image technologies such as Norton or other older approaches.

• **Security** - When it comes to deploying VDI, security is crucial.You have more flexibility over how you safeguard your desktop with VDI.

• **VDI image** - We can establish a VDI image library to meet all of your company's requirements

• **Snapshot technology** - With VDI, you may take snapshots of your datato revert desktops to previous states.

• **Save energy** by using a VDI session with a thin client - A laptop consumes low energy than a desktop. Using virtual desktop infrastructure (VDI) is a means tolower carbon footprint and also it saves money at the same time.In terms of power costs, the corporation saves money.

The study:

The connection between trust and usability was investigated using data from ten organizationbased volunteers. In investigation 1, participants were trained on how to perform a servicing operation on a 3D car model using a computer desktop and the LDD virtual environment.An expert instructed each participant for 15 minutes on how to operate the LDD. Following that, participants were provided a video demonstration of how to execute the service and were obliged to do it on both the LDD and a real-world automotive model. Following the performance, they were asked to score the SUS and TTM associated with the usage of the LDD application as a virtual training tool.

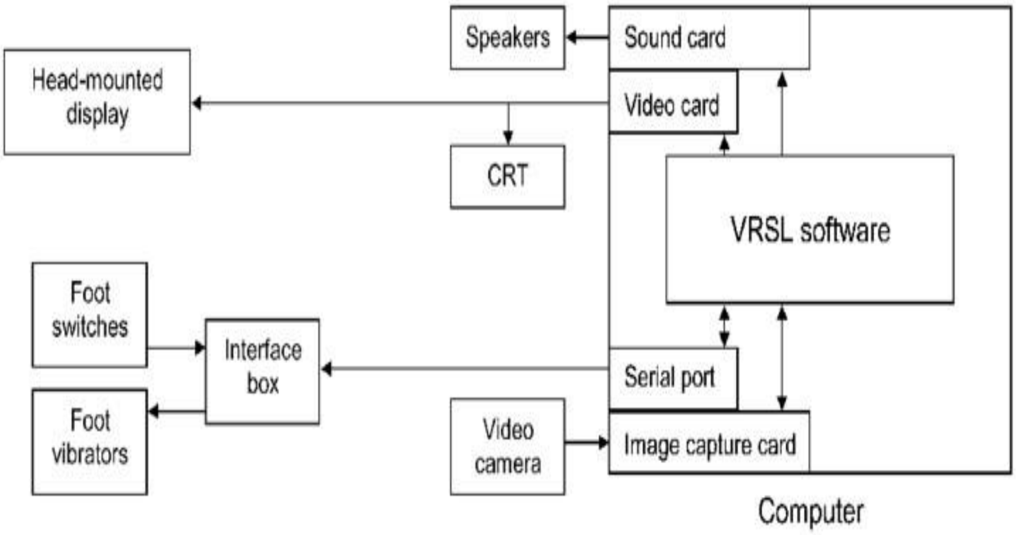

Fig 3: Block diagram of a basic desktop virtual system Research 2 – CAVE Environment [22][23]:

An international team of researchers from the University of Illinois' Electronic Visualization Lab developed the CAVE in 1992.It was created in response to the need for a one-to-many visualisation tool that could be used on big projection displays.

