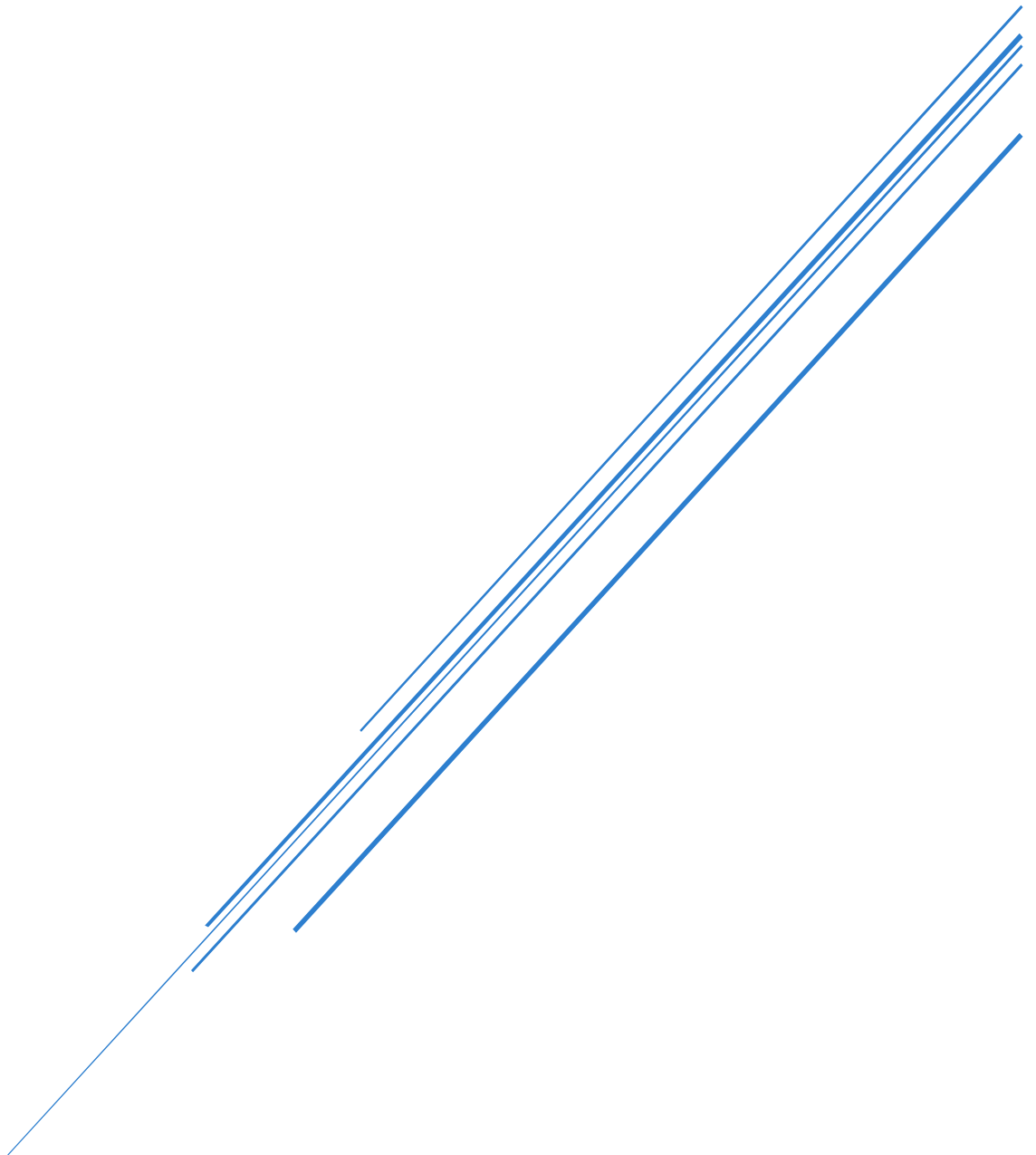


USABILITY EVALUATION OF DIGITAL-TWINS IN VARIOUS DOMAINS

Dara Corrigan



University of Brighton
CI604 Usability Evaluation

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Introduction

Background Information

Digital-Twins are virtual representations of physical or digital entities that enable real-time monitoring, analysis, and optimization of systems. In the context of video games, digital-twins are able to enhance the user's immersion, interaction as well as their engagement. This report will evaluate the Digital-Twin system in the popular open-world video game GTA V, which includes features such as real-world physics, Artificial Intelligence and a simulation of a realistic environment. My objective is to assess the games usability and understand its acceptability while providing recommendations to improve the game based on user feedback and my own analysis.

Problem Statement

While the Digital-Twin system in GTA V includes a highly immersive gameplay experience, it has important challenges for certain demographics of players. Players that have a low level within the game or have a low skill level often find it difficult to progress and earn in game money without paying real money in order to skip ahead, this in turn creates a barrier when it comes to user engagement. In addition to this, the games lack of cross platform functionality limits the broader gaming community from experiencing the games full potential. These issues are very important to enhance the usability of the Digital-Twin in GTA V.

Aims and Objectives

The main aim of this evaluation is to look into the usability of the Digital -Twin system in GTA V. This will include assessing how easy the game is to use / play, the role of real-time updates in enhancing the users engagement and to identify the main areas which need to be improved in order to better meet the users needs. The objectives of this are to analyse the users experiences through diary based methods and the Technology Acceptance Model (TAM) questionnaire, reveal challenges faced by the games players and to recommend improvements to improve the games usability.

Background Investigation

Literature Review

Digital Twins are virtual representations or physical entities, enabling real-time simulation, analysis and monitoring across multiple industries. This review examines traditional and emerging usability evaluation methods relevant to Digital-Twins with a focus on application within video games.

Traditional Usability Evaluation Methods

Traditional methods such as the heuristic evaluation and usability testing have been fundamental in assessing interactive systems. Heuristic evaluation involves reviewing a system against established usability principles to identify any interface and interaction issues. Heuristic evaluation is widely used for assessing system usability due to its structured approach. Usability testing captures practical usability challenges and provides insights into the user's behaviour. Usability testing reveals real-world user interaction patterns and system challenges.

