

# **University of Portsmouth**

## **School of Creative Technologies**

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Light at the End of the Tunnel

By

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### **Abstract**

**This study was designed to investigate the impact of lighting in a First Person Shooter game world environment on a player's decision making processes in relation to previous research in the field of experimental psychology and games research.**

**The study used a level built in UnrealEd 2, with two distinctive lighting versions which were designed to direct players to follow particular paths through the level. It was predicted that players would follow these lighting cues and take the routes intended by the design.**

**It was shown that, whilst players did show a tendency to follow the expected routes, the effect was far less pronounced than was predicted. It was shown that other design aspects such as music played a large role in influencing a player also, as well as psychological preconceptions of what to expect when playing a game in the First Person Shooter genre. Previous gaming experience also appears to have an impact on how players make decisions and the possible influence a level designer can hope to have over these decisions.**

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### I. Introduction

Light is not so much something that reveals, as it is itself the revelation. (James Turrell – Light as a medium, 2008)

Lighting is an aspect of game design that can often be taken for granted. This study looks at the way lighting can be used to an extent that has arguably not yet been fully realised in the majority of released games; to directly influence a player's decision making process.

Survival Horror games, pioneered predominantly by *Alone in the Dark* (1992), *Resident Evil* (1996) and *Silent Hill* (1999), are the genre which makes the most use of lighting to influence game play. However, it is often used in very simple, standardised ways that make use of light, darkness and colour in only a very basic manner. This is portrayed well in much more recent releases such as *LIT* (2009), in which players must move between shadows using illuminated paths. The basic premise in the game is that light is life; darkness is death. This is not to say, of course, that games using lighting in this manner cannot be successful; but could a more complex variety of lighting techniques and uses make games based around there use even more so?

Is it possible to influence how a player behaves, the choices they make when playing a game and the experience they take away from it solely through the use of various lighting techniques? What implications could this have for level design? Ultimately, can making a greater use of lighting as a game play mechanic result in games that are more entertaining?

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Before looking at how lighting can be used to manipulate a player into making specific choices, it is important to step back and look at how the use of lighting is perceived in games currently. In many instances, it is seen as mainly being a major part of the overall level design process and is covered as such in numerous publications and articles; little attention is given to its other possible applications.

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Byrne (2004) states that "Dramatic lighting is critical to the look and feel of your levels". This use of lighting as an aesthetic feature is the use that is often seen as the most crucial; in some cases, this is seen as its only use. To look at lighting this way is to look at it through the eyes of a television or cinema director. In cinema, lighting is a major part of the *mise-en-scène*, a term defined by Robert Kolker as "the use of space within the frame: the placement of actors and props, the relationship of the camera to the space in front of it, camera movement, the use of color or black and white, lighting, the size of the screen frame itself" Kolker (1999). This definition of *misé-en-scène* and the categorisation of lighting within it can be carried over to game worlds, however the free navigation afforded by games requires it to be modified and for designers to "look to other practices outside of filmic media" Niedenthal (2005, pg. 2).

A cinematic approach to game lighting is appropriate as a means of analyzing pre-rendered cut scenes, as well as useful in helping us understand larger lighting strategies that relate to game genres, time of day, narrative elements and mood. (Niedenthal, 2005, pg. 3)

When players are given the freedom to move around an environment freely, they are given the ability to see the world from any angle. The lighting for a game level needs to have more function than simply creating atmosphere; it needs to guide a player's eye so that they can pick out important aspects of the world and make sense of their surroundings. To consider lighting as a tool to be used solely to create mood, atmosphere and emotion without regard for its other applications is to take away a tool that can be used to directly influence game play.

The idea of guiding a player and directing their attention is one that is often seen to be achievable only through more obvious methods, such as objects flying past the player, loud noises or the placement of desirable items (for example weapons, ammunition, health or other powerups) such as the examples selected from *Half Life 2: Episode 2* (2007) by Gallant

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(2009). These methods are also often employed in the Survival-Horror genre, such as *Resident Evil (1996)*.

However, the human brain is highly sensitive and can detect changes in more subtle areas such as lighting, contrast and colour. It is yet to be fully explored through research whether lighting alone can be isolated and used to control a player's decision making. Game design tends towards the explicit rather than the implicit, which does not give players the credit due to them; they do not necessarily need obvious signposting within an environment in order to know what to do or how to continue forward.