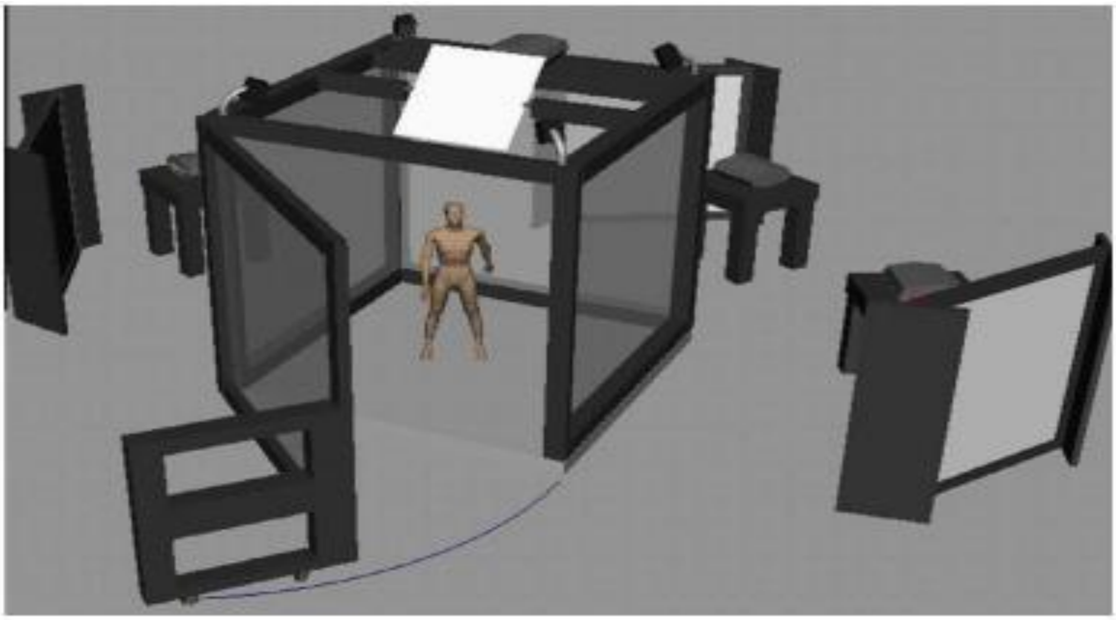

Fig 4: CAVE Environment CAVE characteristics:

The CAVE is typically a 10' *by* 10' *by* 10' cubic metre area that resides in the basement. a larger, darker space. The CAVE is fully composed of rear-projection displays, whereas the floor is entirely composed of down- or rear-projection displays. Additionally, modern CAVE systems are capable of projecting images onto the ceiling, producing a six-sided CAVE environment.

The study:

The second study, conducted at an organisation, had two goals: i) to see if the trust questionnaire could be applied to VR settings in a CAVE; and (ii) to amass evidence about the relationship between trust and usability in a CAVE.The 10volunteers in this study were given a 15-minute basic training to understand how to operate a CAVE system and become accustomed with manipulating items in a 3D interactive experience.The participants were then instructed to interact with the system in order to complete a series of reassembly and assembly activities in a restricted period of time. Volunteers were insisted to rate the usability and trustworthiness of a CAVE programme for object manipulation, assembly, and reassembly activities after the performance.

