BatmanVR – A Usability Case Study to Support Design Reflections on Compelling Virtual Reality Environments

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ABSTRACT

The present paper probes into the virtual reality (VR) design framework published by industry stakeholders and compares it to the experience design of the flagship launching game of PlayStation VR: Batman: Arkham VR. Aligned with observational and qualitative data collected from players, the purpose of the assessment is to evaluate the degree to which the design framework contributes to an immersive storyline and conveys a compelling experience.

The paper makes the distinction between two case-relevant elements of the VR design framework. The first design element is the overall user experience (UX). I focus on principles which reflect the overall quality of the experience translated into the user derived value, covering both interfaces and interactions. The second design element is the user interactions (UI). More specifically, for the case of BatmanVR, UI revolves around gesture-based interactions. The goal of this paper is to evaluate to what extent a publicly acclaimed VR product delivers consumer value, due to its overlapped design choices with UI and UX emerging industry standards and not to a fleeting mainstream hype.

The conclusions summarize valuable takeaways for both theory and practice, for future gaming iterations, as well as insights for cross-industry development.

INTRODUCTION

The launching of PlayStation VR in October 2016 came to top off a buzzing gaming industry, set for a mainstream race ever since Facebook vouched for the technology by buying Oculus – an indie Kickstarter campaign - in 2014.

As we speak, Microsoft, Sony, Facebook – just to mention a few - play their bets in the VR budding business, throwing their first hands in the low-stake gaming industry, while cautiously exploring the extent to which building virtual realities could become a cross-industry opportunity. Facebook recently demoed how their VR solution can be used for remote teams work and meetings, Microsoft hints at creatives with the abilities of Hololens and scaffolds the development of VIVE (HTC) device with apps for designers. Google aims at the educational market, with cheap yet capable devices, dependable on mobile phones on which hundreds of developers already launched games and interactive lessons for kids. Meanwhile, Amazon is working on a "platform and interface for immersive storytelling".

Less likely participants in the game, like Nokia, Siemens, Qualcomm and Intel hold patents for various VR devices, waiting in the pipeline for launching in 2017-2019 (Murphy, 2016). At this point, the VR interactions and interfaces developed by companies are experiential with hopes of creating opportunity and value that eventually, would make the technology necessary and irreplaceable. To make it so, designers tread on unfamiliar and complex paths, with little empirical evidence to support their decision-making. If the design elements of a VR environment are considered separately, many development inquiries find resolution in HCI fundamentals. But the conjunction of different stimulus, the overlapping of technologies and the intrusiveness of it, creates a one-off context which requires an unambiguous and exclusive design framework.

Mostly in the last two years, UX&UI practitioners, developers, engineers and graphical designers started piling up the results of their work and research on different media outlets, mostly outside of academic research. As a few guidelines are consistently reported across multiple platforms, I believe it's appropriate to consider the emergence of a design framework for VR.

The purpose of this paper is to investigate the overlapping of the emergent design framework for VR in relation to one of the flagship applications of the PlayStation VR console: "Batman: Arkham VR" Game (further referred to as the "BatmanVR"). Additionally, where appropriate, and by using the feedback of a relatively small but representative pool of BatmanVR players, the paper will provide user feedback on how these principles affected the gameplay and the overall credibility of their experience. BatmanVR was picked to scaffold the treatise because the game was designed to demo a mix of all the PlayStation VR's features and interactions, being referred to as "the strong wind to cast off Sony's voyage into virtual reality gaming" (RoadToVR, 2016). The author collected observations from the gameplay through informal observation done by the author while first-time users were playing the game (1), through non-empirical information collected from niche websites (2) and by collecting impressions and reactions to the game from the "PlayStation VR" Facebook community (3).