It may be more beneficial, instead of associating game world lighting with the lighting used in films, to compare it to how lighting is used in theatre. A basic example that could easily be applied to a game scenario is the use of lighting to attract attention or to detract attention from something else. On stage, spotlights are used to draw attention to the character or characters in the scene, or used to help distract from something the audience is not intended to pay attention to, such as a scene change.

The above example is only very basic, but the principal is clear. Applied to games, these techniques have the potential to give a level designer much greater control over the experience the player receives by allowing much more refined, structured environments to be created.

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### II. Lighting in Games as a Game Play Mechanic

The *Thief* series, in particular *Thief: Deadly Shadows* (2004), is one of the earlier examples of how light can be turned into a game play mechanic, rather than simply an aesthetic aspect of the game. The player knows that by staying in shadow, they are hidden from enemies and thus safe from attack. The game levels often had multiple methods for completing the objectives, some safer than others and some using different methods to others. However, it was down to the player to make a decision as to which route offered the most advantage to them.

Given the type of game play presented in the *Thief* series, it is difficult to ascertain a player's reasoning behind their decisions whilst playing. The player expects to have to use stealth, and they expect to use darkness as safety. This is in direct conflict with the more primal response to darkness, which is of an area that is unsafe.

It is necessary then, if one is to analyse the effect of lighting on decision making in an unbiased manner, to use a game environment in which the player is not going to view darkness as safety.

This is the case in most First Person Shooter (FPS) games. *Doom 3* (2004) for example uses a lot of dark environments, giving the player a flashlight as the only means of illumination. This flashlight cannot be held along with a weapon however, which is a mechanism used to create tension. In this situation, a player is likely to seek out light areas for safety.

At a basic level, these games are based on human connotations of light and dark. While the difference between them may appear obvious, they may mean different things to different people, meaning these people may approach game situations differently.

For example, if a player is faced with a choice of two paths, one brightly lit and the other in relative darkness; to some people, the darkness will signify danger and they will take the well lit route. However, to others the darkness may signify mystery and they may want to



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investigate to see if anything is hidden in the dark route; the idea that "if you don't want the player to go somewhere then shroud it in darkness" Hale (2009) is not something that can be taken literally with regards to all types of players.

Is it possible to have direct control over how a player will respond to this situation? Can an individual's own personal preferences be overwritten by careful, targeted use of specific lighting?

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### III. Evaluation of Previous Research in the Field

There has been very little in the way of empirical research into the specific topic of influencing player decision making with the use of lighting. There have been however, a number of papers written that suggest theories that can be used as a basis for building more specific research on.

(Knez & Niedenthal, 2008) carried out research that looked at the effects of different coloured lighting models on player perception and performance. Using a 'maze' level design and three lighting models – "warm" reddish, "cool" blueish and "neutral" greyish – participants were asked to play through the level, and were scored on performance (how quickly they finished the level) and perception. Perception was rated by asking participants to give number values to various adjectives with relation to how well they felt they described the level; for example rating the adjective 'beautiful' as 5 would mean the player felt that the level was very beautiful.

The findings of this study suggested that players felt more relaxed in the warmer (red) lighting model than in the others. Whilst the research tentatively suggests that there could be a correlation between this feeling of relaxation and the finding that there was heightened performance of players under this lighting condition, it does not have adequate results to confirm this suggestion.

Regarding the players' perception of the lighting, it was found that players felt "happier" under the warm lighting condition as well as more "enthusiastic". The neutral lighting condition did not make players feel strongly either way, whilst the cool lighting made players less happy and enthusiastic.

Whilst these findings can be taken into consideration by level designers, their downfall is that this research did not emulate a typical FPS game experience. There was no combat (or threat of attack) meaning that players were not analysing the lighting on a tactical level. This

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is, as demonstrated by games such as those aforementioned, a vital part of creating exciting game play.

El-Nasr, Vasilakos, Rao & Zupko, (2009) address this issue, whilst also moving away from using only coloured lighting to test affect on players, with their research also looking at brightness, contrast and orientation of lighting.