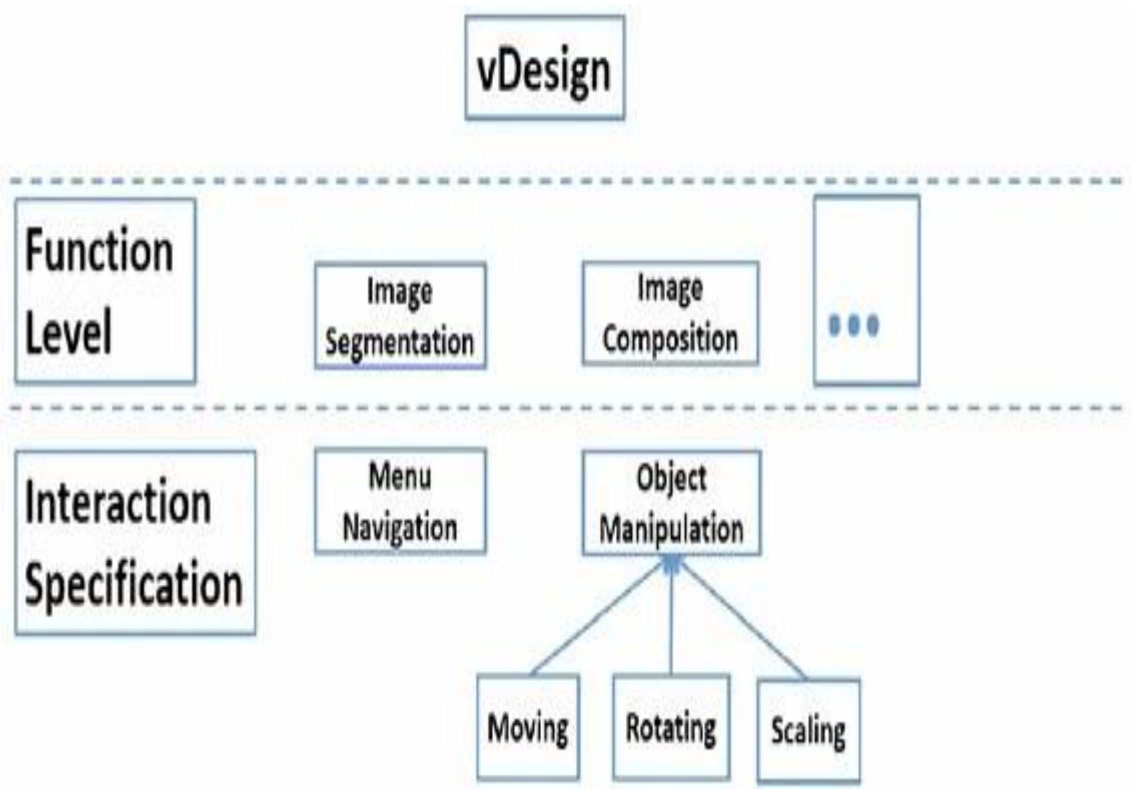

Fig 5: Basic block diagram of a CAVE based virtual design Research 3 - Flight Simulator:

A flight simulator [24] is a system that simulates the flight of an aircraft and its environment, as well as any events that occur while it is in the air. It's an universe where anyone who desires to be a pilot, or simply learn how to fly a plane, or simply play without needing to utilise the original plane can do so. In this instance, the flight simulator is critical for aspiring pilots or airline pilots to study.To enable this pilot prospective study, the flight simulator should be designed to mimic the real-life conditions they might face when flying. This device must have equations that describe how an aeroplane flies, how the control system reacts when activated, the effects of other aircraft systems, and the aircraft's response to external forces such as damping, gravity, and air density. A flight simulator exhibits a variety of the industry's greatest models, each with its own distinct personality and attributes. When a new pilot learns to fly, the best Cessna 182 is typically chosen since it is the most frequently used plane by novice pilots and is also very inexpensive.The Air Force, Army, and Navy are some of the other models that are frequently utilised in flight simulators. A military air force would frequently use a flight simulator to prepare for piloting a fightersimulator ahead of time so that it can be more effective and is utilisedin a simulation involving a real plane. This, too, has become a problem. Regulations, such as those enacted by the Federal Aviation Administration, in flight, the pilot must adjust.