THE EMERGING DESIGN FRAMEWORK FOR VIRTUAL REALITY

Virtual Reality simulates a space of interaction between humans and automated systems. Even when the end-to-end communication happens between people, in VR, the perception of it is facilitated by a digital interface. The uniqueness of this interaction derives from the intrusiveness of the technology. If interface metaphors are traditionally used to remind users of previous schemas and to build on mental models of how "things work," the core purpose of VR is to trick all human receptors into believing - not the lookalike - but into the "reality" of the interface. To do that, the VR is designed to be experienced continuously and

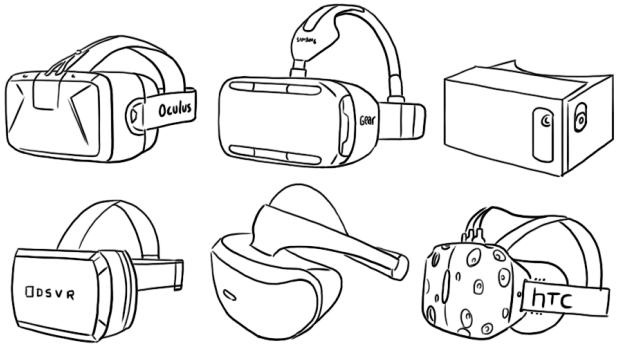

Fig.1: Most known VR Technology present on the market: (left to right, upper line): Oculus Rift, Samsung Gear VR, Google Cardboard, (left to right, lower line) OSVR Hacker Dev Kit, Project Morpheus (Sony PlayStation VR and HTC Vive. *Source: Sundstrom M. Immersive Design – found at: https://goo.gl/7rJJ4E*

without other simultaneous distractions. Hence, the bulky headgear (Fig.1), the accessories, and the suggestion that VR "should be experienced while wearing stereo headphones", preferably with noise cancellation (Linowes, 2015).

The reverse of the coin is that the designers need to consider a set of rules and principles to avoid anxiety and exhaustion caused by deficits in ergonomics, cognitive dissonances or physiological distress. In the name of proper HCI scrutiny, the VR environment could be sliced and diced into various subcomponents. However, for the scope of this paper, the design considerations will focus only on all-purpose User Experience (UX) principles and on gesture-based User Interactions (UI). The latter derives mainly due to the nature of the BatmanVR game, where gesture-based interactions support most of the advancement in the storyline. It's important to notice beforehand that some UI principles overlap but do not apply to the entire UX. Conversely, all UX principles should be considered when designing the UI.

THE UX OF VR: REFRAMING THE HIERARCHY OF NEEDS

In 2015, Cronin advanced an alternative to Maslow's hierarchy of needs, reframed for the VR environment (Cronin, The hierarchy of needs in virtual reality development, 2015) (Fig.2). As his findings are so far

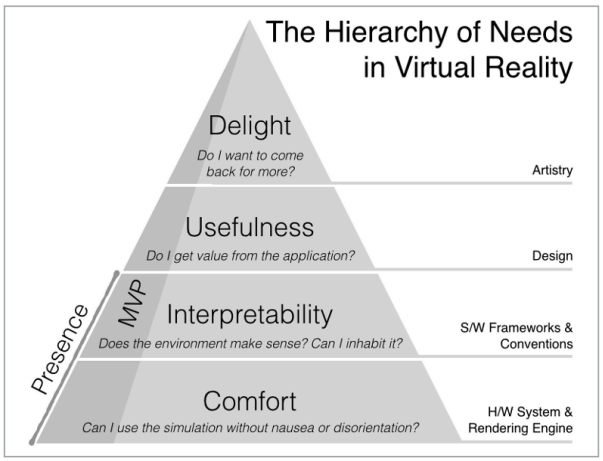

Fig.2: Cronin's Hierarchy of Needs in Virtual Reality*.*
Source: https://goo.gl/cTIGza

unchallenged and they are founded on previous good practices of design, we will be using his pyramid to develop further our discussion on the controversial aspects of some gesture interactions found in the BatmanVR game.