They propose a system called ALVA (Adaptive Lighting for Visual Attention) which is a method for ensuring that game environments are lit in such a way as to draw attention to important aspects, such as enemies, key characters and items. They argue that, when lighting is not employed in a way that allows the player to quickly identify important aspects of an environment, it can lead quickly to player frustration.

The research involved participants playing two versions of a game level, one lit using static lighting (baked lightmaps) which was not conducive to easy visual identification of enemies by the player. The other was lit using full dynamic lighting, which balanced the lighting in the level to provide a better contrast and thus draw attention to key aspects, such as enemies waiting to attack the player.

Their results show that the participants (which were made up of a group consisting of skilled and unskilled gamers) became far less frustrated in the dynamically lit environment, as they died less often from enemy attacks, due to being able to spot threats far more quickly.

This study too has shortcomings, many of which are analysed post-study by the researchers. The issue which may have caused biasing of the results was that "participants were asked to play the same game in session 1 and 2. While we changed the order to balance the order bias, we believe participants will still be a little better in the second round due to knowledge of the level". This is an important aspect to note, as the affect of lighting on a player can only accurately be judged when they have no prior knowledge of the environment they are in.

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There is also an overarching issue with research of this nature; the gathering of a large amount of quantitative, statistical data. Given the subject matter, it may be more beneficial to interview participants in addition to this statistical research to gain more insight into what they were feeling and thinking as they played. This will allow the research to determine to a far greater extent the precise effects of lighting on player conscious or unconscious decisions.

The next step that needs to be taken in this area of research is to study the effects of lighting in a realistic game play context, whilst using participants that have no prior knowledge of the game environment before they play. These players then need to be interviewed to gain richer data. It also needs to be deduced whether or not lighting can be used as a way of making players make decisions that they would otherwise not normally take. If the player that would normally see darkness as dangerous can be made to choose a dark route over a well illuminated route, it will show that lighting has as much power, if not more than other level design aspects, such as architecture or sound in dictating player behaviour.

This control over a player's decisions can be achieved by taking classical psychological research as a basis when constructing game environments. The cognitive-behavioural approach to psychology places a heavy emphasis on the use of two types of 'conditioning'; Classical and Operant.

Classical conditioning can be defined as "a type of learning in which a stimulus acquires the capacity to evoke a *reflexive* response that was originally evoked by a different stimulus" (*Psychology Class Notes : Psychology of Learning and Conditioning, n.d*). Applied to games, this technique could be used to make players associate stimuli in a level in a different way to how they may do in real life. For example, always having illuminated paths lead to something desirable such as a powerup would condition players to follow them. This could then be used to set a trap in a later stage of the game, by luring players towards enemies.

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Operant conditioning can be defined as “a type of learning in which voluntary (controllable; non-reflexive) behaviour is strengthened if it is reinforced and weakened if it is punished (or not reinforced)” (*Psychology Class Notes : Psychology of Learning and Conditioning, n.d.*).

Taking the previous example of an illuminated pathway once more, placing desirable items at the end strengthens this behaviour and encourages the player to repeat it when they find other pathways they can follow. Placing an ambush or trap along it may lessen the likelihood of players repeating this behaviour.

By using a careful balance of these types of conditioning, a level designer can more reliably predict how a player may move through an environment. The environment used in this study has been designed to take advantage of this conditioning theory, as well as looking at other possible methods of influencing a player's decisions.

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### **IV. Methodology**

#### **i. Participants**

Fifteen people participated in the study (12 males, 3 females). All were recruited from within the University of Portsmouth, and ranged in age from 18 years to 28 years old. Participants were recruited from a variety of courses in the faculty of Creative & Cultural Industries. Each participant was asked to rate their skill level as Novice, Intermediate or Experienced in three categories: Console Gaming Skill, PC-Based Gaming Skill, and FPS Gaming Skill. All participants were asked to confirm that they were free of vision problems and did not suffer from any photosensitive conditions.

#### **ii. Research Environment**

The research was not carried out in a fully controlled environment due to space restraints within the University. However to counter this, research was only carried out during quieter periods where external distractions would have only minimal impact on each participant. Noise isolating earphones were used to again reduce the likelihood of external distractions. The lighting in the research area was kept as low as possible to allow the lighting variations in the game environment to stand out, however participants were asked before commencing the research if the lighting level was acceptable for them. This was to prevent participants suffering from eye strain after prolonged playing periods.