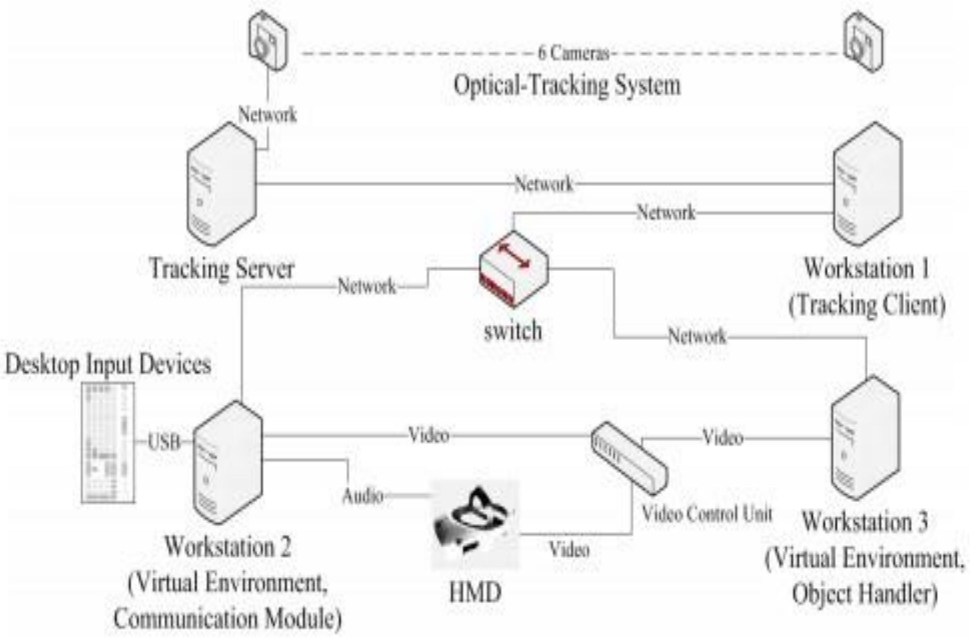

Fig 6: Block diagram of a virtual flight simulator

Fig:7 Participants in a flight simulator The study:

The researchers wanted to determine how Airbus Group pilots reacted to a new commercial aircraft interface. Pilots were able to interact using a part-task simulator. In addition, the simulation included flight gear for a trip. The researchers examined the results obtained by 5 male pilots for the purposes of this study. Airbus Group employs pilots with both commercial andmilitary licences. Each participant used the fly simulator's interface to complete three emergency activity tasks that were assigned to them.

The approach for study three necessitates the participation of two researchers in the evaluation. The lead researcher is the one who takes care of the participants, describes the activities, and distributes the surveys. The secondary experimenter's tasks include operating the simulator, instructing the flyer on cockpit theory, and serving as Air Traffic Control.To begin, the primary researcher informs the volunteers about the flight, as well as the itinerary, what they are expected to do (individually flying the plane), the weather, and so on. The volunteers are then given an overview of the system and invited to try out the interfaces.Pilots were told to engage with the device as much as they wanted until they felt confident and ready to begin the mission. To limit the learning impact, the tasks are ordered in a specific manner. They must retain aeroplane control, respond to the problem using the appropriate procedures, and follow ATC directions during the task (delivered by the second experimenter).They are requested to finish the SUS and Trust survey after completing the three activities to understand how to behave in emergency scenarios using the fly simulator application.

Analysis of Data:

The association between SUS and Trust surveys was evaluated using Pearson's correlation coefficient method. In addition, the Cronbach alpha index [25] is used to assess the scale's consistency. Later, the influence of usability on trust was investigated using a linear regression using stepwise approach. The TTM results are changed to a percent.

4. Results

The three virtual worlds evaluated in the trials received an average SUS overall score of 78.9 % and a trustworthy average TTM score of 77.9 % from participants.Despite the fact that the three studies vary in their utility and the link between trust and usability, the flight simulator, in particular, has resulted in the most usable and trustworthy VR technology of the three.

SUS and TTM [26] surveys proved to be reliable instruments when used to test usability and trust in the usage of Virtual reality, regardless of the hardware used by the volunteers.

Study	SUS	TTM
	α	α
1	.65	.792
2	.92	.884
3	.903	.831

Table 1: Trust and Sustainability

	Overall TTM					
	Study 1		Study 2		Study 3	
	r	p	r	p	r	p
Usability SUS	.645	.044	.693	.026	.895	.04

Table 2: TTM and SUS

In studies 1 (r =.665, p =.036) and 2 (r =.672, p =.033), the total scale of TTM and SUS surveys matched. TTM total scale in all the investigations are shown in Table 2.