The base of the pyramid is **Comfort**. Comfort coins on the need to experience VR without physiological or psychological distress which stems from disorientation (disrupted balance and space perception), nausea (arises from the false perception of self-motion) and eyestrain (Kennedy, Lane, Berbaum, & Lilienthal, 1993). It's the entry level condition of accepting the technology, and it relates to conventional Human Factors research topics like cognitive psychology and information visualization. According to VR practitioners, their primary rule of development is the principle of head tracking, which states that objects in the VR environment must remain fixed, no matter where the user moves their head. Jointly with the depth perception, the head tracking feature contributes to the illusion of a "virtual world". (Google I. , 2015) (Oculus Best Practices - Motion, 2015). The fundamental principle to achieving optimal comfort is the synchronization of the head tracking with the user's eye movement (Eye Tracking), user control of movement (Position Tracking) and gesture control (Hand Tracking) (Fig.3). All the UI elements mentioned in Fig.3 need to be considered simultaneously because any unbalance could psychologically influence the user and mark their experience. The reverse is that, by thoughtfully using each type of tracking while considering their common outcome and exercising non-intrusive control over the actions of the user, VR can turn into an engaging, realistic experience.

The synchronization between tracking systems, the human perception and the interface needs to carefully consider the motion of elements in relation to the user perception. Essentially, the movements of the user should trigger an immediate and accurate reaction from the interface, including menus, stand-by sessions or cut scenes. Any action outside the user's control needs to be carefully

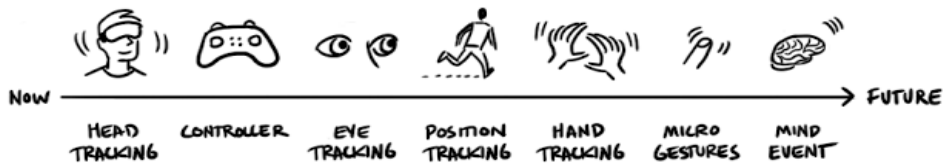

Fig. 3: Syncing the VR technological features with human abilities for a seamless UI.
Source: https://goo.gl/fpNIJP

planned and consistent with user's expectations (Hornsby, 2013) (Shanmugam, 2015) (Oculus Best Practices - Motion, 2015) (Google VR, 2016).
Movement in a virtual space is often causing a cognitive dissonance between the information sent to the brain by the visual system and the information sent by the bodily senses. The dissonance increases proportionally with acceleration, and the brain is wired to perceive change and a possible threat associated with it (Hettinger, Berbaum, Kennedy, Dunlap, & Nolan, 1990). Oculus Rift developers recommend speeds similar to human locomotion speed (Oculus Best Practices - Motion, 2015) and LeapMotion suggested converting any random motion into interactions (LeapMotion, 2016).
There are, however, several ways in which the discomfort caused by uncontrolled motion can be soothed. It was discovered that the hand presence of the user in the virtual reality is a powerful item which underpins a sense of space and balance (LeapMotion, 2016). All along the Batman VR gameplay, the user can bow their head to look at their "hands", be that while they wear "Batman gloves" or they impersonate Bruce Wayne (Fig.4).

Fig. 4: Batman VR: Screenshot showing the hand presence
Source: Game Official Walkthrough: https://goo.gl/8oeM4o

An exciting discovery was made by the author when asking various users to experiment with the game. More than half of them stated they would have wanted to see their feet as well and it's confusing to be able to see the hands but not the feet, which may suggest that additional body representation could reinforce user comfort.
Another way is using a non-intrusive set of tools to guide motion that is not coming from the user, called "motion flow" (Alger, 2016). In a sequence of BatmanVR, when the user descends in the cave, the downwards motion is fast and uncomfortable, and there is no way of stopping it or slowing the virtual elevator that takes you to the underground. The discomfort is dubbed by the height perception as soon as the walls disappear and you find yourself descending into the abyss, on a small metal plate. To appease the falling sensation, the designers introduced upwards flying bats surrounding the cave which brings the experience to better terms with the user (Fig.5).
Lastly, it's important to keep the horizon line fixed (LeapMotion, 2016) (Documentation, 2015) (Google, 2016) to maintain user's perception of stability. Experiments show that a set visual backdrop considerably reduced motion sickness (Prothero, Draper, Furness, Parker, & Wells, 1999), which helps us infer that, in the absence of a horizon line, fixed large objects on the background may reduce the

