The Influence of Diegesis on Immersion in First-person Shooter Games

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NOTE BY THE UNIVERSITY

This project report is submitted as an examination paper. No responsibility can be held by London University for the accuracy or completeness of the material therein.
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ABSTRACT

Immersion in video games has only recently been investigated and the steps to immersive design are still proving elusive. Diegesis is a concept that is mostly used in the film industry, although it is becoming more popular in the gaming industry in recent years with more and more games utilizing diegetic features. This paper explores diegesis and how it influences immersion in video games. Diegetic and non-diegetic versions of a game were tested to observe the effect on immersion. Participants played both versions of the game in Study 1. Both versions of the game were seen to be playable. Challenge and concentration were reported to rise in the diegetic version of the game, showing that more attention was required by this version. In Study 2, half of the participants played the diegetic version of the game and the other half played the non-diegetic version. Immersion scores were recorded. There was no difference in the total immersion scores between the game versions; however, a rise in concentration found in Study 1 suggested that the cognitive involvement factor was significantly higher in the diegetic version. Challenge was also found to be higher in the diegetic version, but for expert gamers only. No other significant differences were found. There appears to be some expert–novice differences relating to challenge, cognitive involvement and control. This paper demonstrates that diegesis can have an influence on certain immersive factors in video games. The findings also add to the current work on immersion, proposing that there may be a link between reported cognitive involvement and challenge in experts. Similarities are drawn from the theory of flow, in that, a balance between
challenge and expertise can increase the odds of achieving high immersion. Implications for game designs highlight the potential for designing levels of challenge in different ways.
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Chapter 1. INTRODUCTION

In the last thirty years gaming has increased greatly in quality. From text adventure games such as Adventure and Zork being released in the late 70s and early 80s respectively, where a player must respond to text appearing on the screen by typing to progress through the game, to games such as Skyrim and Battlefield 3, both released in late 2011, in which players use control pads or keyboards and mice to control the movement and actions of a character in a 3D environment. The popularity of computer games has also risen, perhaps as a result of these improvements. The number of latest generation consoles (3rd generation) sold in the United Kingdom was reported to have risen from 13.5 million in 2008 to 22 million in 2009, meaning that there was close to 8 in every 10 households at that time (Wallop, 2009).

Up until recently the literature on immersion in computer games has been quite open to interpretation, leading to the term being used to describe different concepts (Jennett et al., 2008). Immersion in computer games has only recently been fully investigated and defined. Brown and Cairns (2004) attempted this using a grounded theory research approach to come up with levels of immersion. The effects of immersion on players results in high cognitive involvement, real-world dissociation, challenge and other factors that can be associated with high levels of attention and even peak performance. This has led to games being developed to induce high levels of immersion for the purposes of being able to lose yourself in the game and feel
separated from everyday life. However, they are also developed to simulate realistic training and allow for competent task completion.

Video games are widely used for training and recruitment in the United States Army with the game engine from Unreal-2 being used to create military games. These games are created and used to allow an experience that is similar to real life but not dangerous. Smith (2010) points out that play has been used since the Roman Empire to train militants but that development of video games has taken away the burden of moving pieces and calculating outcomes, which allows the players to become more involved in gameplay without delays or distractions (this is to say that they can become more immersed in the training.)

For these reasons, entertainment as well as training, it is important to build our understanding of immersion and what can cause it. Diegesis is a term that is mostly used in the film industry. Non-diegetic elements in films refer to subtitles and the musical score, while diegetic elements refer to the world that the characters live in and can perceive. Likewise, in the gaming industry, diegetic elements are elements that can be perceived by the game characters and are present in the game world (Fagerholt & Lorentzon, 2009). Features such as health bars and ammo status bars are non-diegetic game elements in most games (Taylor, 2002). Diegesis in computer games is becoming more popular. Games such as Dead Space 2 and Far Cry 2 try to keep all of the features diegetic. This study will test how diegetic and non-diegetic game elements interact and whether they influence video game immersion.
Participants in Study 1 played two versions of the first-person shooter (FPS) game Battlefield 3; one version with diegetic and non-diegetic elements and the other with most of the non-diegetic elements removed. They were then asked to fill out a questionnaire assessing the core gaming elements to ensure that both versions were playable. Each participant also had a chance to give their opinion on any differences they found between the game versions. Participants in Study 2 played only one of the two versions and then reported their immersion scores. Particular interest was given to the cognitive involvement factor and challenge factor, which are recorded by the immersion questionnaire as the level of diegesis was expected to influence these factors the most.

In summary, the aim of this study is to investigate the role of diegesis in video games, with emphasis on its affect on gaming experience and immersion. Immersion in games is also focused on as an important factor in video game design and play. The value of this work is that it contributes to our growing understanding of immersion and can give insight into immersive design in the gaming industry.
Chapter 2. LITERATURE REVIEW

Immersion

The term ‘immersion’ is widely used by gamers and game designers, but the concept is used to describe numerous different experiences and feelings within gaming (McMahan, 2003). Brown and Cairns (2004) conducted a study to try to understand what exactly should be understood by immersion in games. A model of immersion in games was developed that included three stages of immersion. Engagement is the first stage, which is followed by engrossment and finally by total immersion. The first stage must always be achieved to be able to experience the second stage and total immersion can only be achieved after experiencing engrossment (Brown & Cairns, 2004). In all of these three stages, there are several barriers that one must overcome if they are to achieve that stage of immersion and progress to the next.

To achieve engagement, a player must, first of all, like the style of the game. This is known as the barrier of access. The controls of the game, along with the feedback, must also be usable and learnable so that the player has the potential to eventually become an expert. Apart from this, the three main barriers to engagement are time, effort and attention (Brown & Cairns, 2004). Players report to be more immersed if they play for long periods of time. Although becoming more immersed with time, this can also come with a sense of guilt among some players. The level of effort invested then needs to be high to be engaged in a game. Effort level can be
encouraged in some games by linking the level of reward with the level of effort required to receive the reward (Brown & Cairns, 2004). For example, more skill points are rewarded in FIFA 12 for completing games on a harder difficulty settings than games on easier settings. This is an expectation with players as well as being a feature designed into some games. The investment of attention relates to a player’s willingness to concentrate. Brown and Cairns (2004) state that the game itself must contribute to this by presenting things that are worthy of the player’s attention. Therefore, the demand for attention seems to rise as the game becomes more immersive.

In the engrossment stage, game construction must be overcome. This is how the features of the game combine to affect the player’s emotions (Brown & Cairns, 2004). The features of the game include the game’s plot, the visual quality and the interest levels of the game tasks. Brown and Cairns (2004) noted that, when a player is engrossed, the game becomes the most important focus of their attention. With this, players can become less aware of their surroundings. The game can also affect the players’ emotions as they can feel connected to the scenario and game characters. The players, at this stage of immersion, have suspended their disbelief of the game world (Brown & Cairns, 2004). In engrossment, players have been known to try to construct a distraction-free environment by dimming the lights and turning up the volume. This can help progression into total immersion.

Total immersion, as described by Brown and Cairns (2004), is similar to a sense of flow; that is, that it is an optimal experience. Like flow, total immersion is also a
fleeting experience, but during these fleeting moments of total immersion, players report that they feel cut off from reality to the extent that the game is all that matters (Brown & Cairns, 2004). This feeling can be found in video games and not just in virtual reality-type games, just as flow is. However, before experiencing total immersion, a player must overcome some barriers, just like in the earlier stages of immersion. A barrier of empathy must be overcome by the growth of attachment the player feels towards a game character and situation (Brown & Cairns, 2004). Having said this, having empathy for either a character or situation is not enough. The player must be attached to the character as well as the scenario they are in, meaning that being attached to the main character but disagreeing with the situation they were put in would block total immersion. The atmosphere of the game also needs to be overcome. The atmosphere of the game includes graphics, plot and sound, but these aspects also need to be relevant to the actions and locations of the characters (Brown & Cairns, 2004); which means that good graphics and sound are not good enough to induce total immersion, but that these graphics and sounds need to relate to the game specifically.