In the context of Digital-Twins, these methods have been applied in many fields. E.g. in aerospace, heuristic evaluation has been used to assess cockpit simulations, making sure that the pilots can interact effectively with the system under pressure. The usability evaluation of cockpit simulations has highlighted interface challenges faced by pilots. In manufacturing, usability testing has analysed worker interactions with Digital-Twins of machinery, focusing on errors and the time it takes to complete tasks. Usability Testing has played a key role in reducing worker error rates in Digital-Twin systems.

However, these traditional methods may not completely capture the dynamic and immersive nature of Digital-Twins in video games where user interactions are highly changing. Users experience evaluation in video games, particularly immersive environments, requires methods beyond traditional testing.

Emerging Techniques in Usability Evaluations

To address the limitations with traditional methods, emerging techniques focus on real-time data collection and users' behaviour analysis. Methods such as eye-tracking physiological monitoring and clickstream analysis provide deeper insights into user engagement and cognitive load. Emerging techniques, including physiological monitoring, offer new opportunities to assess user engagement.

In healthcare, eye tracking has been used to study how doctors interact with patient simulation interfaces, identifying areas where attention is focused and where users encounter difficulties. Eye-tracking studies have been pivotal in identifying user attention areas in complex systems. These methods hold potential for evaluating Digital-Twins in video games to assess immersion and engagement. Tracking eye movements in games has been shown to correlate with player engagement.

Digital-Twins Within Video Games

In video games, Digital-Twins are used to simulate realistic environments, NPC behaviour and dynamic game mechanics. Evaluating usability in this area involves addressing unique challenges such as immersion, adaptability and immersion. Digital-Twin elements in games like NPC behaviour and environmental changes create unique usability challenges.

In GTA V, realistic weather changes, NPC interactions and environmental changes function as components of a Digital-Twin system. Evaluating these features involves addressing how players interact and see the games realistic features. The interactive Digital-Twin system in GTA V provide insights into player behaviour. Emerging techniques like player telemetry and subjective feedback through questionnaires provide valuable insights into how Digital-Twin features affect user satisfaction. Telemetry tracking methods have proven useful for evaluating Digital-Twin features in games.

Digital-Twins are also used in game testing, where virtual environments mimic real-world conditions to predict player behaviours. Evaluating the usability of these systems ensures they provide accurate insights to developers while maintaining player immersion. Game testing simulations have demonstrated the importance of accurate usability evaluations.

Challenges and Novel Areas

Despite advancements, challenges remain in adapting usability evaluation methods to highly interactive and immersive systems like Digital-Twins. The under-researched areas include:

- **Contextual Usability Testing:** Traditional testing methods often fail to account for the real-world contexts in which Digital-Twins are used. In video games factors such as user tiredness or session length can influence outcomes. Player fatigue during testing is often underexplored.
- **Adaptive Evaluation Frameworks:** As Digital-Twins in video games expands, usability evaluation frameworks must adapt to assess dynamic behaviours. E.g. NPC interactions may change based on player actions, requiring real-time evaluation techniques. Real-time evaluation techniques are necessary for adaptive behaviours in Digital-Twin systems.
- **Scalability of Testing:** Conducting evaluations at scale remains a challenge, especially for large open world games that use Digital-Twin systems. Automated testing tools and AI-driven evaluations offer potential solutions but require further exploring. Scalable testing solutions for large-scale game environments remain an emerging research area.

Conclusion

Usability evaluation methods are vital in ensuring Digital-Twins are effective. While the traditional methods remain important, emerging techniques offer new ways to assess usability in dynamic and immersive environments. In video games, Digital-Twins present unique opportunities and challenges. Future research should focus on contextual usability testing and adaptive frameworks to enhance the evaluation of Digital-Twins in gaming and other domains.

Method Selection

Reasoning for Diary-Based Method

The diary-based method was selected for the evaluation as it helps provided detailed and personal insights into how participants interacted with the Digital-Twin system in GTA V. This allowed the participants who were computer science students within the module and who have experience in gaming to note their experiences, thoughts and any challenges over a period of playing the game. This method has helped to identify changes in engagement and usability issues that may or may not appear during a single session of playing the game. In order to ensure privacy of the participants all entries were kept anonymous which meant no names or any other personal details that linked the participant to an identity were collected. This also meant that all participants were able to share their full and honest opinions without any concern.

Reasoning for TAM Questionnaire

The Technology Acceptance Model (TAM) questionnaire was selected to go along with the diary-based method because it provides clear and structured data about how easy the system was to use, how useful it is, and how much it engages the users. This tool also helps measure and compare what the participants thought about the system, giving helpful insights into its strengths as well as its areas that need improving. Participants were able to share their feedback through the questionnaire to ensure the results were relevant. In order to ensure the privacy of the participants, all responses were also kept anonymous so that the participants could share their honest opinions on the system.

System Description

System Overview

Grand Theft Auto V (GTA V) is an open world action / adventure video game developed by Rockstar Games. It is set in the fictional state of San Andreas. The video game allows for players to explore a vast and detailed world while also completing missions, taking part in side quests and interacting with non-player characters (NPS's). The game is very well known for its realistic physics, dynamic environments, and detailed storytelling. GTA V's virtual world acts as a knowledgeable Digital-Twin which mirrors real world systems such as economy, the weather and social interactions.

Key Features of GTA V's Digital-Twin

The digital-twin within GTA V encompasses many key features that help enhance its realism. These features include:

Real Time Simulation of Weather: The system includes a dynamic changing of the weather such as, rain, fog, snow and storms which help to influence the gameplay and the player interactions.

A Dynamic Economy and Environment: The prices for good within the game and services fluctuate and the environment adapts based on activities completed by the payer, making a living and the evolving world around them.

AI-Driven NPC's: Pedestrians, drivers and the other NPS's exhibit lifelike behaviours and respond to the players actions as well as any changed to the environment.

All of these features work together in order to create a highly immersive experience for the player that closely mimics real-world systems and interactions.

Interactive Features and User Experience Elements

GTA V's interactive elements allow for players to engage quite deeply with its Digital-Twin, these include:

Customisation and Control: Players have quite a range of control over their characters, vehicles and weapons which allows for a personalised gameplay experience.