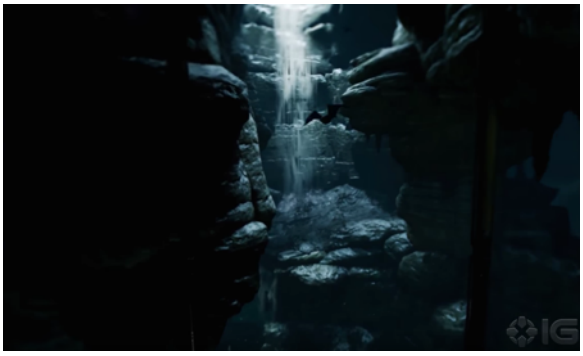

Fig. 5: Batman VR: Screenshot showing the user descend in the underground; Bats are depicted as flying upwards, distracting the user from the motion into the abyss.
Source: Game Official Walkthrough: https://goo.gl/8oeM4o

distress caused by uncontrollable motion. In Fig 4, the motion is vertical, and the walls of the cave with big, round, horizontally orientated curves serve the user's orientation during the descent.

The second step of the pyramid is **Interpretability** defined by how convincing and plausible is the VR environment for the user. VR can twist reality, but when doing so, it needs to play by scientific bylaws and graphical anchors to trigger schemas and mental models which will "tell" the user that it is all "possible". Together with comfort, interpretability is what creates the basis for credible presence in the VR environment. In other words, the user needs to be physically comfortable and to have all the necessary information to infer the context as "lifelike" and to perceive their VR presence as convincing.

Usefulness describes how much value the VR experience delivers, compared to the user effort and it is correlated with how well it engages the user. Usefulness is also associated with the expectations build both outsides and within the virtual realm. For example, even before playing

BatmanVR, the user anticipates the presence of Batmobile or the Batarangs (a specific, bat-shaped throwing weapon), fitting for the mental models associated with Batman's storyline. While playing the game, the user expectations change. The Batarangs are gesture controlled, and they are an important UI element of the gameplay, required to advance the storyline; Therefore, the user's expectation escalates from just having them, to being able to aim and throw them purposefully. On the other hand, the Batmobile supports no prolific interactions and, compared to the high interactivity of other objects in the game, its fleeting purpose may cause disappointment.

Lastly, **Delight** is the most problematic to explain, the final element that contributes to user engagement and addiction. Delight taps into the emotional load of the user, together with pleasant long term memories and valuable signals loaded into the immediate attention and the working memory of the user. Along with the essential elements of UI and graphical design, every detail of the content and the presence subsidize to delivering delight. The haptic movements give immediate gratification, tapping into the working memory. The non-actionable details in a VR space carry an emotional message associated with the traditional Batman storyline or Gotham City.

THE UI IN VR: GESTURE-BASED INTERACTIONS

To provide with a compelling UI analysis of BatmanVR, first, the paper will lay out the high-level UI design principles for VR, while, subsequently, it will list the gesture-based interactions found in Batman VR, substantiating the extent to which they both overlap.

Virtual Reality User Interaction Design Principles

In 2015, based on multiple design iterations, Kutliroff & Yaron laid out three high-level principles of developing robust gesture-based interactions: interactions need to be natural, intuitive and immersive.

1. Interactions need to provide with a natural user experience

Consistent with the Comfort stage of designing for VR, the movements performed by the user needs to be straightforward and comfortable. Ergonomics theory states that for computer interface users, the most comfortable position for people is while sitting and resting their elbows on the table or chair arms (Jaschinski & Wolfgang, 1999). However, the VR environment distances itself from traditional ergonomics studies by allowing the user to adopt different positions. One example is how VR leverages hand and arm movement to a greater extent than traditional interfaces. The downfall to these interactions is user fatigue. When the user needs to wave their arms around, they need to raise their arms at shoulder level or exercise gesture controls with their arms and hands for extended periods of time, fatigue ensues. (LeapMotion, 2016). Similarly, fatigue appears if there is no consideration for left-handed/right-handed specific interactions or when the arms are extended in the opposite direction and blocks user's line of sight. (Kutliroff & Yaron, 2015).

The author infers that Fitts's law in VR adds significance, as it triggers not only time as a variable but also the user's fatigue. In one of the early scenes of BatmanVR, the user needs to target and grab a key from Alfred's hand. (Fig.6)

Fig. 6: Batman VR: Screenshot showing the small key the user needs to pick from Alfred's hand.