Challenge was noted by Cox, Cairns, Shah and Carroll (2012) to be an important factor in immersion. Specifically within this, cognitive challenge is more important than physical challenge for achieving immersion. Rather than challenge being viewed as a factor simply put forward by a game, Cox et al. (2012) put forward that there is an interaction between the expertise of the player and the challenge of the game. This interaction leads to the perceived challenge of the game. Cox et al.
(2012) also found that when the balance of challenge and expertise was better, the immersion was higher. This is similar to flow theory, as a balance between challenge and expertise can lead to flow. There may be a connection, therefore, between flow and Brown and Cairns’ (2004) concept of total immersion.

Brown and Cairns’ (2004) work on immersion was furthered by Cairns, Cox, Berthouze, Dhoparee and Jennett (2006) and Cox, Cairns, Berthouze and Jennett (2006) to develop a questionnaire for the measurement of immersion in games. This questionnaire was further developed by Jennett et al. in 2008 to further simplify and test it. The current version of the Immersive Experience Questionnaire (IEQ) resulted from this refinement. The IEQ is made up of six sections, which are all derived from previous work on cognitive absorption, presence, immersion (Brown and Cairns, 2004; Cairns et al., 2006; Cox et al., 2006) and flow (Csikszentmihalyi, 1990).

The first three sections of the IEQ are concerned with attention on the task. Basic attention (how focused a participant was), temporal dissociation (the feeling of losing track of time while doing a task) and transportation (the extent to which a participant felt that they were part of the game world more than they felt part of the real world) are the three areas of attention targeted by the questionnaire. The fourth section of the questionnaire is derived from flow theory and the finding that too much challenge can lead to anxiety (Csikszentmihalyi, 1990), which could hinder immersion. Therefore, challenge is assessed. The fifth section is related to emotional involvement. This was shown by Brown and Cairns (2004) to be important in the
form of character and situation empathy and the transfer of consciousness. The last part of the IEQ is enjoyment.

From these sections, five factors emerged that contribute to immersion, which were included in the questionnaire. Cognitive involvement, real world dissociation and emotional involvement are the factors that are attributed to the player, and challenge and control are factors attributed to the game.

To understand the concept of immersion fully, it can be helpful to investigate related concepts. Flow is a concept that is quite closely linked to immersion, and even more so to the concept of total immersion. This can be used to gain a good understanding of the higher end of immersion, as it is an optimal experience.

Flow

Csikszentmihalyi (1990) defines flow as “a state of concentration so focused that it amounts to absolute absorption in an activity.” Flow can be felt in many different tasks including sports, music and video games. Flow is broken up into eight contributing factors, which are; a balance between ability level and challenge, merging of action and awareness (where reactions and controls become automatic responses rather than needing conscious thought), clear goals and feedback, a high degree of concentration, a sense of personal control, a loss of self-consciousness, a distorted sense of time and intrinsically rewarding experience (where the experience needs to be rewarding in itself rather than being done for any reward or external motivation) (Csikszentmihalyi, 1990). Some of these factors should be taken into
account when testing gaming experience. Care should be taken to match skill levels with challenge of the game to allow a balance between the player and the game (Cox et al., 2012). The environment should not be distracting so that the player can concentrate solely on the game. The player should not need to keep track of how long they have been playing so that they can lose track of time without penalty; and the player should like the style and genre of the game they are playing so that they can become intrinsically motivated. All of this should stop external factors from blocking the potential for a positive gaming experience. These features of flow are interesting to note as they overlap with features of immersion. As discussed previously, similarities can be drawn between flow and the highest state of immersion: total immersion. The main difference being that flow is one state of being, while immersion can be graded.

As it is useful to understand the optimum experience of flow, it can also be useful to understand the experiences at the other end of the scale. The core elements of gaming experience were developed to address this. Without these elements, gamers would have negative experiences and not be able to achieve immersion. This is why it is important to understand these elements when dealing with immersion in games.

**Elements of gaming**

Calvillo-Gámez, Cairns and Cox (2010) proposed a new approach for looking at gaming experience. The Core Elements of Gaming Experience (CEGE) were
developed to address the whole experience when gaming, rather than just optimal experience. The CEGE are elements that build up a basic positive experience and, without these elements, the experience would be poor.

The theory is broken up into two main parts: the video-game and puppetry. The video-game refers to the game itself while puppetry is based on the interaction between the game and the player (Calvillo-Gámez, Cairns & Cox, 2010). The video-game is divided into game-play and environment. Game-play is centred around the rules and scenario of the game. A player must understand the game’s rules as well as accepting them. They also must be able to connect with the character and the situation that the character is in. If the scenario is too far fetched for the player, or the rules and scenario don’t match up well, a player might have a negative gaming experience. The environment part of the video-game is how well the game is presented. This means that the graphics can play a part in a positive experience, but there is more to environment than graphics. How realistically the player can interact with the game environment is also a part of this. For example, if a player shoots a wall in Battlefield 3 there is a bullet mark left on the wall afterwards, which reflects positively with the environment gaming element. Likewise, seeing tyre-marks on the road after performing a skid in Gran Turismo 5 is positive but the car coming to an immediate stop after hitting into a ribbon barrier on the side of the road is not realistic and reflects negatively on the environment element. Sound can also add to the environment of a game as seen in Counter Strike when a voice shouts “the bomb has been planted!” (Calvillo-Gámez, Cairns & Cox, 2010).
Puppetry is the other part of the CEGE and is comprised of control, ownership and facilitators. Control is the element that involves the player getting used to how the game works. This includes the physics of the game (how the character moves) and the goals of the game. Learning and being able to use the game controls is important for this element. Knowing how controls cause actions in the game is also important. Ownership is usually achieved after a player gains control. This means that the player feels responsible for all of the actions being done in the game and can relate to what is happening (Calvillo-Gámez, Cairns & Cox, 2010). Facilitators act as a way for a player to reach ownership without necessarily achieving high levels of control. These can be past experiences with the game or similar games or a high level of connection to the scenario or looks of the game (Calvillo-Gámez, Cairns & Cox, 2010). A player’s willingness to play can also act as a facilitator.

These elements all come together to produce a positive experience, which is shown in Figure 1. Calvillo-Gámez, Cairns and Cox (2010) also developed a Core Elements of Gaming Experience Questionnaire (CEGEQ) based on their work to test these elements in video games. This questionnaire is useful to test any changes made to a game to ensure that they do not change the game to produce a negative experience.
The concepts that have been discussed thus far have all been to build up a thorough understanding of immersion in games. Diegesis will now be explained and related to immersion to highlight any connections between the concepts.