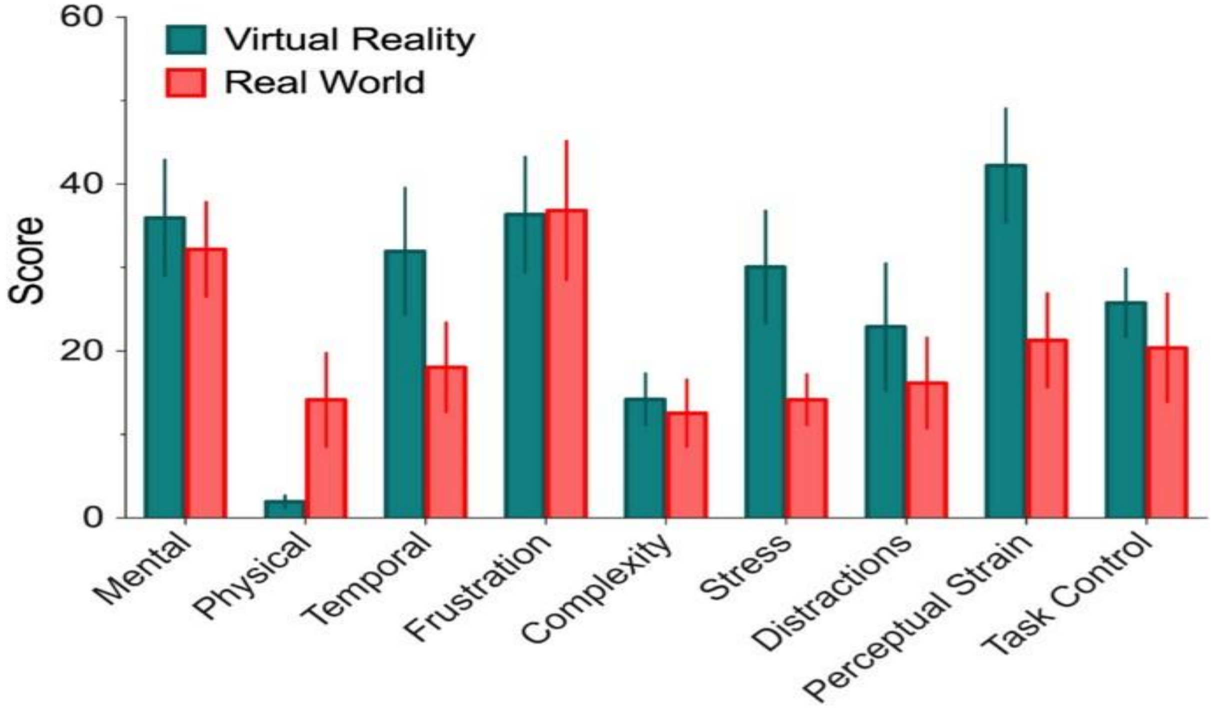

Fig 8: Virtual reality vs real world

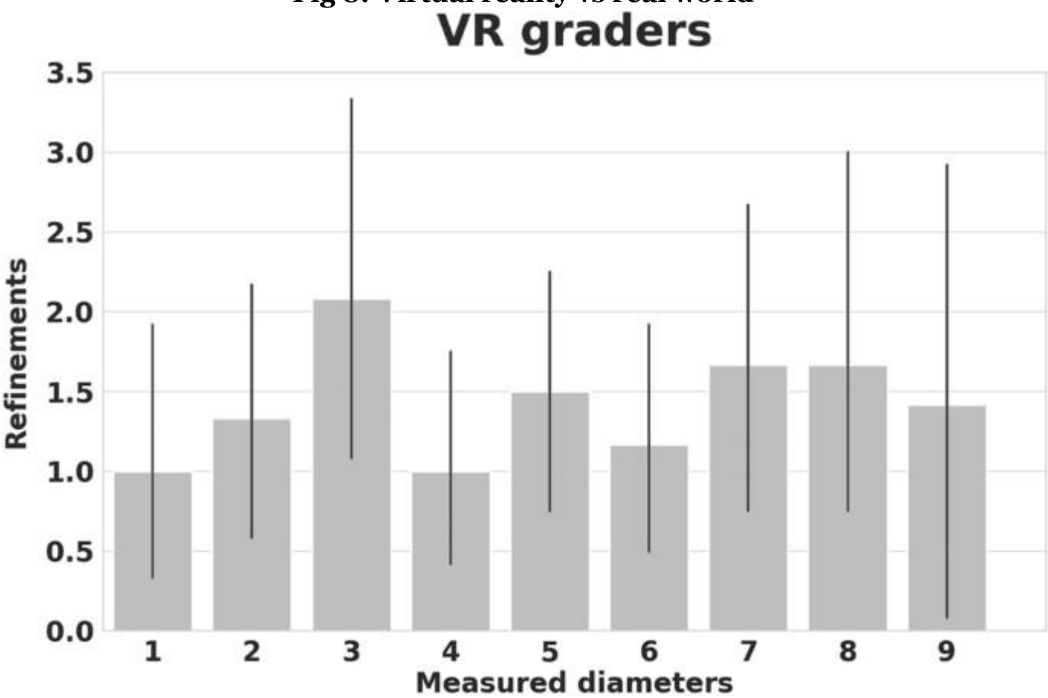

Fig 9: Validation of virtual reality

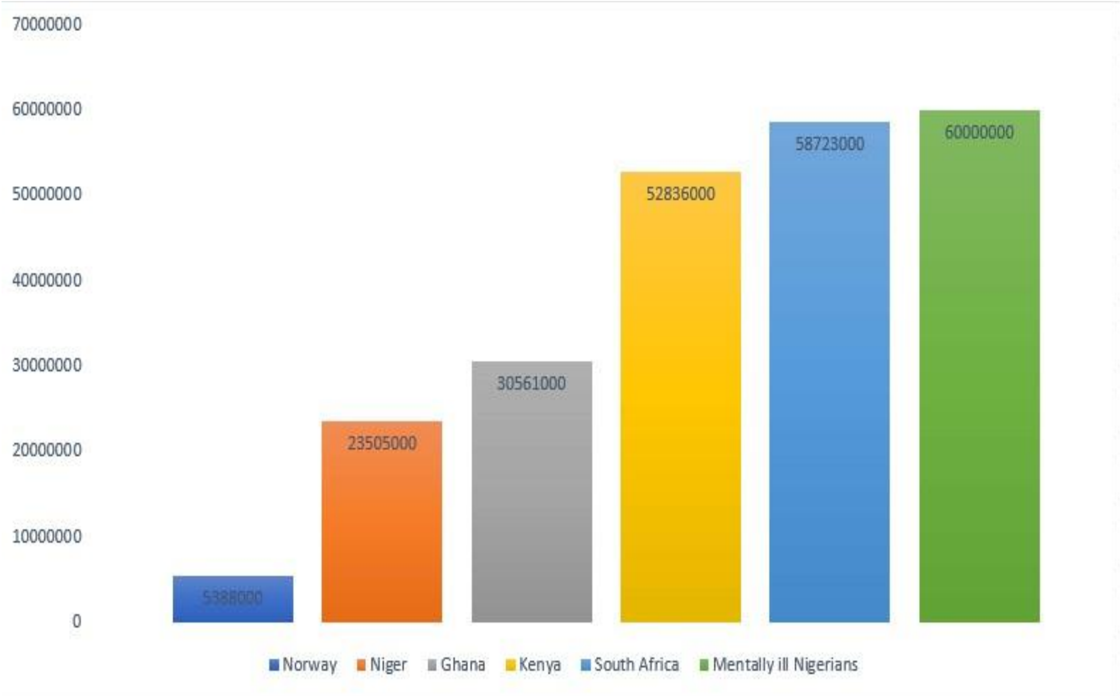

Fig 10: VR and mental illness

5. Discussions

In most cases, the relationship between trust and SUS has been investigated in the internet and software areas. The above studies intended to see if the same association holds true for virtual reality systems. The outcomes of the three studies will be discussed in this section in light of the hypotheses presented earlier in the study.

Assumption 1: Performance Indicators of VR Products with TTM and SUS are Reliable.
Cronbach's alpha values demonstrate that the surveys are reliable for the VR domain, particularly in the latter two experiments.Because there isn't much data on how these surveys are used in VR, the findings could have a big impact on upcoming VR research and how we gauge usability and trust.