Player Controlled Impact on the Environment: Players are able to influence the world through their actions, examples of this are , causing traffic jams, changing property ownership or altering the behaviour of NPC's.

Seamless Interaction with Systems: The games interface and controls are designed to facilitate intuitive interaction, such as accessing the apps within the game, completing missions and managing resources.

These interactive features help to provide an engaging user experience. This helps make the Digital-Twin in GTA V a perfect example of virtual world simulation.

Evaluation Process

Initial Assessment

My evaluation began with an initial assessment in order to determine the scope and focus of my study. The participants were selected based on their familiarity with the system, GTA V. This step also involved talking to the participants about the goals of the study and their contributions. All ethical considerations were addressed during this stage ensuring the participants that anonymity of their data was guaranteed and making sure consent to use their results was obtained.

Diary Study Assessment

The participants were asked to document their interactions with the Digital-Twin system in GTA V over an hour and a half testing period. A diary template was provided which included questions such as “Describe any challenges you faced today” and “Between 1 and 5, rate the systems responsiveness and ease of use.” This approach allowed for the participants to capture their insights into their experiences helping to highlight both the strengths and areas of improvements within the system. Regular reminders were also sent out to participants to ensure that their diary entries were completed, and support was provided regarding any questions they had about the process.

TAM Questionnaire Assessment

After the diary study, the participants were asked to complete the Technology Acceptance Model (TAM) questionnaire. The TAM questionnaire was created to measure key usability factors such as perceived ease of use, behavioural intentions and usefulness. The questions were presented on a 5 point scale and the participants were asked to provide additional comments to further explain why they chose the response they did. This final assessment provided structured, quantitative data to complement the findings from the diary entries.

Data Collection and Management

The data I gathered from both the diary study and TAM questionnaires were collected and stored securely. The diary entries were anonymised by assigning participant ID's rather than using names. The TAM questionnaire results were collected and analysed to identify any patterns or trends. The diary entries were grouped by common themes to understand user experiences better. Participant privacy was protected throughout the entire process and all data was stored following the ethical guidelines.

Data Analysis, Results and Recommendations

Diary Study Data

To help understand the impact of GTA V 's immersive features, a diary study was carried out. Participants were asked to write a short diary entry (about a paragraph or two) of a challenge they faced while playing or something they noted needed fixing. When writing they were asked to focus on realism, engagement and overall, their enjoyment.

Realism and Immersion

Participants noted that NPC behaviours and realistic weather enhanced their immersion within the game. For example, participants enjoyed how the weather influenced their driving dynamics and the appearance of the games world such as puddles forming during rain. Some also mentioned feeling a deeper connection to the game when NPC's responded to their actions such as complementing outfit choices or reacting to aggressive behaviour. Although, a few entries did highlight inconsistencies such as NPC reactions becoming very predictable after extended playing time or glitches with environmental interactions.

Engagement with the World

GTA V features a vast open-world design which encourages exploration. Diary entries have mentioned players taking time to engage with activities not related to the games story, such as exploring the mountain areas, driving scenic routes or testing limits with NPC's. These moments tended to highlight each participants session and showcasing the games ability to create unique experiences. However, repetitive patterns in the gameplay such as predictable NPC behaviours were cited as areas for improvement.

Ease of Interaction

Quite a few participants mentioned how intuitive the games controls felt for complex tasks such as heists or environmental interactions. The diary entries seemed to show positivity for the game for providing clear instructions more so in single player mode. In contrast to this, some participants talked about how frustrating the online modes lack of guidance was, which felt frustrating due to new features being added with no explanation of how they worked.

The Balance Between Realism and Fun

The diary entries tended to reflect on how GTA V balanced realism with engaging gameplay. The participants liked the games attention to detail such as how NPC's responded dynamically to crimes. However, some said that overly exaggerated elements like the flying motorcycle and NPC's overreacting to minor issues took away from the realism. Suggestions included enhancing NPC reactions, improving vehicle physics and refining certain game mechanics to better align with real-world expectations.

Overall User Experience

The participants consistently described their sessions playing as enjoyable and immersive, with most saying they had a desire to revisit the game. Most of the diary studies praised GTA V for its ability to create a dynamic and interactive world. This included its immersive features being a big factor in keeping their interest over time.

TAM Questionnaire Data

The TAM questionnaire was used to collect feedback on how the participants felt their experience of GTA V was. The areas the questionnaire focused on were ease of use, engagement, usefulness and realism. The participants were asked to rate their experiences on a scale of 1 (strongly disagree) to 5 (strongly agree) and then to explain their ratings

Ease of Use

Most participants found the features within the game easy to use and intuitive they also gave high ratings for the interface and controls of the game. Many spoke about tasks like using the in-game phone and interacting with objects felt simple. However, there was also mention from some participants about how new players may struggle with the complexity of the online mode which lacks clear instructions.

Engagement

Participants enjoyed exploring the open world within the game and revisiting its immersive elements. Many participants mentioned how they liked to spend time completing side activities such as visiting scenic areas or discovering hidden details within the games map which makes it more enjoyable. Participants also noted how interacting with NPC's and dynamic situations helped to keep the game interesting over time.

Usefulness

Immersive features within the game such as NPC behaviours, the realistic weather and environmental changes were highly appreciated by the participants. The participants noted how these elements made the game more engaging. Although, some had pointed out that certain features such as police and other NPC reactions felt less advanced when compared to other titles by Rockstar Games such as Grand Theft Auto IV and Red Dead Redemption 2.

Realism

Participants felt that GTA V balanced realism while still maintaining the idea of fun very well. They showed likeness for features such as NPC behaviour and weather effects but found some aspects within the game unrealistic and unnecessary and needing future improving whether by update or in the next title of the series. Examples of these features included the addition of flying vehicles within the game and how the character holds a very large number of weapons such as a minigun and rocket launcher but seems to just pull it out of their pocket. Other suggestions for improvements included more realistic NPC actions, fixing of occasional and general bugs and better physics for the vehicles as all cars felt the same when driving no matter how big or small they were.

Conclusion

Most participants overall were happy with the level of realism within the game and how it enhanced their gameplay. While some areas within the game felt outdated, the majority of participants agreed that the games immersive features made it very enjoyable and worth revisiting.