**Diegesis in games**

The terms diegetic and non-diegetic originate from the film industry but have gained more relevance in the gaming industry with time. Galloway (2006) described how these terms relate in video games and how they interact with the player (operator) and the machine itself (see Figure 2). The interaction between these four extremes creates two overlapping axes, which results in four separate “moments of gamic action” (Galloway, 2006, p. 8). Galloway defines diegesis as “the game’s total world of narrative action” (p. 7) and non-diegesis as “game elements that are inside the total gamic apparatus yet outside the portion of the apparatus that constitutes a pretend world of character and story” (p. 7–8). From these definitions, it can be seen that the action of pausing the game is a non-diegetic one and shooting a gun in Battlefield 3 is a diegetic action. Likewise, a machine is something that usually has...
an input and output system such as a controller and a screen. In the machine, software and hardware interact to produce the game. An operator is someone who communicates with the machine via the input and output devices, which results in gaming (Galloway, 2006). So diegetic and non-diegetic actions can each be split into two parts: operator and machine.

![Game space diagram](http://example.com)

Figure 2. Game space (Brown, 2009).

Machine acts will be explained first, starting with diegetic machine acts. A good example of a diegetic machine act is what is called the ‘ambience act’. This is the part of the game that runs in the background without any influence from the operator. Grand Theft Auto goes into an ambience act if left idle by the operator. Artificially intelligent characters walk by, traffic lights change and the sun goes down, all with no input from the operator. This act is continuous and unchanging. It
would repeat itself forever if there was no input from the operator. Anything that is
pure machine process can be considered a diegetic machine act (Galloway, 2006), so
artificially intelligent characters and the game environment are good examples of
this.

Non-diegetic machine acts are acts that arrive from outside of the game world
from the machine. So power ups, goals, difficulty adjustment, heads-up display
(HUD) and health packs are all non-diegetic machine acts, but so are software
crashes and network lag. These acts can be split into two types: disabling acts and
enabling acts. A disabling non-diegetic machine act is one that is detrimental to
gameplay in some way (Galloway, 2006). This includes freezes and network lag but
it also includes the most obvious example of a non-diegetic machine act: the ‘game
over’ moment. This is also the most significant non-diegetic machine act as it
signifies the final break in diegesis. Enabling non-diegetic machine acts are acts that
enrich the gameplay (Galloway, 2006). They are the receipt or use of extra lives,
points or checkpoints. These are important for smooth gameplay but they can also
be incorporated into the diegetic world. Leaning against a wall to regain health is an
example. Regaining health is a non-diegetic machine act but leaning against the wall
to do it makes it relate to the diegetic world. Even in the early text game Adventure,
the command for teleportation ‘xyzzy’ was presented as a magic spell. These
features are interesting as they can break the diegesis but they can also be used to
strengthen the belief in the diegetic world. In Metal Gear Solid, for example, one of
the bosses uses his strong psychic powers to render your control port useless, so to
continue the fight, the operator must break from the diegetic world and plug the controller into a different port (Galloway, 2006).

Diegetic operator actions are split into move acts and expressive acts. These acts are what most people think of when they think of video games: things that happen inside the game world and are controlled by an operator (Galloway, 2006). Move acts are anything to do with changing the position of a game character such as walking, jumping, strafing, crouching etc. but move acts also cover change in a character’s gaze to change what is visible in the game environment (Galloway, 2006). These are often controlled with a joystick, arrow keys or analogue sticks and can even be found in games without a character. For example, rotating a piece in Tetris or moving it sideways would be move acts. Expressive acts include any expression made by the player so: use, fire, emote, select, rotate, unlock, apply, cast, examine and talk are all expressive acts. Objects in the game world can be actionable (doors to open, enemies to kill) or non-actionable (the sky, a dead enemy). Actionable objects can be highlighted by the HUD in some games and, in others, actionable objects can only be found by investigation, therefore requiring a more keen sense of attention from the players (Galloway, 2006).

Lastly, non-diegetic operator acts are those that are exterior to the game world, but are integral to gameplay (Galloway, 2006). These acts include pausing the game or changing settings. Setting up a game hack would also be a non-diegetic operator act. These examples are known as setup actions, but configuration actions also exist (Galloway, 2006). Configuration actions are non-diegetic operator actions that are
central to the gameplay. For example, configuring weapons and attacks in Final Fantasy X are important for a positive experience but they are not present in the diegetic space of the game.

Each of the four aspects of the diegetic and non-diegetic all have a role to play in gaming experience and are all present for good reasons. In this paper, the non-diegetic elements of an FPS game will not be completely removed, as they can be important to gameplay, but they will be shifted from non-diegetic space to diegetic space and represented in different ways (See Figure 3).

![Figure 3. Representing non-diegetic elements diegetically.](image-url)
This change from non-diegetic to diegetic in an FPS game should affect participants’ gaming experience in several ways that are related to the factors of immersion which will be explained below.

**This study**

This study is going to test a diegetic and a non-diegetic FPS game with a view to observing the differences in immersion. Editing an FPS game to move the non-diegetic features to a diegetic space will influence immersion scores in a number of ways. The HUD will be removed as well as information given to the player about checkpoints (for a full list, see Chapter 3.Study 1, Design). The rewards in the game (enabling non-diegetic machine acts) such as checkpoints are still present, but their occurrence is not communicated to the player. This type of gameplay is more commonly associated with role playing games than with FPSs (Galloway, 2006) and it could cause a higher level of challenge, as the player cannot relax after crossing a checkpoint, for example. Removing these features may also influence attention levels throughout and require more effort from the player (Galloway, 2006), which should influence immersion (Brown & Cairns, 2004). Cognitive involvement in the game will be effected for similar reasons. Another way the games will differ is that actionable objects such as doors that can be opened will not be explicitly distinct from doors that cannot open. This is reported to increase the level of attention required to progress (Galloway, 2006). Removing these features should increase cognitive challenge in the game and will increase challenge scores on the IEQ as a result (Cox et al., 2012). Attention being three out of the six sections in the IEQ, it is
a large make up of immersion and players will experience a higher level of cognitive involvement as a result of this.

Hypotheses:

H(a)1: The diegetic game will produce higher cognitive involvement scores in the IEQ than the non-diegetic game.

H(a)2: The diegetic interface will produce higher challenge scores in the IEQ than the non-diegetic game.
Chapter 3. STUDY 1

The purpose of Study 1 was to assess two game interfaces using the CEGEQ to measure how both of the versions of the game satisfy the core elements for game experience. The reason for understanding how the versions differed in this sense was, first of all, to make sure that any changes to the original game were not conflicting too heavily with any core element. This would cause the game to be unplayable and would create a barrier to any possible game immersion. Another reason to use the CEGEQ was to analyse how the two interfaces differed in each factor of the questionnaire. If the two interfaces produce different scores for a specific factor, this could go some way to explaining any difference in game experience or in immersion scores.

1. Method

Participants

Nine participants were recruited to be involved in this study from University College London (UCL). All of the participants were acquaintances of the researcher and were recruited from the Human-Computer Interaction with Ergonomics masters course. All of the participants in Study 1 were male and aged between 23 and 31 (M = 26, SD = 2.64). Participants were pre-screened to ensure that they enjoyed playing FPS games, preferably on a PC but also on consoles. This was to ensure that the participants could easily pass through Brown and Cairns’ (2004) barrier of access and experience engagement. All of the participants had over two years of gaming
experience and played games more than once a week for over half an hour. Participants were also paid £5 for taking part in the study.

Materials

A Dell OptiPlex 960s running Windows 7 was used to run the game. It had 3GB RAM, an Intel Core 2 QUAD Q9550 processor, 256MB ATI RADEON 3470 graphics card and combination output, which connected to ear phones or headphones (depending on each participant’s preference). The game was run at a resolution of 1152x648. Although the game was capable of running at a better resolution, this was chosen to give the best balance between looks and game speed. An ambidextrous mouse was provided for input along with use of the computer’s keyboard. On-ear headphones or earphones were provided for audio output or the participant could use their own set. A chair with wheels was provided with adjustable height. There was nothing else located in the room other than the desk with the computer on it and the participant’s possessions, so as to limit distractions.