Source: Game Official Walkthrough: https://goo.gl/8oeM4o

The difficulty of the task is underlined by the inadequate expertise of the player in controlling the UI. More often than not, the author noticed users dropping the key and scrambling to pick it up. Later in the game, as the expertise of the player increases, the task of selecting small objects become less distressing, but the users always face some level of anxiety in dealing with small objects, which causes further movement and fatigue.

2. Interactions need to provide with an intuitive user experience

An interface interaction is more intuitive as there's less conscious effort and learning needed to operate it. Intuitive gesture control interactions involve resuming to fundamental priming and physical life mental models of interactions. Instead of double clicking on a folder, gesture control should allow us the action of opening it with our hands. But, because the traditional HCI already defined counterintuitive interactions, associating a digital environment with natural interactions has become atypical and created dissonance or discomfort. Kutliroff & Yaron recognize the limiting factors of digital interfaces and sensibly observe that a critical element in designing rich, intuitive UI is understanding user's intentions with technology. (Kutliroff & Yaron, 2015).

In BatmanVR, all the information about missions, tasks or other characters involved in the gameplay is stored in a computer to which the player needs to access in the cave to advance the storyline. (Fig.7) It's ironic that in an environment such rich in UI opportunities, the designers leveraged traditional HCI mental models of interactions.

Fig.7: Batman VR: Screenshot showing computer interface which gives access to contextual gameplay information.

Source: Game Official Walkthrough: https://goo.gl/8oeM4o

3. Interactions need to provide with an immersive user experience

An immersive experience means the user acts upon the elements of the interface and activates the UI elements in the pre-attentive cognitive stage, without consciously thinking and processing the task. Pre-attentive apparatus is sensitive to two elements: signal detection (grouping, depth perception, and edge detection) and prior experience, translated into expectation (or expertise) (Wickens, Hollands, Banbury, & Parasuraman, 2015). Consistently, Kutliroff & Yaron state that user's actions' consequences should be predictable and consistent with the flow between the virtual world and the real one. Furthermore, they incorporated pre-emptive elements into their design, like Gestalt principles (2015). An interesting thing to mention is that gesture-based technology tracks user's motion permanently and it can detect confusion or delay and can incorporate further nudges into the design to guide their actions. Very few interfaces take advantage of this opportunity. An excellent example is the Apple Watch which detects when you sat for extended periods of time and it taps your wrist to remind you to walk or stand.

BatmanVR does not know how to feed into this stream of continuous information about the user. For example, although it gets signals from different sensors positions on the user, on the console and the motion controllers, it still needs user input to validate their standing or sitting position during gameplay. However, a more severe persistent issue is the way the PlayStation VR console regulates the user input to the virtual world. A lot of gaming professional reviewers and console communities' hubs complained about the motion controllers who ensure the hands tracking on PlayStation VR. According to the complaints, the controllers severely cuts into the promise of delivering an immersive experience. The controllers support a series of inputs as shown in Fig.8. Additionally, some in-game functions and game menus support gesture control through the rotation of the motion controller around its vertical axis, movement and hand gestures of various velocities and direction, arm rotations, and the game menu scroll is done through eye movement of the user upwards and downwards. However ironic, though, the supported diversity of the user input and gesture control does not meet the requirement of making it a natural experience, almost none of it. For example, when picking up the key from Fig 6., the user needs to push their thumb on the T button, similarly to pressing the thumb to the index finger when picking an object. But the subtle difference illustrated in Fig 9. causes a pre-attentive cognitive dissonance, causing confusion and sometimes anxiety for the user.

Gesture-Based Interactions in Virtual Reality

As with any other digital interface, the VR allows for three main types of interactions: manipulation, navigation, and communication.