Reflection

Gained Insights

Throughout this process, I gained a deep understanding of Digital-Twin usability evaluations particularly within video games where usability evaluation methods must be adapted for immersive and dynamic systems. The diary studies helped provide valuable insights into player behaviour and emphasising the importance of understanding user interactions within real-world situations. Additionally, analysing usability challenges within video games highlighted the unique aspects of testing Digital-Twin systems compared to other industries.

Challenges Encountered

One of the main challenges was balancing the depth of analysis while staying concise, especially with a wide-ranging area such as Digital-Twins. Incorporating player-focused methods in the diary studies was particularly demanding as ensuring relevance to gaming contexts required creative thinking and alignment within usability principles.

Appendices

Ethical Review Forms

Risk Assessment Form



University of Brighton

Please do not save and reuse copies of this form locally. The form is updated regularly, and you can find the most current version from the links on the [SharePoint ethics and integrity page](#) or from the information following question L5 of the BREAM ethics application form.

Risk Assessment Form Research

Name of the risk assessor	<i>Dr Sanaz Fallahkhair</i>	What School or Department are you in?	ATE	Authoriser's signature	<i>Sanaz Fallahkhair</i>
Assessment title	<i>User Experience Design and Evaluation</i>	Date of assessment		Location of the activity	
Description of the work area or activity being assessed		<p>The user experience, and usability evaluation study involves the testing and evaluating digital twin system of the video game Grand Theft Auto V (GTA V) with potential users. This will take place online. Number of people participating will be between 3-10. <i>The equipment that will be used is computers, and the study roughly should take an hour.</i></p> <p>The sequence of activities will be:</p> <ol style="list-style-type: none"> <i>Greeting, and run down of what the study will entail. (20 minutes)</i> <i>Observational study (20 minutes), participants go through the task using the game Grand Theft Auto V and complete a diary entry based on their experience.</i> <i>Post-test TAM questionnaire. (20 minutes)</i> 			

What is the hazard?	People affected and how they might be harmed	Measures in place to control the risk	Risk Rating			Additional controls required and by whom	New Risk Rating		
			S	L	R		S	L	R
Software and data privacy failure	Research participants or yourself or other students.	Make sure all data is safe and secure in Office 360 and Microsoft apps, Microsoft Cloudbased storage as it is signed by GDPR agreemnet	2	2	4				

S= Hazard severity, L= Likelihood of occurrence, R= Combined risk rating

Figure 1



Contract Covid-19	Participants, researcher	Make sure the social distancing is in place and hand sanitiser is provided	3	2	6				
Eye strain and posture problems due to prolonged computer use	Researcher	Set up work place according to ergonomic guidelines and take regular breaks.	3	2	6				

Figure 2



Please do not save and reuse copies of this form locally. The form is updated regularly, and you can find the current version from the links on the [SharePoint ethics and integrity page](#) or from the information following question L5 of the BREAM ethics application form.

Likelihood	Severity					
		1 Minor	2 Moderate	3 Significant	4 Serious	5 Major
	1 Rare	1	2	3	4	5
	2 Unlikely	2	4	6	8	10
	3 Possible	3	6	9	12	15
	4 Likely	4	8	12	16	20
	5 Almost certain	5	10	15	20	25

Hazard severity

1 – Minor	Capable of causing minor injury which would not require first aid treatment but may result in temporary health conditions (e.g. temporary skin rashes etc.).
2 – Moderate	Capable of causing minor injury which would allow the individual to continue after first aid treatment on site or at a local surgery. The duration of the stoppage/treatment is such that the normal activities are not seriously interrupted.
3 - Significant	Capable of causing injury or disease likely to result in an individual being unfit for work for one or more days.
4 - Serious	Capable of causing serious injury or terminal/chronic disease to an individual
5 - Major	Capable of causing death or multiple serious injury and/or possible destruction of property. Such a hazard would include a major event such as an explosion, toxic release, building collapse etc. It may cause death and injury both on and off site and would be the subject of a major incident report.

Likelihood of occurrence

1 – Rare	An incident is possible but only under freak conditions should there be a possibility of an accident or illness.
2 – Unlikely	If other factors were present, this incident or illness might occur, but the probability is low (e.g. storing items above shoulder level, worn carpet etc.).
3 – Possible	The incident may happen if additional factors precipitate it, but it is most unlikely to occur without them. The additional factor is more than a casual slip or nudge and would require an additional action or event to trigger it (e.g. leaving a vehicle with the engine running, obstructing an access/egress route, failing to replace a defective light, obstructing emergency equipment etc.).
4 – Likely	The effects of vibration, weather, inexperience, physical state, or human carelessness would precipitate an incident, but which is unlikely to happen without this additional factor (e.g. ladder not secured, temporary electrical supply, makeshift arrangements, medical condition etc.).
5 – Almost Certain	If the activity/condition continues as it is, there is almost a 100% certainty that an incident will happen (e.g. broken stair or ladder rung, exposed electrical conductor, unstable stack of materials etc.).

S= Hazard severity, L= Likelihood of occurrence, R= Combined risk rating

Figure 3

Potential hazards and measures to prevent risk

Hazard	Lone working Visiting locations or meeting with participants when alone, the researcher may be vulnerable to threat, intimidation or theft
Measures to prevent risk	If possible, visit location prior to data collection to assess possible risks associated with built and social environment. Where high-vis vest if working near traffic (e.g. data collection in a car park) Wear appropriate clothing for the weather Check weather in advance and adjust plans accordingly Researcher to be aware of health and safety procedures of research location: o Fire bells or other emergency warning o Location of fire alarms and exits o Emergency plan if under threat.
Hazard	Other Risk associated with research location. This could be from the location itself or environmental factors
Measures to prevent risk	If possible, visit location prior to data collection to assess possible risks associated with built and social environment. Where high-vis vest if working near traffic (e.g. data collection in a car park) Wear appropriate clothing for the weather Check weather in advance and adjust plans accordingly Researcher to be aware of health and safety procedures of research location: o Fire bells or other emergency warning o Location of fire alarms and exits o Emergency plan if under threat.
Hazard	Other Discussion of sensitive topics with potential to cause distress to participants or researcher
Measures to prevent risk	Ethics committee approval at Tier 1 or Tier 2 as required Focus group to take place in UoB premises if possible Find out what support is available if there is a problem - who would be available to assist if you called for help? Focus group schedule to be sent to participants in advance if possible Ensure participants understand their right to withdraw and option of not answering questions put to them Research relevant support options for participants and researcher to use after the discussion Consider using a Distress Protocol (such as that generated by Chris Cocking). Remain neutral if you are acting as the discussion Facilitator Students should discuss proposed questions with their Tutor