The game that was chosen for this experiment was Battlefield 3. Several games were studied to find a game that was editable by the researcher appropriately as well as taking advantage of modern technology to produce an up-to-date game that compared well to others on the market. This was an important factor as it was desirable to meet players’ expectations to allow for a positive gaming experience. The level chosen within the game was chosen as it was deemed to be completable in
about 20 minutes. The level was split into five scenes, which could be easily used to
gauge a participant’s progress (20%, 40%, 60%, 80% or 100%).

Game experience was tested using the CEGEQ, which consists of 38 questions
that are each answered using a seven-point Likert scale (see Appendix A). The
CEGEQ was answered twice by each participant (once after each condition).

A semi-structured interview was conducted after the second CEGEQ was filled
out, which asked participants about their thoughts and opinions regarding each
interface and any difficulties or advantages found in either interface (see Appendix
B). Any interesting answers were followed up.

A consent form (see Appendix D) and information sheet (see Appendix E) were
provided to each participant and a MacBook Pro was used to record the audio from
the post-play interview.

Design

A within-subjects design was used with each participant testing two conditions.
One condition of this study will be a level of Battlefield 3 with all of the non-
diegetic information present in the interface. This includes: crosshairs, teammate
markers and names, ammo display, compass, saving notifications, visual objective
notifications (see Figure 4), goal markers (see Figure 4), grenade indicators, item
walkover notifications (see Figure 5) and environment interaction notifications (see
Figure 6). The other condition will be the same level of the game, but with all of this
visual information removed (see Figure 7). There are audio instructions built into the
game to aid goal clarification and objectives, which will be present in both
conditions. So, the independent variable in the study is the presence or absence of
the non-diegetic information. The dependant variable in the study was the scores on
the CEGEQ. The CEGEQ was answered by each participant twice, once after each
of the two conditions. The conditions were counterbalanced to reduce any effects of
learning of the interfaces. The counterbalancing was done by alternating between
which interface each participant received first. Each interface was played using the
same game level, which meant that each participant had to re-play the same level
with a different interface. This was to ensure that the two interfaces were being
tested on one part of the game, which would not differ in any other way. A post-play
interview was also conducted to gain feedback on the experiences of both of the
conditions.
Figure 4. Visual objective notification and goal marker.

Figure 5. Item walk over notification.
Figure 6. Environment interaction notification.

Figure 7. Interface with all non-diegetic information removed
Procedure

The participants were welcomed at reception and brought up to the game lab. They were then presented with a consent form and information sheet regarding the experiment. After these forms were read and signed, the experiment was run through verbally by the researcher. The game was explained as well as the game controls. The participants then adjusted their seat and set up their ear/headphones so they were comfortable. The volume was checked to make sure the level was not too high or low. One of the two conditions were given to the participant to play and they did so for up to 20 minutes or until they completed the game level. After the condition was completed, the researcher was notified and the participants answered the first CEGEQ as the researcher set up the second condition. After filling in the CEGEQ an opportunity was given to the participants to go to the toilet or stretch their legs. After this, the same level of the game was played with the other condition in place. This was played for up to 20 minutes again or until the level was completed. The second CEGEQ was then filled out. After this, there was a brief interview, which lasted up to 10 minutes, which was recorded by the researcher. The participants were then debriefed, thanked for their participation and paid £5. All participants were escorted out of the building after testing.

2. Results

Paired samples t-tests were used to determine whether there was a difference in the core gaming elements between the two versions of the game. CEGEQ scores
were calculated for the diegetic and non-diegetic versions of the game. The mean CEGEQ score for the diegetic version was 185.44 (SD=8.17) and the mean score for the non-diegetic version was 188.56 (SD=14.42).

No significant difference was found between the two versions of the game across the CEGEQ scale (t = 1.309, df = 8, p = .227), the puppetry scale (t = 2.041, df = 8, p = .076) or the video game scale (t = 1.961, df = 8, p = .086). Enjoyment (t = .170, df = 8, p = .870) and frustration (t = 1.019, df = 8, p = .338) were also not significantly different between the two game versions.

A post-game interview was carried out with each participant after they had played both versions of the game to gather opinions on differences between the games and any potential difficulties. Three of the four participants that played the non-diegetic version of the game first stated that they would not have been able to progress through the game if they were given the diegetic version first although, interestingly, four out of the five participants that played the diegetic version first finished the level within the 20-minute time limit the first time around (seven out of nine participants finished the level in total the first time, as seen by Table 1). This shows that the diegetic version of the game was perceived to be more difficult than it actually was, after having used the non-diegetic aides.
Table 1. Participant Performance on First Play

<table>
<thead>
<tr>
<th>Participant number</th>
<th>Game played first</th>
<th>Progress %</th>
<th>Completion time in minutes (if applicable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Non-diegetic</td>
<td>100%</td>
<td>17</td>
</tr>
<tr>
<td>2</td>
<td>Non-diegetic</td>
<td>80%</td>
<td>N/A</td>
</tr>
<tr>
<td>3</td>
<td>Diegetic</td>
<td>80%</td>
<td>N/A</td>
</tr>
<tr>
<td>4</td>
<td>Diegetic</td>
<td>100%</td>
<td>18</td>
</tr>
<tr>
<td>5</td>
<td>Non-diegetic</td>
<td>100%</td>
<td>19</td>
</tr>
<tr>
<td>6</td>
<td>Diegetic</td>
<td>100%</td>
<td>20</td>
</tr>
<tr>
<td>7</td>
<td>Diegetic</td>
<td>100%</td>
<td>16</td>
</tr>
<tr>
<td>8</td>
<td>Non-diegetic</td>
<td>100%</td>
<td>19</td>
</tr>
<tr>
<td>9</td>
<td>Diegetic</td>
<td>100%</td>
<td>17</td>
</tr>
</tbody>
</table>

Another finding from the post-game interview is that all of the participants reported the diegetic version of the game to be more challenging and, when asked, all of the participants reported a higher need for attention in the diegetic version. It is also interesting that the more experienced the participant was at playing FPS games, relatively speaking, the more they enjoyed the challenge of the diegetic version.

3. Discussion

The CEGEQ was used in Study 1 to ensure that edits made to the game were not causing it to be unplayable or significantly more unplayable. There was no
significant result in the core elements of gaming scale in the questionnaire, nor was there a significant result for the two main scales in the questionnaire (the puppetry scale and the video game scale). This showed that any changes made to the game did not affect the core elements of the gaming experience significantly. Frustration and enjoyment score also did not differ significantly between the two game versions. As both of the game versions produced high scores on the CEGEQ, low immersion scores due to a lack of core gaming elements should not be an issue in Study 2. Similarly, any differences found in immersion scores in Study 2 will not be due to any core gaming element being more or less present in either game version.

The post-game interview found that the perceived difficulty of the diegetic version of the game was greater for those who played the non-diegetic version first. This may be due to a dependance built on the HUD elements and map markers (described in Chapter 3. Study 1, Design) while playing the non-diegetic version. This has interesting implications for players’ progression through difficulty levels throughout a game. If the option of both versions are available to a player, then they may chose a diegetic game style for repeat play or if they want a more challenging experience. This increased challenge could also work by forcing a player to play with a diegetic interface as seen by the participants who played the diegetic version first. The participants who played the diegetic version first progressed through the level just as well as the other participants but did still report a higher need for attention (although it should be reiterated here that the participants in this study
were all experienced gamers and these findings may only apply to this type of gamer.)