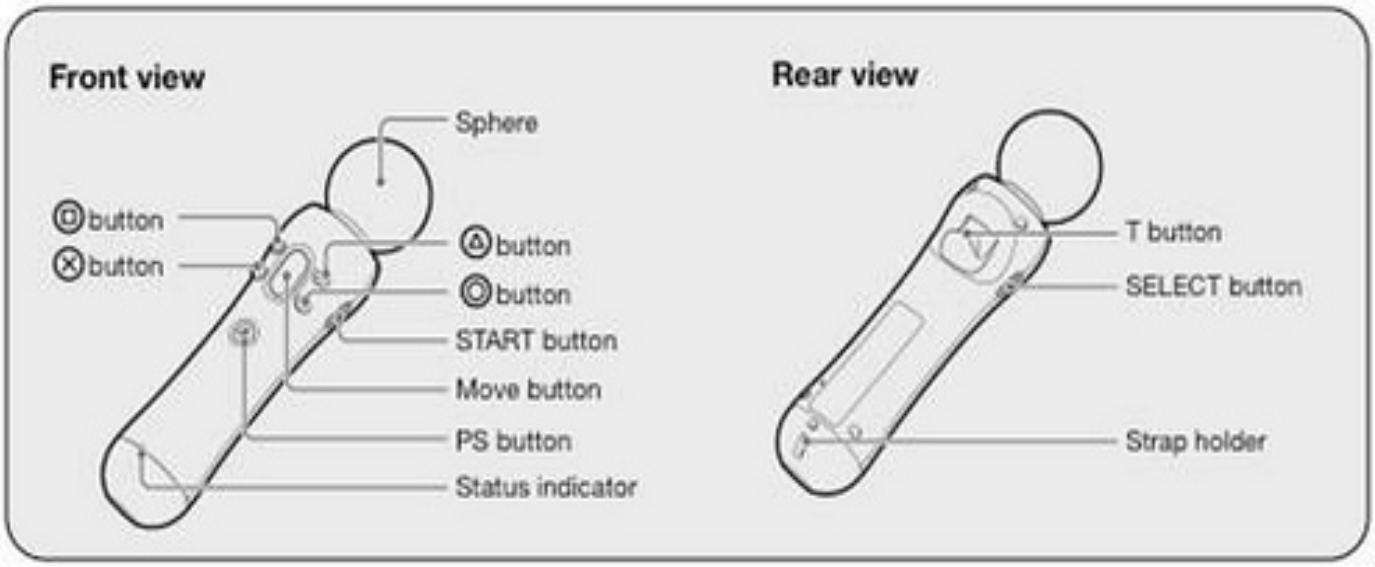

Fig 8: PlayStation VR Motion Controller – one for each hand, designed to support gesture control and direct user input for the VR Games.

Source: PlayStation Blog: https://goo.gl/JC3F7l

Fig.9: Struggling to create an intuitive and interactions for an immersive UX: Top: "grabbing" a key with the motion controller in BatmanVR; Bottom: the natural gesture of grabbing a key.

Source: author's archive

1. Manipulation

Manipulation is what allows the user to alter and change elements in VR and it can happen in three ways:

- Direct user controls: through natural interactions. Aiming and throwing batarangs at a target uses natural gestures, similar to those utilized in a similar physical situation in real life. Throwing batarangs is in fact, one of the most enjoyable interactions in the game, as noticed by the author. People enjoy it because it is simple, it's a natural movement, it's useful – also because almost always hits the target and its action provides feedback by leaving a discreet trail of stardust behind. Both the interactions and the user experience pay respects to both the hierarchy of needs and the three principles for developing gesture-based interactions[1].
- Physical control: can happen through devices on which the user exerts control, like the motion controllers. In the game, to move from one position to another, the user needs to point the motion controller and press a particular button to teleport to that point. The motion is probably the most comfortable possible given the nature of the action. There is little to no perceived motion and the visual image provided to the user is mostly a fade-to-black of the present scenery, continued by a fading appearance of the targeted view. It is also very useful and fast, for an objective-orientated player. However, interpretability fails, even on the backdrop story of a superhero; Batman was a self-made hero, and his abilities cannot support teleportation. As a consequence, interpretability influences and decreases the overall delight.
- Virtual Control: happens entirely within the VR; for example, the interaction with Alfred (Fig 5) occurs entirely within the VR. One reason for having these types of controls is to simplify the other type of interactions, e.g. the direct and physical control because those are the taking a higher toll on the working memory of the user. The primary design consideration to be considered for virtual controls is discoverability and how to signal to the user when an area is actionable. It's a good place for using natural affordances, cues and metaphors, as well as tapping into long-term memory and existing mental models. For example, you know that – to get to Robin, Batman must first call the Batmobile, so the user purposefully is looking for an area to call the car. Putting a road in the visual field of the user guides and nudges them to direct their attention there.