#### **iii. Analytical Stimuli**

Previous experiments, as well as numerous theoretical papers have covered the topic of lighting *colour*. This has been shown to have an impact on players' mood and emotion; an effect that is in keeping with findings from psychological research such as carried out by Knez (2001) and to a greater extent by Knez & Niedenthal (2008).

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However, in targeting this study specifically at lighting's effect on decision making, the decision was made to use mainly white lighting and variations of it, such as flickering and pulsing lights. Coloured lighting is only used in the context of the environment; for example, an activated machine glows green whilst an inactive or locked machine glows red. This is intended to remove the possibility of colour association, beyond that which would be expected in an average gaming situation, as it could lead to biased results. There is only one point in the level, which is outlined in the Results chapter, where the study looks at the effect of coloured lighting. This was added to the environment in order to have some statistical results to use should lighting colour be quoted as being important in games in the opinion of the participants.

#### **iv. Design**

The game environment has been built in UnrealEd 2, the map editor that retails with the game *Unreal Tournament 2004* (2004). It has been carefully designed to simulate a 'real-world' situation that could be presented in any retail FPS game. The environment is designed in a circular fashion (known as a 'hub' design) in which the player must locate and activate five computer terminals. Doing this allows the player access to the final part of the level.

The intention of this design was to study the effects of lighting in the least detached manner possible. By presenting it in a believable game environment in which the player is asked to carry out relevant tasks the results should be more applicable to level design on a wider scale. For this reason also, an element of combat was included (utilising a third-party toolset for adding Artificially Intelligent enemy characters into the standard multiplayer engine). Areas where combat occurs are specifically chosen so that it does not interfere with the collection of lighting data.

Two versions of this environment were used in the study, each of which had alterations made to its lighting model. Each model was intended to draw the player through the hub

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area in a different direction. Within this structure, each model was intended to make players make different decisions at specific points throughout the level.

### **v. Analyses of Game Play Data**

For each lighting model, a list of points at which players would have to make decisions was created (Appendix I & II). The demonstration video on the attached DVD shows each of these points. The list of time stamps in (Appendix VI) shows where in the video each can be seen.

Only the first action the player took when reaching each point was recorded, as this was seen to be the most unbiased manner of measuring reaction to a stimulus. Any further action taken by the player in relation to each point of analysis was noted, but was not taken into account when collating the final data.

The points being analysed in the level were broken down into categories: Guiding the Player and Attracting the Player.

Guiding the player consists of using directional lights, such as spotlights, to emphasise a particular path through the environment. It also consists of using lighting to illuminate paths along the floor for the player to follow.

Attracting the player consists of using lighting in such a way as to draw the player in to that part of the environment. This could be done by way of placing lighting in or around an area that would not usually be on the player's direct path.

All recorded data was also checked against the digitally recorded videos of each participant's play session to ensure accuracy.



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### **vi. Analyses of Interview Data**

Each participant was asked to partake in a short semi-structured interview when they had completed their play session.

The data gathered from these interviews forms the basis of the conclusions drawn from this study. The empirical data gathered from the game play sessions was used to inform these conclusions further, giving them greater context.

### **vii. Procedure**

Each participant was brought into the research area, and briefed on what would be required of them during the experiment. Each was asked to fill in a questionnaire asking them to categorise their skill in the areas of Console Gaming, PC-Based Gaming and FPS Gaming as Novice, Intermediate or Experienced. The questionnaire also asked participants to write which genre of games they preferred to play.

Participants were allowed to play an unrelated level to practice if they were not already familiar with the game play.

The participant was then asked to play through the research environment. The participants were informed that the level was part of a larger campaign in a hypothetical game in order to give it a context. They were also informed that they had ten lives and to play as they normally would. The specific aim of the research was not given so to avoid biasing results, however participants were informed that all data would be useable, regardless of their game play performance; this was intended to minimise the effect of the Observer's Paradox.

Whilst participants played through the environment, the researcher observed and recorded the relevant data in relation to the key points in the level that were being analysed.