The other finding of the interview was that the diegetic version of the game was reported to require more of the participants’ attention. All of the participants reported this as well as using words such as “concentration” and “immersion”. The participants that were more experienced seemed to enjoy this heightened level of concentration the most. Due to this finding, information regarding player experience will be collected in Study 2. These findings support hypothesis 1 and 2: that the diegetic game will produce higher immersion scores in the cognitive involvement factor and the challenge factor in the IEQ. This will be tested in Study 2.
Chapter 4. STUDY 2

The purpose of Study 2 was to study the differences between the two interfaces further to see how the differences in the levels of diegesis affected immersion scores. As discussed in the previous section, the two interfaces produced no differences in the CEGEQ, showing that both games are capable of inducing immersive experiences. The two interfaces were tested again but this time focusing on participants’ immersion scores.

Due to the finding in Study 1 that the more experienced players reported high concentration and challenge, expert and novice gamers were recruited to investigate further whether there is any difference between concentration and challenge levels with regards to expertise level.

The method for experiment 2 was the same as that for experiment 1, except for the details below.

4. Method

Participants

Twenty-eight participants were recruited to be involved from the UCL subjects pool. Twenty-one of the 28 participants were male (75%). Participants’ age ranged from 18 to 36 with an average age of 24.25 (SD = 3.89).
Participants were pre-screened to ensure that they had no sight or hearing problems. It was also required, as in Study 1, that they enjoy playing FPS games, preferably on a PC but also on consoles. All of the participants were grouped into an expert or a novice group. Participants either played FPS games for over an hour a week for the last two years or they played less than this. For the purposes of this paper, participants that reported to regularly play FPS games were coded as experts. Every other participant was coded as a novice. Participants were paid £5 for taking part in the study.

**Materials**

The setup of the computer and room used in experiment 1 was used again for experiment 2.

Battlefield 3 was chosen again to control for any possible differences in gaming elements across different games or game levels. The same game level that was used in Study 1 was used again for Study 2.

Immersion scores were tested with the IEQ, which consists of 31 questions that were answered on a 5-point Likert scale (see Appendix C).

**Design**

The two conditions were the same as Study 1: diegetic and non-diegetic interface. For information regarding the specifics of the two interfaces, refer to Study 1.
A between-subjects design was used with each participant testing one of the two interfaces. The independent variable in this study was the interface type. Half of the participants played the game with the diegetic interface and the other half played the non-diegetic interface. The dependant variable in the study was the participant’s score on the IEQ.

**Procedure**

All participants were greeted and introduced to the study as they were in Study 1. After setting up, reading the information sheet (see Appendix F), filling in consent and learning the controls, one of the two conditions were assigned to the participant to play. The participants then played for up to 20 minutes or until they completed the game level. After the level was completed, the researcher was notified and the participants answered the IEQ straight away. The participants were then debriefed, thanked for their participation and paid £5. All participants were escorted out of the building after testing.

**5. Results**

Four participants were removed from the data as outliers because they did not have enough knowledge of FPS games to be able to learn the controls sufficiently for any meaningful gaming experience to occur. The remaining participants were grouped into expert and novice groups. There were 10 experts and 14 novices in this study.
Independent t-tests were used to determine whether there was a difference in immersion scores across the two versions of the game. Cognitive involvement and challenge were then tested to see if the scores differed between the two versions of the game. IEQ scores were calculated for the diegetic and non-diegetic versions of the game. The mean IEQ score for the diegetic version was 123 (SD = 12.22) and the mean score for the non-diegetic version was 118.83 (SD = 11.87).

The immersion scores between the two game versions were found to not be significantly different (t = 0.847, df = 22, p = .203, one tailed). When tests were done on individual factors within the questionnaire, a significant difference was found in the cognitive involvement factor (t = 2.664, df = 22, p = .007, one tailed), showing higher scores in the diegetic version of the game (M = 45.25, SD = 3.17) than the non-diegetic version (M = 40.92, SD = 4.66). No significant difference was found between the game versions with the challenge factor (t = 0.895, df = 22, p = .190, one tailed), which showed a mean of 18.42 (SD = 2.19) in the diegetic version and 17.75 (SD = 1.36) in the non-diegetic version. A full list of means can be seen in Table 2.
Table 2. Mean IEQ scores.

<table>
<thead>
<tr>
<th></th>
<th>Diegetic</th>
<th>Non-diegetic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>123</td>
<td>118.83</td>
</tr>
<tr>
<td><strong>Cognitive involvement</strong></td>
<td>45.25</td>
<td>40.92</td>
</tr>
<tr>
<td><strong>Real-world dissociation</strong></td>
<td>19.5</td>
<td>21.67</td>
</tr>
<tr>
<td><strong>Challenge</strong></td>
<td>18.42</td>
<td>17.75</td>
</tr>
<tr>
<td><strong>Emotional involvement</strong></td>
<td>46.17</td>
<td>44.83</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td>33.08</td>
<td>30.83</td>
</tr>
</tbody>
</table>

After the results of Study 1, a one-way analysis of variance was conducted to investigate how challenge differed when taking gaming experience into account. Participants were divided into four groups: diegetic expert (n = 6), diegetic novice (n = 6), non-diegetic expert (n = 4) and non-diegetic novice (n = 8). Results show a statistically significant difference at the p < .05 level for the four groups: F (3, 20) = 3.9, p = .023. Despite reaching statistical significance, the difference in mean scores between the groups was relatively small. The effect size, calculated using eta squared, was .37. Post-hoc comparisons using the Tukey HSD test showed that the mean score for the diegetic expert group (M = 19.83, SD = 1.94) was significantly different from both the diegetic novice (M = 17, SD = 1.41) and non-diegetic novice (M = 17.5, SD = 1.51) groups. These results are visualised in Figure 8.
Figure 8. Diegesis and expertise effects on challenge.

Any differences in challenge were based on perceived challenge of the game and not on difficulty levels. This can be seen from participants’ performance scores, which show that only four participants in each condition did not progress past the third section of the level out of five (see Table 3).

Table 3. Progress made by participants.

<table>
<thead>
<tr>
<th></th>
<th>Diegetic Novice (n of participants)</th>
<th>Non-Diegetic Novice (n of participants)</th>
<th>Diegetic Expert (n of participants)</th>
<th>Non-Diegetic Expert (n of participants)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N = 6</td>
<td>N = 8</td>
<td>N = 6</td>
<td>N = 4</td>
<td>N = 4</td>
</tr>
<tr>
<td>60%</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>80%</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>100%</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>
Following these results, a one-way analysis of variance was conducted to investigate whether expertise affected any other factors in the questionnaire. No difference was found in the total IEQ scores, with the means of all four groups (expert diegetic M = 129.17, SD = 9.77; expert non-diegetic M = 110.5, SD = 14.25; novice diegetic M = 116.83, SD = 11.91; novice non-diegetic M = 123, SD = 8.65) not differing. However, results showed a statistically significant difference at the p < .05 level for groups under the cognitive involvement factor: F (3, 20) = 5.7, p = .005. The effect size, calculated using eta squared, was .46, showed that the difference in mean scores was relatively small. Post-hoc comparisons using the Tukey HSD test showed that the mean score for the diegetic expert group (M = 46.83, SD = 2.48) was significantly different from the non-diegetic expert group (M = 37.5, SD = 5.45). Results also showed a significant difference in the control factor: F (3, 20) = 4.2, p = .019. The effect size was worked out using eta squared, which shows a small effect size (.39). The Tukey HSD post-hoc test revealed a significant difference between the diegetic expert group (M = 35.5, SD = 1.76) and the non-diegetic expert group (M = 27.75, SD = 4.27). No other differences were observed.