Overall, Batman VR does not do a good job at leveraging affordances, cues, and metaphors. The space orientation and appraisal of the available space are very vague; there are no cues as to how far you can explore an area and often happens to wander around a specific scene just looking for a secondary space to "teleport" so that they could fulfill the necessary tasks.

According to Sherman&Craig, manipulation is governed by Feedback, Ratcheting, Constraints, Distance, Pointer beam scope, Hysteresis Frame of reference Bimanual interface, Control location, Control visibility, Movement formula (control order and gain) (Craig & Sherman, 2002)

2. Navigation

Navigation allows the user to find their way and navigate purposefully in the VR. In Batman VR, moving from one area to another happens only in two ways. First, at the beginning of the game, when the user takes a downward, uncontrolled descent into the cave. We previously discussed the drawbacks of such motion. The author suspects that movement was hazardous, but it was a calculated risk because it has an impactful "awe" effect, even if underlined by subtle discomfort. After all, surprise and adrenaline are not an emotion defined by comfort.

After that stage of the game, all navigation is made through facing the motion controller to the point where the user wants to teleports, pushing a button, followed by an instantaneously change of perspective to match the spot selected for teleportation (Fig 8). The landmarks are all pointed out in the same, similar way. Although when discussing navigation, we consider both travel and wayfinding, BatmanVR lacks almost entirely the latter. The only distinctive landmark is the non-natural, non-intuitive representation of the motion control to a distinct point in space where the player can teleport during gameplay. Collecting opinions from players, the author discovered that lack of wayfinding is not in their awareness during the gameplay as a drawback. However, after a while, they would eventually categorize the gameplay as simplistic because there are not a lot of spaces to explore and choice flexibility.

[1] *https://www.youtube.com/watch?v=lIv0k9TCXfY*

Additionally to all navigation considerations, I feel I need to mention the way the travel in time interaction is designed in BatmanVR. The time control function allows the player to inspect a replication of an occurrence and to enable them to re-experience a particular moment from various perspectives. At a particular point in the storyline, Batman needs to rewind the time to reconstruct a crime scene. None of the people the author inquired or observed found the scene to be easy at first. Navigation in time requires almost always the metaphor of time, like a clock representation or a time bar (Sherman & Craig, 2002). It also requires the metaphor of navigation, like emulating the standard VCR buttons: "play", "pause", "back", "forth". While the scene does not have a metaphor for time, making it difficult for the player to place themselves in a certain moment of the time reconstruction, it does have the three navigation buttons: play forward, play backward and pause, all controlled by one of the motion controller (Fig.10).

Fig.10: Batman VR: Screenshot showing time navigation controls for scene reconstruction

Source: Game Official Walkthrough: https://goo.gl/8oeM4o

The issue is that the way you play forward is through rotating your wrist to the right while rotating to the left will navigate backward. A short jerk of wrist will pause the navigation. According to my observations and the insights brought forward by players from all over the world on their Facebook community, this is one of the most exhausting scenes of the game, with two people giving up or stating that they need a break at this point. Most people do not figure out right off the bat how to navigate it and when they do, it's even worse to control the reconstruction. The storyline requires sudden pausing for further investigation of the space for clues, and that caused additional anxiety because a lot of players ended up going back instead of pausing. All in all, this is one of the most unwelcoming scenes of the Batman VR. At the basic level, it crosses the base of the hierarchy of needs, comfort. Players complained about discomfort in their hands and wrists for trying so hard to pause, instead of going back or forth. It hinders the spontaneity and the intuitiveness of gesture control, ruining the immersion, which triggers lesser interpretability and usefulness. Ultimately, it lowers the delight and caused abandonment due to high anxiety.

3. Communication

Communication allows the user to convey information and feedback either to other (human) players or non-players character (NPC/non-human).

In the BatmanVR game, communication is very limited, even with NPCs, Most, if not all NPCs interact with the player independently from their will. The only important scene of player-NPC communication happens between Batman and Penguin and it's activated by the player, by teleporting next to the character. Together with wayfinding, communication is the missing piece to building a fully immersive space.