Each participant completed a short recorded interview after their play session, conducted by the researcher. The questions (Appendix III) were open to allow feedback to be as

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genuine a response from the participant as possible. If a point of particular interest had been noted during the play session, the researcher asked about this specifically to gather further data on it. Interview transcripts can be read in Appendix X.

Debriefing of participants was carried out via email after the research had been completed, to avoid the possibility of participants passing information between each other, biasing results.

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### **V. Analysis of Binary Decision Points**

As participants played through the research level, they had to make decisions at specific points. These were, in every case apart from one, always binary decisions with two possible outcomes such as going left or going right. The devices used to create these decisions for the player are broadly grouped into points that attempt to 'Guide the Player' and those that attempt to 'Attract the Player'.

This chapter will look at key findings from the data gathered from these decision points during the play sessions of each participant. The decision ratios for each Analysis Point in the level are shown in the table in Appendix V, with the full statistical data available in Appendix IX. A list of the Analysis Points along with their timestamps in the Reference video can be found in Appendix IV.

The results are based on the data collected from all fifteen participants. One participant did not provide data for some Analysis Points, due to ending the experiment early; these points are shown in the results table in Appendix VI, marked as 'One Result Not Used'. Out of the fifteen participants, eight played Lighting Model A and seven played Lighting Model B. The ratios used in the results reflect this.

The statistical results were collated and analysed to define which points in the level appeared to have the biggest effect on player decision making. For each point being analysed, the number of participants that made the 'expected' decision – the decision that the lighting was designed to entice them into making – was contrasted with the number of participants that made the 'unexpected', or opposite decision. These ratios were then cross-referenced with what participants had stated in their interviews to identify patterns and relationships between them.

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### **i. Influence of Lighting on Players versus the Influence of Other Factors**

After analysing the decision ratios from all Analysis Points, it is clear that there is a definite split between the Analysis Points which resulted in a heavy bias towards a particular decision being made and the Analysis Points which did not provoke a strong response of one particular decision over the other.

Looking closer at particular Analysis Points that provoked strong responses shows that there is a pattern emerging amongst a particular type of decision; it appears that a noticeable difference in decision weightings occurs when the binary decision is between moving towards something emphasised by lighting, against moving towards something that could be seen as a more 'traditional' guide to a player. There are numerous examples of this throughout the data collected.

#### ***Light versus Proximity***

Analysis Point 2 of 'Guiding the Player' (Appendix VIII) gives the player the choice of either following a row of green lights towards a door on the opposite side of the room, or simply going through the door that is next to them. Both lead to the same place, however taking the route further from them allows them to bypass combat with an enemy. The majority of participants took the route closest to them. This suggests that lighting alone is not a method powerful enough to make a player exert extra effort to reach something farther from them.

Analysis Point 3 of the same section gives the player the choice of leaving a room via an exit on the ground floor, or an exit on a catwalk on the level above them. One lighting model emphasises the lower exit with bright lighting whilst the other emphasises the upper exit. Despite this, the majority of participants across both lighting models took the lower exit, which is the route nearer to them as they enter the room on the lower level. Again, this suggests that players are more inclined to head towards things in closer proximity to them

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over things farther away, even if the farther away object or route is being portrayed as the preferable way to proceed.

### ***Light versus Desirable Items***

One aim of this research was to investigate whether players could be conditioned to prioritise signposting through the use of lighting over more traditionally desirable items such as powerups, weapons and ammo. Analysis Point 4 of 'Guiding the Player' suggests that this is not possible, at least in a situation where the player has not been immersed in the game for a shorter period.

This Analysis Point placed the player in a corridor which was lit on one side using the 'pathway lighting' method described in the Glossary of Terms and in Appendix VIII. The opposite side was unlit, but had a health pack placed on it. One lighting model turned the pathway lights off whilst the other left them on. If players followed the side of the corridor away from the health pickup, they would be rewarded with a better position from which to attack the enemies in the following area.

Regardless of the state of these lights, the majority of players headed immediately for the health pickup, even if their health was not low. This would suggest a predisposition amongst gamers of all experience levels to prioritise objects that are of immediate benefit to them rather than methods which may have more indirect benefit to them.