Hypothesis 1 is supported as cognitive involvement rises for the diegetic version of the game. Hypothesis 2 is rejected as challenge was not found to go up with the diegetic version. Hypothesis 2 may be supported with certain types of gamers as seen by significant differences in challenge scores in the diegetic game version among expert gamers.
6. Discussion

The diegetic and non-diegetic versions of the game did not differ on immersion as a whole but some differences were found within the immersion factors. The cognitive involvement factor showed differing scores among participants across the two conditions. The diegetic version produced higher cognitive involvement scores than the non-diegetic version. This supports hypothesis 1.

Challenge was not found to be different across the two game versions so hypothesis 2 was rejected, although a difference was observed when the participants were separated by levels of expertise. The more experienced, or expert gamers in the study reported significantly more challenge in the diegetic version of the game than the novice players did in both versions of the game. This difference was greater in the diegetic version as novices reported less challenge for this game version. As well as this, there was no significant difference between challenge scores given for the non-diegetic version of the game between novices and experts. This indicates that there may be factors in the diegetic game version that only increase challenge to advanced players.

One reason for this finding may be that the shift from non-diegetic to diegetic meant that more things needed to be investigated and remembered in the diegetic version, the ammo count is a good example of this. The novice users may have given up control of the ammo count and left it up to chance, while the more advanced players may have kept a count and replaced guns as they moved through
the level. Although it can be helpful to keep a count of ammo and pick up different guns, it is possible to go through the level without doing this as the character automatically replenishes ammo if he walks over a gun of the same type. It seems feasible that novices may have disregarded ammo count.

When the participants were split into experts and novices, differences were found in the challenge, cognitive involvement and control factors of the IEQ. This indicates that there may be some expert–novice differences in the diegetic features that were tested. The challenge that is reported by novices may be more related to game difficulty while challenge could be linked with the level of cognitive involvement with more experienced players.
Chapter 5. GENERAL DISCUSSION

From non-diegetic to diegetic

As mentioned in the literature review, items in the non-diegetic game were edited to move them to a diegetic representation or remove them completely. Non-diegetic operator acts were kept to a minimum in both conditions. This means that participants were instructed not to pause the game or try to edit settings during gameplay unless absolutely necessary. Of course, the non-diegetic act of the participants finishing gameplay could not be removed, but most non-diegetic operator acts were avoided in both cases. With operator acts in general, the diegetic operator act of expression was edited in the diegetic version as actionable objects in the game were not presented to the player using non-diegetic machine displays (such as doors to open or weapons to pick up, see Figures 5 and 6). Rather, participants had to actively search out actionable objects, which demanded more of their attention (Galloway, 2006).

Non-diegetic machine acts were the main source of change in the two versions of the game. Of course, the disabling act of ‘game over’ was not removed in either version, but the message was less explicit in the diegetic version if a participant died during the level. In the non-diegetic version, the character fell to the ground and a red message was displayed saying “mission failed, you died” (see Figure 9), followed by a loading screen and then automatic resumption at the last checkpoint. While in the diegetic version, the red message was not displayed and nor was the
loading screen. Rather, the player fell to the ground, blacked out and then resumed at the last checkpoint.

![Figure 9. Non-diegetic - Mission Failed](image)

Apart from the disabling acts, many enabling acts were edited in the game. As listed in Study 1: crosshairs, teammate markers and names, ammo display, compass, saving notifications, visual objective notifications (see Figure 4), goal markers (see Figure 4), grenade indicators, item walkover notifications (see Figure 5) and environment interaction notifications (see Figure 6) were all edited in the diegetic game version. While the indicators on screen were removed for all of these, most of them were all still present in the game. Aiming was signified by bullet streams, marks and environmental interaction wherever they hit; teammates were identified by uniform and position in the scene; the ammo was indicated by the character needing to reload; saving still occurred (without any notification); objectives were
communicated by artificially intelligent teammates most of the time (the exception being the beginning of the level, where the character is on his own with only enemies for company) and if they were not, the scenario was clear enough that all participants knew what they needed to do. Knowing where to go was often apparent by the layout of the level as well as lighting over actionable doors; grenades were still visible, although not as visible without the flashing indicator; guns could still be picked up if a character was over them; and actionable doors could still be opened. So only the compass was left without a diegetic counterpart. This was not seen to be detrimental as the compass was not shown to be crucial for gameplay.

**Cognitive involvement**

Cognitive involvement levels were seen to rise in Study 2, which is a result of several factors. A high effort level could be observed in the diegetic game due to the change in representation of the actionable objects. The need for investigation is often seen in role playing games as the goal of those games is about searching for things to interact with (Galloway, 2006), while in FPS games, the objectives usually involve the game presenting the player with actionable objects and then letting players interact with them. A higher need for attention can be seen in the removal of the enabling non-diegetic machine acts such as the ammo indicators and teammate markers. Participants were forced to keep these in mind while playing instead of being able to not attend to the ammo until they chose to in the non-diegetic game.
Challenge

It was noted in Study 1 that the perceived challenge was greater in the diegetic game after having played both versions. The performance scores did not reflect these differences in reported challenge, however (see Table 1). This perceived difference could be due to a dependance built on enabling machine acts in the game, meaning that elements placed in the game to help the player get through the level that are not present in the diegetic world (such as ammo count and map markers) were utilised by participants because they were given to them. Participants that used these elements in their first gameplay did not need to imagine the game without them, or even devise a way to manage without them. On the other hand, participants that played the game for the first time without any of these elements present developed ways of progressing through the game just as well. So even though these elements are reported as crucial to gameplay, players may not be able to accurately reflect on the element’s need as the players never develop an alternative strategy to the one they develop first.

The difference in challenge scores was not found to be significant in Study 2. This may be due to the participants being made up of novice gamers as well as expert gamers. When split into four groups (diegetic expert, diegetic novice, non-diegetic expert and non-diegetic novice), differences were observed. Challenge was rated higher by experts in the diegetic version than the novices in either version, with the greatest difference between the expert diegetic group and novice diegetic group. This implies that removing non-diegetic features increases perceived
difficulty for experienced players only. If more experienced users are using the information given in the non-diegetic displays more, this could lead to a rise in challenge when they are removed, as the cognitive challenge of the game would rise (Cox et al., 2012). When they are removed, the experienced players must attend more to the game to gain the relevant information from diegetic representations of the missing non-diegetic displays (for example, the experienced player may have to think about where to go next by studying the layout of the environment, rather than simply following a map marker). This could lead to higher concentration and also go some way in explaining the higher cognitive involvement observed in Study 2. This kind of concentration can lead to higher levels of immersion. Novice players may not achieve these higher levels of concentration as they might just explore the level using trial and error to find the right path.

**Expertise**

As seen in the results of Study 2, challenge and cognitive involvement were rated significantly higher by experts than they were by novices. Although challenge was rated higher in the diegetic game by experts, the performance scores did not reflect these differences (see Table 3). Linking this with the higher cognitive involvement scores reported among the experts in the diegetic game, it may be that experts are linking challenge with the amount of attention that is needed, while novices rate challenge based on difficulty of the game.
Control was also rated higher in the diegetic game by the expert gamers. Although the controls and graphics were the same in both versions of the game, the expert participants felt more in control of the game when playing the diegetic version. This may be due to the participants needing to keep their attention on the game to remember and find information that is presented to them in the other version, which causes the participants to focus more of their attention on the game and become more connected to the game world.