Assumption 2: There is a connection between usability and trustworthiness.
The findings indicated that in studies 1 and 2, a strong link is there between the overall SUS and TTM. While the results from studies 1 and 2 reveal a link between the SUS overall scale and trust, this is not the case in study 3.When analysing the effect of the usability aspect of SUS on trust, however, significant outcomes were discovered in all three trials, as shown in Table 2. There could be two causes for the lack of a meaningful outcome in Study 3.First and foremost, there is the low number of samples. It's possible to predict that if the sample size is increased, the results will match those of research1 and 2. The nature of the participants' experience could be the second factor. Indeed, research 3 is the only one in which the participants were really experts.

Assumption 3: Different VR systems have this correlation.
Due to the similarity of the three tests' results, it is feasible to see the link between trust and usability in a variety of VR samples with varying attributes. The findings of experiments 1 and 2, which employed two separate virtual reality systems, demonstrate this, in comparison to the 2D desktop configuration used in research 1, the CAVE utilised in research 1 has a 3D environment, unique interaction modes, and a broad variety of experiences.

6. Conclusion

Virtual reality is a rapidly developing technology that is being used in a variety of fields. Understanding the factors that influence consumer trust in technology could have a significant impact on how people engage with VR and how it is developed.The goal of this study was to collect the first data on the relationship between two well-known elements in human-computer interaction (HCI): usability and trust. The essay addresses how virtual reality systems may be trusted. The studies' findings generally corroborate the study's assumptions, demonstrating that a) commonly used HCI tools can be used to reliably examine the user experience of various VR systems, b) there is a strong correlation between usability and confidence in VR systems, implying that usability may be a predictor of users' faith in VR systems, and c) this correlation exists across diverse VR technologies.The current findings reinforce the notion that designers who wish to create aninnovative VR application must consciouslyframe the system's functionality by providing useable tools. As previously stated, trust is a broad and multifaceted concept, thus comprehending the function of usability in VR applications is only the first step toward a complete knowledge of the trust in technology notion.Future research should examine the impact of usability in the formation of people's views and values (including trust) about innovation, as well as the effect of other elements on trust in virtual reality.

Reference

[1] https://en.wikipedia.org/wiki/Trust_Technology

[2] Lankton, Nancy K., D. Harrison McKnight, and John Tripp. "Technology, humanness, and trust: Rethinking trust in technology." Journal of the Association for Information Systems 16, no. 10 (2015): 1.

[3] Distel, Bettina, Katherine M. Engelke, and Sydney Querfurth. Trusting me, trusting youtrusting technology? A multidisciplinary analysis to uncover the status quo of research on trust in technology.No. 35.ERCIS Working Paper, 2021.

[4] Hua, Chenggang, Shu Cole, and Nan Xu. "Rethinking trust in tourism apps: the moderating effect of age." Journal of Hospitality and Tourism Technology (2021).

[5] Schröppel, Tina, JörgMiehling, and SandroWartzack. "How to identify relevant product properties in the context of user-product interaction?." Procedia CIRP 91 (2020): 615-620.

[6] Husain, Uvesh. "IMPORTANCE OF TECHNOLOGICAL PREDICTORS TO DEVELOP CONTINUOUS INTENTIONS FOR E-TAX FILING: MEDIATING-MODERATING ROLE OF BEHAVIORAL FACTORS." International Journal of Management (IJM) 11, no. 7 (2020): 1289-1303.

[7] Schroeder, Tanja, Maximilian Haug, and HeikoGewald. "The Ambivalence of Mhealth Apps-A Qualitative Research on Techno-stressors of Mobile Health Applications." (2021).

[8] Purwanto, Edi, and Vicky Budiman. "Applying the technology acceptance model to investigate the intention to use e-health: a conceptual framework." Technology Reports of Kansai University 62, no. 05 (2020): 2569-2580.