S= Hazard severity, L= Likelihood of occurrence, R= Combined risk rating

Figure 4

Recruitment Flyer

Seeking volunteers for a research study to conduct user experience and usability testing and evaluation of a software

I would like to invite you to take part in user experience design project. The purpose of this research study is to test and evaluate a user experience and usability of a software artefact by testing and evaluation.

To participate in this research, you must:

- Be an adult 18+ years old
- With an interest to evaluate/test software or hardware artefact of computer systems

The user experience, and usability evaluation study involves the testing and evaluating digital twin system of the video game Grand Theft Auto V (GTA V) with potential users. This will take place online. Number of people participating will be between 3-10. *The equipment that will be used is computers, and the study roughly should take an hour.*

The sequence of activities will be:

1. *Greeting, and run down of what the study will entail. (20 minutes)*
2. *Observational study (20 minutes), participants go through the task using the game Grand Theft Auto V and complete a diary entry based on their experience.*
3. *Post-test TAM questionnaire. (20 minutes)*

To find out more please follow the *link below to the / attached* Participant Information Sheet and consent form.

Figure 5

Participant Information Sheet



University of Brighton

Title of Study

CI604 Usability Evaluation of Digital Twins in Various Domains

Introduction and what is the purpose of the study/project?

My name is Dara, and I am a final year BSc Computer Science with Cyber Security student at the University of Brighton. I am carrying out this research as part of my coursework project; it is entirely for educational purposes. The aim of the study is to investigate the usability of the Digital Twins system within the video game, Grand Theft Auto V (GTA V). This includes assessing how easy the game is to use and how real time updates enhance user engagement. This will help to identify the main areas that would need to be improved [in order to](#) better meet the user's needs.

Invitation paragraph

I would like to invite you to take part in my research study. Before you decide, I would like you to understand why the research is being done and what it would involve for you. To this end, please read this document so that you are clear as to the implications of your participation in the study. This will take you several minutes. I am happy to answer any questions that you may have.

Why have I been invited to participate?

You have been invited to participate in this study as I would like to establish your interest in the game Grand Theft Auto V (GTA V).

Do I have to take part?

Your participation is voluntary, and there is no obligation to take part. If you are a student a decision not to take part will not have any negative consequences in terms of your study, work, or other academic activities

What will happen to me if I take part?

The study will take no longer than 1 hour to complete and you are required to participate only once. You will be asked to fill out a diary entry documenting your time using the system as well as filling out a questionnaire.

Will I be paid for taking part?

You will not be paid for your participation and therefore I would like to thank you for both your time and consideration during this study.

What are the potential disadvantages or risks of taking part?

Participating in this study is very low risk. If, during the study, you feel fatigued, tired or require a comfort break please tell me and you can take an immediate break.

What are the potential benefits of taking part?

There will be no direct benefit to you as a participant. The data that I am gathering from you is purely for educational purposes in the context of my study.

Will my taking part in the study/project be kept confidential?

To help maintain the confidentiality of all our participants, the data that I gather from your participation will be anonymised and given a reference e.g., participant 1. Demographic data such as gender or age will be summarised e.g., 5 males and 5 females between the age of 18 to 35. You will not be personally referred to when I analyse, evaluate, and write up the study for inclusion in my coursework.

All collected data will be stored on my secure University of Brighton One Drive during analysis. Only my supervisor and I will have access to the data. The data will remain on my University One Drive until I complete my studies. On completion of my studies all data will be deleted.

Figure 6

1. Please follow this link to the University's Research Privacy Notice for further information on data protection.
<https://unibrighton.ac.sharepoint.com/:b:/s/public/ERAnx7fZSR9Lv6MRZ1KwpMMBcOSYGp30CAwkTzb bzHLDNQ?e=4gH9GQJ>.
2. If you are reading a hard copy of this document, the QR Code below also provides a link to the University's Research Privacy Notice for further information on data protection.



What will happen if I don't want to carry on with the study?

You are free to withdraw from the study at any time until the end of the data collection session. Any information that I have gathered e.g., consent form, or data captured e.g., response to tasks, will be shredded and or deleted.

- *However, once you have submitted the anonymous data it will not be possible to remove the data of an individual participant anymore.*

What will happen to the results of the project?

The results of the study will be written up for inclusion in my coursework projects. If you want to see my finished dissertation please contact me through my email address below and I will send it to you as pdf document.

Contact details

Researcher: Dara Corrigan – d.corrigan1@uni.brighton.ac.uk

Supervisor: Dr. Sanaz Fallahkhair - S.Fallahkhair@brighton.ac.uk

What if I have a question or concern?