**Implications**

This paper has several implications for the body of research and industry. In Study 1, challenge was perceived to be higher in the diegetic game and was also reported to be higher in Study 2 for experts only. Not only was this the case, but the higher challenge was reported by participants to be more enjoyable. This has implications for game design for expert gamers. Instead of increasing the difficulty by simply increasing the health of the enemies and lowering the health of the player’s character, this is another way of changing the difficulty level. It should be noted that the actual difficulty of the game does not change with the introduction of these diegetic features, but the perceived difficulty does change, which should be considered also when designing different difficulty levels, as perceived skill is important to achieve immersion (Cox et al., 2012). Attention and cognitive involvement rise to make the connection to the game world without the external help of extra features given to the player by the machine, outside of the game world (non-diegetic machine acts). Scenes must be investigated and caution must be taken
throughout the level (as checkpoints are not communicated). Thought should be
given to the differences between difficulty levels in FPS games because of these
findings. Adding to this, if the game is perceived as more difficult, but performance
is still at the same level, then the players could perceive themselves to have a higher
skill than they are. This could mean that the implementation of diegesis into FPS
games in harder difficulty settings could increase enjoyment, satisfaction and,
possibly, the chance of total immersion and flow.

There seems to be some implications for the research on immersion, as
challenge may be viewed with different priorities, based on one’s expertise level. In
Study 2, the expert participants seem to link challenge with the amount of attention
that needs to be dedicated towards the game, while novices rate challenge based on
the difficulty level. A link between challenge and cognitive involvement could be
made here.

**Future direction**

This paper gives a starting point to the relationship between immersion and
diegesis in FPS games but there are many questions left unanswered. Expert and
novice gamers were both recruited in this study with a view to getting a
representative sample of the gaming community. There seems to be some expert–
novice differences, such as enjoyment levels. As well as enjoyment, there may be
differences between what information is prioritised and attended to in the game
when not all of the information is represented on the screen.
Testing diegesis with experts only may be more suitable to understand how it would effect higher difficulty levels in an FPS game. Expert users may also give a better insight as to why any differences occur and whether they were valuable.

An opportunity is also there to test this concept in different types of games. This paper used an FPS game as it was editable and the elements within the game quite clearly fitted into the four types of diegesis. FPS games are also quite easy to jump into without needing to build empathy with the game and characters to those players who like them. Role playing games and even massive multiplayer online games open up new doors, which should be explored in their own right.

Limitations

The recruitment of novice and expert gamers in Study 2 highlighted some difficulties of recruiting novice gamers. As participants needed to enjoy the style of FPS games to make the transition into immersion easier, it was difficult to find gamers who like FPS games but do not play them. As novices were defined in this study as gamers who played FPS games less than an hour a week, participants may not enjoy these games as much as the more experienced players. A way around this problem may be to recruit more experienced players and categorise them according to level of expertise. So rather than having an expert and novice group, two levels of expert groups may produce more accurate data.
Chapter 6. CONCLUSION

In conclusion, this paper presented the concept of diegesis in games and related it to the growing body of literature on immersion in games. Study 1 allowed experienced gamers to play and compare both diegetic and non-diegetic games and found that challenge was higher in the diegetic version and that the challenge was enjoyable. The diegetic game was also perceived to be harder than the non-diegetic game, but performance scores did not reflect this. The games were shown to both have the CEGE for a positive experience and, so, were further tested. Study 2 assessed immersion differences between the two games with the expectation of the diegetic game having higher cognitive involvement (H1) and challenge (H2) than the non-diegetic game. Hypothesis 1 was confirmed but hypothesis 2 was not, although challenge was higher in the diegetic game for experts than it was for novices. This difference led to further investigation into expert–novice differences and it was found that there are differences in cognitive involvement, challenge and control, all higher for experts. This showed a connection in the reporting of cognitive involvement and challenge for experts. The results also showed that diegesis can have an influence in immersion and this has implications for the design of games, specifically the differences between difficulty settings, going forward.
REFERENCES


APPENDIX A - CORE ELEMENTS OF GAMING QUESTIONNAIRE

Please read the following statements and answer by marking or circling one of the numbers that best describes your experience. 1 indicates that you completely disagree with the statement and 7 indicates that you completely agree with the statement.

1. I enjoyed playing the game
   1 - 2 - 3 - 4 - 5 - 6 - 7

2. I was frustrated at the end of the game
   1 - 2 - 3 - 4 - 5 - 6 - 7

3. I was frustrated whilst playing the game
   1 - 2 - 3 - 4 - 5 - 6 - 7

4. I liked the game
   1 - 2 - 3 - 4 - 5 - 6 - 7

5. I would play this game again
   1 - 2 - 3 - 4 - 5 - 6 - 7

6. I was in control of the game
   1 - 2 - 3 - 4 - 5 - 6 - 7

7. The controllers responded as I expected
   1 - 2 - 3 - 4 - 5 - 6 - 7

8. I remember the actions the controllers performed
   1 - 2 - 3 - 4 - 5 - 6 - 7

9. I was able to see on the screen everything I needed during the game
10. The point of view of the game that I had spoiled my gaming

11. I knew what I was supposed to do to win the game

12. There was time when I was doing nothing in the game

13. I liked the way the game looked

14. The graphics of the game were plain

15. I do not like this type of game

16. I like to spend a lot of time playing this game

17. I got bored playing this time

18. I usually do not choose this type of game
19. I did not have a strategy to win the game

20. The game kept constantly motivating me to keep playing

21. I felt what was happening in the game was my own doing

22. I challenged myself even if the game did not require it

23. I played with my own rules

24. I felt guilty for the actions in the game

25. I knew how to manipulate the game to move forward

26. The graphics were appropriate for the type of game

27. The sound effects of the game were appropriate

28. I did not like the music of the game
29. The graphics of the game were related to the scenario
   1 - 2 - 3 - 4 - 5 - 6 - 7

30. The graphics and sound effects of the game were related
   1 - 2 - 3 - 4 - 5 - 6 - 7

31. The sound of the game affected the way I was playing
   1 - 2 - 3 - 4 - 5 - 6 - 7

32. The game was unfair
   1 - 2 - 3 - 4 - 5 - 6 - 7

33. I understood the rules of the game
   1 - 2 - 3 - 4 - 5 - 6 - 7

34. The game was challenging
   1 - 2 - 3 - 4 - 5 - 6 - 7

35. The game was difficult
   1 - 2 - 3 - 4 - 5 - 6 - 7

36. The scenario of the game was interesting
   1 - 2 - 3 - 4 - 5 - 6 - 7

37. I did not like the scenario of the game
   1 - 2 - 3 - 4 - 5 - 6 - 7

38. I knew all the actions that could be performed in the game
   1 - 2 - 3 - 4 - 5 - 6 - 7
APPENDIX B - POST GAMING INTERVIEW

Which game did you like playing the most?

Which game did you like the look of most?

Did you feel that you needed to pay more attention to either game?

Were there any issues that annoyed you in either game?

If you had a choice, which one would you play again?

Do you think you would have benefitted from any training?

Is there anything else you felt about the games that I should know?

Other questions that frequently came up:

So which bits would you take from the heads up display that are most important?

If you were to play through the same level again which version would you chose to play?
APPENDIX C - IMMERSIVE EXPERIENCE QUESTIONNAIRE

YOUR EXPERIENCE OF THE GAME
Please answer the following questions by circling the relevant number. In particular, remember that these questions are asking you about how you felt at the end of the game.