[9] Evans, Leighton, and Michal Rzeszewski. "Hermeneutic Relations in VR: Immersion, Embodiment, Presence and HCI in VR Gaming." In International Conference on HumanComputer Interaction, pp. 23-38.Springer, Cham, 2020.

[10] Lv, Zhihan, Dongliang Chen, Ranran Lou, and Houbing Song. "Industrial security solution for virtual reality." IEEE Internet of Things Journal 8, no. 8 (2020): 6273-6281.

[11]https://www.researchgate.net/publication/280316864_Relationship_Between_Trust_and_Usability_in_Virtual_Environments_An_Ongoing_Study.

[12]Lv, Zhihan, Dongliang Chen, Ranran Lou, and Houbing Song. "Industrial security solution for virtual reality." IEEE Internet of Things Journal 8, no. 8 (2020): 6273-6281. [13]Symonenko, Svitlana, NataliiaZaitseva, ViacheslavOsadchyi, KaterynaOsadcha, and Ekaterina Shmeltser. "Virtual reality in foreign language training at higher educational institutions." (2020).

[14]Radianti, Jaziar, Tim A. Majchrzak, Jennifer Fromm, and IsabellWohlgenannt. "A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda." Computers & Education 147 (2020): 103778.

[15]Chang, Eunhee, Hyun Taek Kim, and ByounghyunYoo. "Virtual reality sickness: a review of causes and measurements." International Journal of Human–Computer Interaction 36, no. 17 (2020): 1658-1682.

[16] Hohmann, Volker, Richard Paluch, Melanie Krueger, Markus Meis, and Giso Grimm. "The Virtual Reality Lab: Realization and application of virtual sound environments." Ear and Hearing 41, no.Suppl 1 (2020): 31S.

[17]Muhanna, Muhanna A. "Virtual reality and the CAVE: Taxonomy, interaction challenges and research directions." Journal of King Saud University-Computer and Information Sciences 27, no. 3 (2015): 344-361.

[18] Oh, Catherine S., Jeremy N. Bailenson, and Gregory F. Welch. "A systematic review of social presence: Definition, antecedents, and implications." Frontiers in Robotics and AI 5 (2018): 114.

[19] Salanitri, Davide, Chrisminder Hare, Simone Borsci, Glyn Lawson, Sarah Sharples, and Brian Waterfield. "Relationship between trust and usability in virtual environments: An ongoing study." In International Conference on Human-Computer Interaction, pp. 4959.Springer, Cham, 2015.

[20] Pan, Ye, and Anthony Steed. "A comparison of avatar-, video-, and robot-mediated interaction on users' trust in expertise." Frontiers in Robotics and AI 3 (2016): 12.

[21] Pan, Ye, and Anthony Steed. "The impact of self-avatars on trust and collaboration in shared virtual environments." PloS one 12, no. 12 (2017): e0189078.

[22] Chrobak, Pawel. "Implementation of Virtual Desktop Infrastructure in academic laboratories." In 2014 Federated Conference on Computer Science and Information Systems, pp. 1139-1146. IEEE, 2014.

[23] Ishii, Akira, Masaya Tsuruta, Ippei Suzuki, ShutaNakamae, Junichi Suzuki, and Yoichi Ochiai. "Let your world open: Cave-based visualization methods of public virtual reality towards a shareable vr experience." In Proceedings of the 10th Augmented Human International Conference 2019, pp. 1-8. 2019.

[24] Valentino, Kelvin, Kevin Christian, and EndraJoelianto. "Virtual reality flight simulator." Internetworking Indonesia Journal 9, no. 1 (2017): 21-25.

[25] Quansah, Frank. "The Use OfCronbach Alpha Reliability Estimate In Research Among Students In Public Universities In Ghana." African Journal of Teacher Education 6 (2017). [26] Borsci, Simone, Glyn Lawson, BhavnaJha, Mark Burges, and DavideSalanitri. "Effectiveness of a multidevice 3D virtual environment application to train car service maintenance procedures." Virtual reality 20, no. 1 (2016): 41-55.