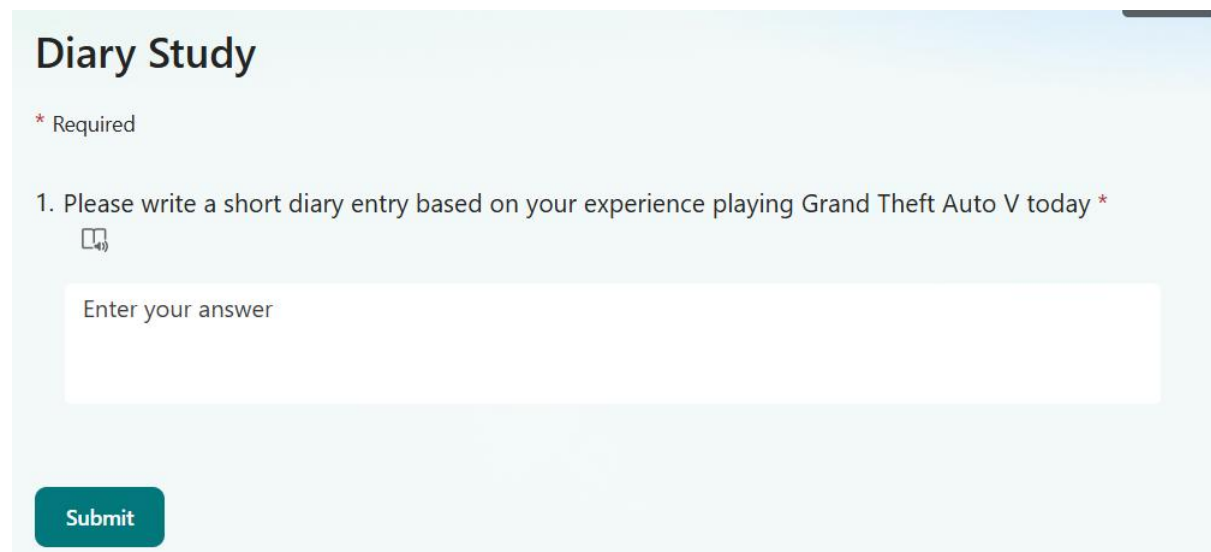
Please contact Dr Friederike Günzel (f.k.gunzel@brighton.ac.uk) School of Architecture, Technology and Engineering Research Ethics and Integrity Lead.

Who has reviewed the study?

The study has been reviewed given a favourable ethical opinion by the School of Architecture, Technology and Engineering Research Ethics and Integrity Committee.

Figure 7

Dairy Study Template



Diary Study

* Required

1. Please write a short diary entry based on your experience playing Grand Theft Auto V today *

Enter your answer

Submit

Figure 8

Diary Study Entries



< Respondent 1 Anonymous 02:25 >

Time to complete

...

1. Please write a short diary entry based on your experience playing Grand Theft Auto V today *

Today, I played during a heavy rainstorm in the game and I noticed how my car handled alot differently on the wet roads compared to when it is dry. The puddles and raindrops on the windshield made everything feel so realistic. I love how the weather changes can create a more immersive experience, even if it doesn't necessarily change the way I play. It's these small details that make the game stand out to me personally.

Figure 9

1. Please write a short diary entry based on your experience playing Grand Theft Auto V today *

I spent most of my session playing today just driving around and exploring the map. I went up to the mountains, and the view was very detailed for a game. The way the light changes at sunset made it feel quite realistic as it replicated real life. I didn't do any missions while playing, but it was still fun to just wonder around the world. The world feels alive but some NPC reactions are quite predictable after playing for a while like how they always panic the same way if I accidentally bump into them

Figure 10

1. Please write a short diary entry based on your experience playing Grand Theft Auto V today *

I tried some advanced features today like hacking during a heist. At first I thought it would be complicated, but the game gave clear instructions and it wasn't too hard to figure out. It's great that the game makes even challenging tasks feel straightforward. I did get frustrated while in free mode in online mode because there are so many features, and it's not always clear what I'm supposed to do. I think they should explain it better for new players

Figure 11

1. Please write a short diary entry based on your experience playing Grand Theft Auto V today *

The NPCs behaviour stood out to me while playing today. When I was walking down the street in a nice outfit, people complimented me. Later I stole a car and the owner tried to fight me before calling the police. It's cool how their reactions make the world feel more dynamic. That said, I noticed some odd moments like NPCs panicking when I just walked by them. It breaks the immersion a bit

Figure 12

1. Please write a short diary entry based on your experience playing Grand Theft Auto V today *

I had a lot of fun while playing gta 5 with real-time interactions today. During a mission, I was driving with Lester, and when I crashed he stopped what he was talking about to yell at me for driving badly. It was funny but also so realistic. These little moments in particular make the game much more enjoyable. I wish more games paid attention to small details like this.

Figure 13

1. Please write a short diary entry based on your experience playing Grand Theft Auto V today *

I played gta online today, and while I enjoyed exploring with friends, I ran into some frustrating moments. The flying bikes i feel are so stupid and should not be apart of the game. They ruin the balance of realism and fun. I kept getting attacked by other players using them, which made it hard to enjoy the session. I also noticed a few glitches with NPC behaviour, like paramedics arriving at a scene but not actually helping anyone. Still, the game's immersive features kept me coming back for more but there is definitely lots to improve on such as what I mentioned

Figure 14

1. Please write a short diary entry based on your experience playing Grand Theft Auto V today *

Today when playing I tried focusing on the smaller details in the game. I went into a store, bought snacks, and noticed how the shopkeepers behaviour / mood changed when I lingered around too long. It felt so lifelike, especially when they started eyeing me suspiciously.

Figure 15

1. Please write a short diary entry based on your experience playing Grand Theft Auto V today *

I spent most of my time playing today customising my car. The options are endless, and it's fun seeing how the world reacts to flashy vehicles. NPCs even commented on my car. However, I wish the driving mechanics were a bit better. Even SUVs handle like sports cars, and it feels unrealistic when they don't roll on sharp turns. It's a minor annoyance, but it stands out in such a detailed world.

Figure 16

1. Please write a short diary entry based on your experience playing Grand Theft Auto V today *

While playing, I decided to mess around with the environment a bit. I drove into a lamp post, and it fell over. It's good to see how the game accounts for things like that. On the downside, some bushes still act like solid walls when you hit them, which can be annoying, especially during police chases. These inconsistencies don't ruin the experience but are noticeable after long play sessions.


Figure 17


1. Please write a short diary entry based on your experience playing Grand Theft Auto V today *

I revisited some older missions today and was reminded of how the characters interact during gameplay. They comment on your driving, and it can be funny when they get frustrated if you're reckless. The dialogue feels so natural, making the missions feel more immersive. However, I noticed some NPC glitches, like a paramedic arriving at a scene but leaving without helping the injured person. It's moments like these that break the illusion of realism for me.