Gender (Please circle): Male     Female

Age:     _____

1. To what extent did the game hold your attention?
   Not at all 1 2 3 4 5 A lot

2. To what extent did you feel you were focused on the game?
   Not at all 1 2 3 4 5 A lot

3. How much effort did you put into playing the game?
   Very little 1 2 3 4 5 A lot

4. Did you feel that you were trying you best?
   Not at all 1 2 3 4 5 Very much so

5. To what extent did you lose track of time?
   Not at all 1 2 3 4 5 A lot

6. To what extent did you feel consciously aware of being in the real world whilst playing?
   Not at all 1 2 3 4 5 Very much so

7. To what extent did you forget about your everyday concerns?
   Not at all 1 2 3 4 5 A lot

8. To what extent were you aware of yourself in your surroundings?
   Not at all 1 2 3 4 5 Very aware
9. To what extent did you notice events taking place around you?
   Not at all 1 2 3 4 5 a lot

10. Did you feel the urge at any point to stop playing and see what was happening around you?
    Not at all 1 2 3 4 5 Very much so

11. To what extent did you feel that you were interacting with the game environment?
    Not at all 1 2 3 4 5 Very much so

12. To what extent did you feel as though you were separated from your real-world environment?
    Not at all 1 2 3 4 5 Very much so

13. To what extent did you feel that the game was something you were experiencing, rather than something you were just doing?
    Not at all 1 2 3 4 5 Very much so

14. To what extent was your sense of being in the game environment stronger than your sense of being in the real world?
    Not at all 1 2 3 4 5 Very much so

15. At any point did you find yourself become so involved that you were unaware you were even using controls?
    Not at all 1 2 3 4 5 Very much so

16. To what extent did you feel as though you were moving through the game according to your own will?
    Not at all 1 2 3 4 5 Very much so

17. To what extent did you find the game challenging?
    Not at all 1 2 3 4 5 Very difficult

18. Were there any times during the game in which you just wanted to give up?
19. To what extent did you feel motivated while playing?
   Not at all 1 2 3 4 5 A lot

20. To what extent did you find the game easy?
   Not at all 1 2 3 4 5 Very much so

21. To what extent did you feel like you were making progress towards the end of the game?
   Not at all 1 2 3 4 5 A lot

22. How well do you think you performed in the game?
   Very Poor 1 2 3 4 5 Very well

23. To what extent did you feel emotionally attached to the game?
   Not at all 1 2 3 4 5 Very much so

24. To what extent were you interested in seeing how the game’s events would progress?
   Not at all 1 2 3 4 5 A lot

25. How much did you want to “win” the game?
   Not at all 1 2 3 4 5 Very much so

26. Were you in suspense about whether or not you would win or lose the game?
   Not at all 1 2 3 4 5 Very much so

27. At any point did you find yourself become so involved that you wanted to speak to the game directly?
   Not at all 1 2 3 4 5 Very much so

28. To what extent did you enjoy the graphics and the imagery?
   Not at all 1 2 3 4 5 A lot
29. How much would you say you enjoyed playing the game?
   Not at all  1  2  3  4  5  A lot

30. When interrupted, were you disappointed that the game was over?
   Not at all  1  2  3  4  5  Very much so

31. Would you like to play the game again?
   Definitely not  1  2  3  4  5  Definitely yes
APPENDIX D - CONSENT FORM

Consent Form

Title of Project: Diegetic Interfaces and Their Influence on the core gaming elements and immersion
This study has been approved by the UCL Research Ethics Committee as Project ID Number: MSc/1112/002

Participant's Statement

I agree that I have

- read the information sheet and/or the project has been explained to me orally;
- had the opportunity to ask questions and discuss the study; and
- received satisfactory answers to all my questions or have been advised of an individual to contact for answers to pertinent questions about the research and my rights as a participant and whom to contact in the event of a research-related injury.

I understand that I am free to withdraw from the study without penalty if I so wish, and I consent to the processing of my personal information for the purposes of this study only and that it will not be used for any other purpose. I understand that such information will be treated as strictly confidential and handled in accordance with the provisions of the Data Protection Act 1998.

Signed:__________ Date:__________

Investigator's Statement

I confirm that I have carefully explained the purpose of the study to the participant and outlined any reasonably foreseeable risks or benefits (where applicable).

Signed:__________ Date:__________
APPENDIX E - INFORMATION SHEET STUDY 1

Information Sheet

<table>
<thead>
<tr>
<th>Title of Project: Diegetic Interfaces and Their Influence on the core gaming elements and immersion (study 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>This study has been approved by the UCL Research Ethics Committee as Project ID</td>
</tr>
<tr>
<td>MSc/1112/002</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name, Address and Contact Details of Investigators:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Richard Kennedy</td>
</tr>
<tr>
<td>UCL Interaction Centre</td>
</tr>
<tr>
<td><a href="mailto:richard.kennedy.11@ucl.ac.uk">richard.kennedy.11@ucl.ac.uk</a></td>
</tr>
</tbody>
</table>

We would like to invite you to participate in this research project. You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, please read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or you would like more information.

Details of Study

This study is testing the core elements of gaming experience in a first person shooter game using different user interfaces. You will be shown the game and the controls will be explained to you. After you are comfortable with the game, you will play through the campaign mode for about 20 minutes or until you complete the game level uninterrupted. After this, the researcher will notify you and you will then stop playing. You will then fill in a questionnaire measuring the core elements of gaming experience, which consists of 38 short questions. You will then play through the same level of the game but with a different interface. After this, you will fill in the core elements of gaming experience again. A short interview will be conducted after the second gameplay session (about 10 minutes) and the audio will be recorded. The whole experiment should last about an hour. You will then receive £5 for taking part. Please feel free to ask any questions as they arise or email me after the experiment with any questions.

It is up to you to decide whether or not to take part. If you choose not to participate, you won't incur any penalties or lose any benefits to which you might have been entitled. However, if you do decide to take part, you will be given this information sheet to keep and asked to sign a consent form. Even after agreeing to take part, you can still withdraw at any time and without giving a reason.

All data will be collected and stored in accordance with the Data Protection Act 1998.
APPENDIX F - INFORMATION SHEET STUDY 2

Information Sheet

Title of Project: Diegetic Interfaces and Their Influence on the core gaming elements and immersion (study 2)
This study has been approved by the UCL Research Ethics Committee as Project ID
Number: MSc/1112/002
Name, Address and Contact Details of Investigators:
Richard Kennedy
UCL Interaction Centre
richard.kennedy.11@ucl.ac.uk
We would like to invite you to participate in this research project. You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, please read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or you would like more information.

Details of Study

This study is testing the levels of immersion in a first person shooter game using different user interfaces. You will be shown the game and the controls will be explained to you. After you are comfortable with the game, you will play through the campaign mode for about 20 minutes or until you complete the game level uninterrupted. After this, the researcher will notify you and you will then stop playing. You will then fill in a questionnaire measuring immersion, which consists of 31 short questions. The whole experiment should last about half an hour. You will then receive £5 for taking part. Please feel free to ask any questions as they arise or email me after the experiment with any questions.

It is up to you to decide whether or not to take part. If you choose not to participate, you won't incur any penalties or lose any benefits to which you might have been entitled. However, if you do decide to take part, you will be given this information sheet to keep and asked to sign a consent form. Even after agreeing to take part, you can still withdraw at any time and without giving a reason.

All data will be collected and stored in accordance with the Data Protection Act 1998.