4. Other logic properties of the PlayStationVR that contribute to the immersive UX of the Batman VR are:

• The relatively expanded user mobility in the game. During the starting menu, the user can walk on a terrace overlooking the entire Botham city. They're able to turn, bend over the balustrade and admire the city skyline.

• The field of view, the opacity and the masking of the headgear. Very light, compared to other devices, The VR PlayStation headgear is almost tolerable to the point where – engaged in action – the user forgets of its existence. There's no visual information coming from outside the headgear, and the immersive sensation is accentuated if wearing noise-canceling headphones.

• PlayStation VR's graphic latency is locked in at around 18ms – which is about 0.002 seconds faster than the highest acceptable latency before you would notice the lag in VR.

• However, the 1080p resolution interferes with the user experience, specifically in instances where detail is important, and there's no motion involved. It becomes a downside when the user focuses on getting information from the computer screen in the Batcave (Fig 6) or when reading notes in different actionable areas of the game.

• Haptic Reactions in the Motion controllers are rare, and the technology is underused. Therefore, there is not a lot of data or insight on the efficiency of the haptic movements for the PlayStation VR and even less for our paper case study, BatmanVR. However, based on the observations of the author, when used, haptic movements channel the reaction of the environment, which induces a rewarding sensation of interaction and delivers a more realistic presence.

CONCLUSIONS

Overall, BatmanVR seemed to have cut some corners in designing the UI of the game, capitalizing on the novelty effect and the market hype. The navigation is severely simplified, cutting into the credibility of the story and the users need of interpretability. In fact, it is so dramatically simplified that the only vector available for a vibrant debate is travel from one point to another, and even that is distorted by using the "point and teleport" interaction. Truthfully, the game developers had in the motion controller provided by Sony, a less than desirable device to

scaffold the valuable interaction, as pointed out by many critics.

Certainly, there's a combination of factors stemming from an incoherent UI here and there, along with the storyline. One would be the fact that we deal with a digital and a 3D interface, both emergent and with little market feedback, paired for the first time together to achieve ambitious goals.

Second, because of the intrusive nature of VR, there is little place for forgiveness in making mistakes. Every motion has a direct and critical impact on the user's biological receptors. The users' undivided attention, praised and courted for its role in creating an immersive experience, turns for the worse.

The design satisfies basic user needs in the VR space, with few, irrelevant digressions. Following a safe path in development, the designers made sure the occasional scare or adrenaline spike is within acceptable limits. Experiencing the storyline from a first-person perspective, watching "your hands" wearing Batman's gloves, certainly adds emotion and spice and contributes to the general user delight.

From this point of view, I believe the game adds something vital to the VR design framework. There is little structure laid out on how to spark emotional interest in developing for VR, and even less about leveraging discomfort to create memorable sensations and memories.

Overall, BatmanVR is more of a demo to showcase the device abilities, a variation of a clickbait for other VR games, and a promise for future sequels, all wrapped up under cover of the mainstream story, with plenty of fan service under the hood. On the other hand, the VR design framework explored in the present paper adds consistency off the beaten track, leading to safe, sturdy but unremarkable user experiences.

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ADDITIONAL COMMUNITIES AND HUBS HELPING THIS RESEARCH:

IGN Gaming Review Community:
http://www.ign.com/

VR Hardware Review Community:
http://www.roadtovr.com/hardware-reviews/

The UX of VR Curated Knowledge Hub:
http://www.uxofvr.com/

Reddit Occulus Community:
https://www.reddit.com/r/oculus/comments/3yo14m/is_this_the_biggest_vr_community/

Reddit BatmanVR Community (invite only):
https://www.reddit.com/r/BatmanVR/

Reddit PlayStation VR Communities:
https://www.reddit.com/r/playstationvr/

Facebook PlayStation VR Owners Community(Closed Group):
https://www.facebook.com/groups/PSVRowners/

Facebook PlayStation VR Community
https://www.facebook.com/groups/sonypsvr/

Cardboard & VR Developers Community on Google+
https://plus.google.com/communities/111524380182206513071