### ***Light versus Architecture***

It is a common assumption that when faced with large architectural features as well as smaller features or signposting that a player will be more strongly drawn towards the larger feature due to its dominance of the space. Analysis Point 6 of 'Guiding the Player' posed this type of decision to participants, giving them the option of following a corridor through a large archway at the end of it, or taking a route through a much smaller doorway on the side of the corridor. One lighting model used spotlights to draw additional attention to this smaller doorway. Again, despite the use of lighting the majority of players still took the

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route via the large archway first, suggesting that architecture has a more predominant impact on a player than lighting.

### ii. Influence of Identical Lighting in Different Situations

#### *Exploration of the Environment*

Lighting was also designed in the research level to attract players to certain areas which contained weapons or other desirable items. The expectation was that, in the lighting model that used this lighting, players would be more likely to find these areas than in the lighting model that did not use this lighting.

However, a pattern can be seen in which particular areas participants found and the impact that lighting had on these participants. It appears that, when the player is faced with a dead end (which contains a hidden item) they are more likely to explore it regardless of whether lighting is encouraging them to or not. This is opposed to when an item is hidden in an area that the player can move through from one end to another. In this situation it appears that lighting has much more influence on a player's tendency to explore.

Analysis Points 6, 8 and 11 of 'Attracting the Player' show this occurring. Analysis Point 6 places a health pickup behind a stack of boxes in a dead end which the player has no other need to explore. One lighting model places lights behind these boxes to emphasise the space the health pickup is hidden in whilst the other lighting model turns these lights off. However, the majority of players in this situation explored and found the health pickup in both lighting models.

Analysis Points 8 and 11 are both areas where a pickup is placed in a hidden location (behind storage crates and inside a storage crate respectively) in a room that a player can move through freely without reaching a dead end. In both situations, one lighting model emphasises the location of the pickup with bright lighting whilst the other lighting model turns these lights off. In both situations, the majority of players located the pickups when

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the lighting was on, whilst the majority of players did not locate the pickups when the lighting was off.

This suggests that players are less likely to freely explore when the way forward is more obvious to them. However, when lighting is used to draw attention to otherwise apparently unimportant areas, players will associate this with something that is of interest to them and will be more likely to divert their attention.

### ***The Flickering Light***

The flickering light is used in two Analysis Points in the level. Analysis Point 1 of 'Attracting the Player' places a flickering light behind a large pile of debris in one lighting model, with the other lighting model turning this light off.

When the flickering light is turned on, more players explore the area it is illuminating and locate the weapon pickup nearby than when the light is turned off. This suggests the flickering light draws players towards it due to it being visually interesting – an implication backed up by comments made by particular participants in the interviews, which are covered in the following chapter.

However, this is directly at odds with the impact of the flickering light used in Analysis Point 9 of this section. This Analysis point gives players a choice between two paths, one lit with a flickering light, and one lit with normal static lighting. While the majority decision was not heavily weighted, there was a tendency for players to take the path lit with static lighting over the path lit with the flickering light.

A possible explanation of this is that, when faced with the *option* of investigating a flickering light, players are less wary of it being a trap as they are not being forced towards it. When they are forced to make a choice between a flickering light and a normal light in order to proceed, they may be more aware of the possibility of a trap and be more likely to avoid the flickering light. This is looked at in more depth in the following chapter.

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### **iii. Subtle and Explicit Lighting Techniques**

Another theme apparent throughout the research results is that players are most influenced by more explicit lighting techniques. This, of course, sounds like an obvious assumption to make, however it is relatively common for lighting to be considered something which only needs to be used subtly to have the desired effect.

It can be seen from this study that subtle lighting techniques can be overlooked by players. For example, the use of pathway lighting throughout the level was intended to act as a method of guiding the player through the environment by illuminating the route to take to continue forwards.

Analysis Point 1 of 'Guiding the Player' used this method to illuminate one of two possible paths (which differed between lighting models) that the player could take. Whilst the number of players that took the illuminated path over the non-illuminated path was greater, the difference was only negligible.

A similar result was observed at Analysis Point 10 of this section, where the pathway lighting was intended to lead players left or right, depending on which lighting model was being played. A greater number of players followed the pathway lighting, but again the difference in numbers was negligible.