Figure 18


TAM Questionnaire

Perceived Usefulness 


1. The realistic weather and environmental changes within *GTA V* enhances my gameplay experience. * 

1	2	3	4	5
---	---	---	---	---

Strongly Disagree Strongly Agree


2. Please explain why you gave this rating. * 

Enter your answer

3. The realistic behaviour of NPC's (Non-Playable Character) within the game feels dynamic and engaging. * 

1	2	3	4	5
---	---	---	---	---

Strongly Disagree Strongly Agree

4. Please explain why you gave this rating. * 

Enter your answer

Figure 19

5. The game world responds to my actions in ways that make my experience more immersive. *



1	2	3	4	5
---	---	---	---	---

Strongly Disagree

Strongly Agree

6. Please explain why you gave this rating. *



Enter your answer

7. The detailed real time interactions within the game makes it more enjoyable to play. *



1	2	3	4	5
---	---	---	---	---

Strongly Disagree

Strongly Agree

8. Please explain why you gave this rating. *



Enter your answer

9. The features within *GTA V* make it feel like a real living and breathing world. *



1	2	3	4	5
---	---	---	---	---

Strongly Disagree

Strongly Agree

Figure 20

10. Please explain why you gave this rating. *



Enter your answer

Figure 21

Perceived Ease of Use

11. The features within *GTA V* are easy to understand and interact with. *

1

2

3

4

5

Strongly DisagreeStrongly Agree

12. Please explain why you gave this rating. *

Enter your answer

13. Learning how to interact with the game world and its systems was easy and straightforward. *

1

2

3

4

5

Strongly DisagreeStrongly Agree

14. Please explain why you gave this rating. *

Enter your answer

Figure 22

15. I rarely feel overwhelmed or confused by the complexity of the game. * 

1

2

3

4

5

Strongly Disagree

Strongly Agree

16. Please explain why you gave this rating. * 

Enter your answer

17. The game provides me with enough feedback that I understand how my actions affect the world around me. * 

1

2


3

4


5

Strongly Disagree

Strongly Agree

18. Please explain why you gave this rating. * 

Enter your answer

19. I find it easy to adapt to the games more advanced features (e.g, environmental changes or NPC interactions). * 

1

2

3


4

5

Strongly Disagree

Strongly Agree

Figure 23

20. Please explain why you gave this rating. * 

Enter your answer

Figure 24

Behavioural Intentions

40

21. I enjoy spending time exploring the detailed world within *GTA V*. *

40

1

2

3

4

5

Strongly DisagreeStrongly Agree

22. Please explain why you gave this rating. *

40

Enter your answer

23. The games immersive features makes me want to keep playing the game. *

40

1

2

3

4

5

Strongly DisagreeStrongly Agree

24. Please explain why you gave this rating. *

40

Enter your answer


Figure 25

25. I would recommend the games detailed world and interactions to other players. * 


1	2	3	4	5
---	---	---	---	---

Strongly Disagree

Strongly Agree

26. Please explain why you gave this rating. * 

Enter your answer

27. The games features make me interested in trying out similar games with similar realistic environments. * 


1	2	3	4	5
---	---	---	---	---

Strongly Disagree

Strongly Agree

28. Please explain why you gave this rating. * 

Enter your answer


29. I am likely to revisit the game because of its realistic and dynamic features. * 

1	2	3	4	5
---	---	---	---	---

Strongly Disagree

Strongly Agree

Figure 26

30. Please explain why you gave this rating. * 

Enter your answer

Figure 27

General User Perceptions



31. The games features such as the changing weather and NPC behaviours work smoothly most of the time. *

1

2

3

4

5

Strongly Disagree

Strongly Agree

32. Please explain why you gave this rating. *

Enter your answer

33. I feel the games world reacts appropriately to my actions. *

1

2

3

4

5


Strongly Disagree

Strongly Agree

34. Please explain why you gave this rating. *

Enter your answer


Figure 28

35. Some parts of the games advanced features could definitely be improved to make the experience better. * 

1	2	3	4	5
---	---	---	---	---

Strongly Disagree

Strongly Agree

36. Please explain why you gave this rating and an in depth response to what improvements you think the game needs (What doesn't feel realistic or works properly). * 


Enter your answer

37. The balance between realism and fun within the games systems feels right to me * 

1	2	3	4	5
---	---	---	---	---

Strongly Disagree

Strongly Agree

38. Please explain why you gave this rating. * 

Enter your answer

39. Overall, I am satisfied with the games level of realism and how it enhances the gameplay. * 

1	2	3	4	5
---	---	---	---	---

Strongly Disagree

Strongly Agree

Figure 29

40. Please explain why you gave this rating. * 

Enter your answer

Figure 30

TAM Questionnaire Data

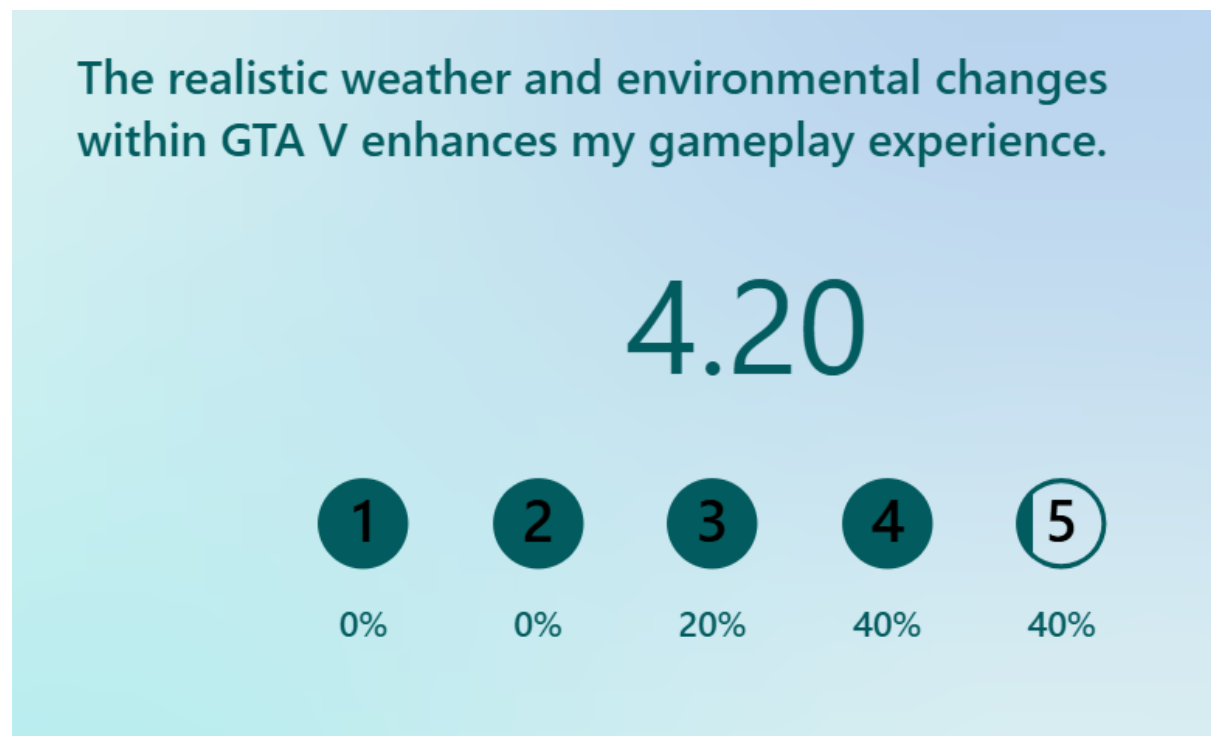


Figure 31



Figure 32

The game world responds to my actions in ways that make my experience more immersive.

3.80

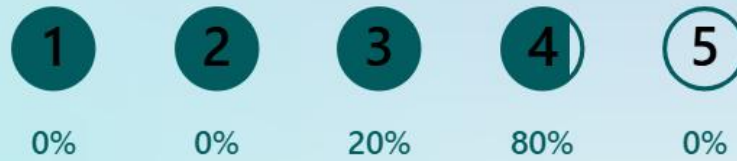


Figure 33

The detailed real time interactions within the game makes it more enjoyable to play.

4.80



Figure 34

The features within GTA V make it feel like a real living and breathing world.

3.40

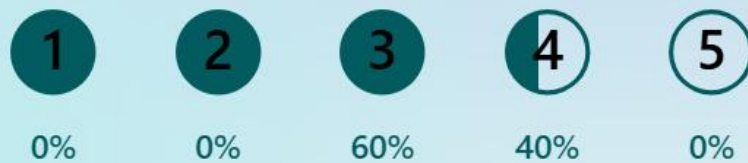


Figure 35

The features within GTA V are easy to understand and interact with.

4.80



Figure 36

Learning how to interact with the game world and its systems was easy and straightforward.

4.80

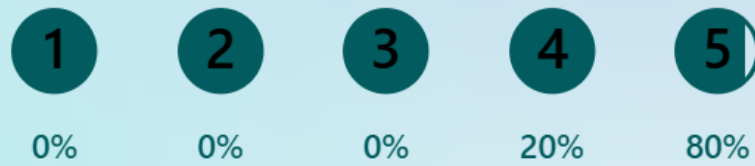


Figure 37

I rarely feel overwhelmed or confused by the complexity of the game.

4.00



Figure 38

The game provides me with enough feedback that I understand how my actions affect the world around me.

4.80

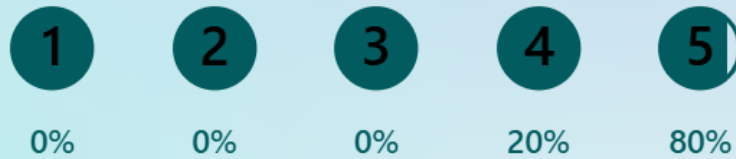


Figure 39

I find it easy to adapt to the games more advanced features (e.g, environmental changes or NPC interactions).

5.00



Figure 40

I enjoy spending time exploring the detailed world within GTA V.

5.00



Figure 41

The games immersive features makes me want to keep playing the game.

4.20



Figure 42

I would recommend the games detailed world and interactions to other players.

4.80



Figure 43

The games features make me interested in trying out similar games with similar realistic environments.

4.60



Figure 44

I am likely to revisit the game because of its realistic and dynamic features.

4.60



Figure 45

The games features such as the changing weather and NPC behaviours work smoothly most of the time.

4.20

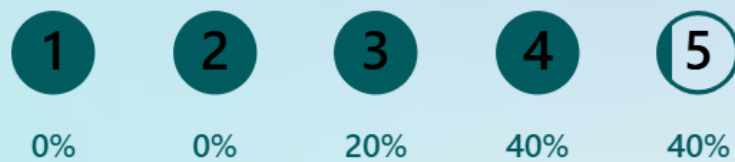


Figure 46

I feel the games world reacts appropriately to my

4.00



Figure 47

Some parts of the games advanced features could definitely be improved to make the experience better.

4.60

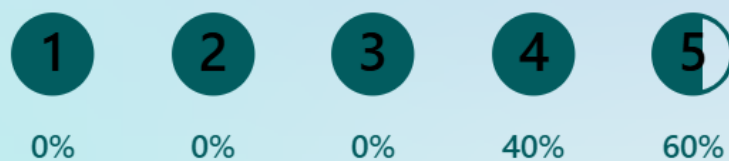


Figure 48

The balance between realism and fun within the games systems feels right to me

3.80

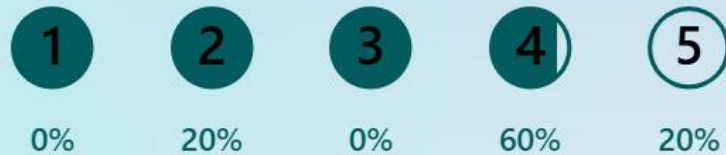


Figure 49

Overall, I am satisfied with the games level of realism and how it enhances the gameplay.

4.20

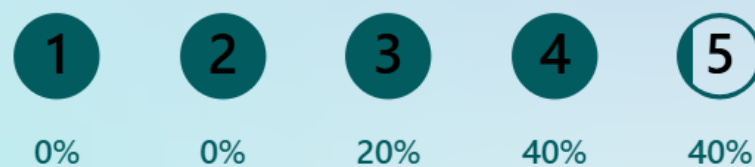


Figure 50

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