Analysis Point 8 of this section also uses a subtle variation of lighting, with the player tasked with making a decision to move along the left hand or right hand side of the room. One side is lit with a subtle blue ambience, the other with a subtle red ambience. It was expected that players would be more inclined to take the route lit with blue lighting due to the connotations of red with danger. This was the result that was observed but again, there was only a very small difference in the number of players taking one route over another.

When these situations are compared to Analysis Points using much more obvious lighting techniques such as bright point lights in comparably dark environments and large spotlights



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highlighting specific objects or areas, the difference is very obvious. Many more players are influenced by the explicit lighting.

This raises an interesting issue for designers wanting to utilise lighting in a more game play oriented manner. Explicit lighting appears to be the most reliable method of influencing player choices, but this could be at the cost of realism and believability of the environment.

This is not to say that subtle lighting cannot also be used effectively, and as the next chapter will show, even explicit lighting can be overlooked by many players while still having a subconscious effect on their decisions.

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### **VI. Discussion of Interview Findings**

Whilst all of the participants that took part in this study offered a large number of different feedback points, not all of them were relevant to this study. However, some of these seemingly irrelevant points were mentioned by a number of participants and thus, need to be considered when looking at the results from other aspects. In this chapter, the most commonly raised topics will be discussed, and some possible preliminary conclusions put forward. It is important to note that these conclusions are not definitive, as the small number of participants involved in the study cannot be used to make generalisable assumptions. These conclusions are speculative and would need further study using a much larger cohort size in order to be proved or disproved.

An example of the interview structure and which questions were asked to interviewees can be read in Appendix III.

#### **i. Player Decision Making and Navigation**

The way players chose to navigate the environment and the processes they employed to do this were of the most interest in relation to the aims of this study. To reiterate the initial question posed by this research; is it possible to influence how a player behaves, the choices they make when playing a game and the experience they take away from it solely through the use of various lighting techniques? The points raised by interviewees combined with the statistical evidence of decision making suggest that this is possible, but only to a certain extent.

The most significant piece of evidence taken from the interviews was from the question "How did you navigate your way through the level?", which was then followed with the question "Did you ever feel 'pushed' in a particular direction or as if one route was emphasised more than another?". Of the fifteen participants, ten stated that there was nothing in particular they noticed that acted as a guide, or as something they followed to

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move through the level. However, the statistical results show that despite not consciously making these decisions, these ten participants still displayed the 60:40 split in favour of making the decisions that were 'expected' based on the level design.

This would seem to suggest the possibility that lighting works on a far more subconscious level than is perhaps realised.

Of the five participants that acknowledged there was a factor in the level that influenced their choices, only three said that lighting was that factor. These three participants noticed that directional spotlights were used to place emphasis on doors and pathways that led forwards through the level, and that in general, the more brightly illuminated areas signified the correct way to go, whilst the darker areas were the direction they had come from.

The experience of the participants in terms of gaming also appears to have an impact on how much they are consciously influenced by lighting. The participants that noted lighting as a factor in their navigation choices all described themselves as experienced gamers, but gamers that do not play a large number of FPS games. This could suggest that heavy FPS players become accustomed to the genre, and game play of that genre, thus pay less attention to their environment and more attention to their objective (shooting enemies, solving puzzles or locating objectives). Gamers that may have experience of other genres but little experience of FPS games may have a smaller number of expectations, and will be less likely to have developed genre-specific connotations. This is discussed at greater length in the 'Connotations and Conditioning' section of this chapter.

Given the number of players that appear to have been influenced, subconsciously at least, by lighting, what *did* players notice consciously as they moved through the environment?

Many of the participants that stated that nothing influenced them in particular then went on to talk about how they made decisions to progress through the level. Many of these methods of decision making were much less cerebral than expected.

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For example, two participants stated that they simply entered rooms and looked immediately for the computer terminals, as they knew that was their main objective. They moved through the level in this manner, paying little attention to other cues that may be in the environment. Two other participants stated that they were drawn mostly towards any areas that looked new or different. Another two participants stated that they followed 'literal' signposting in the level, such as following cables to locate switches and computers. Lastly, two more participants admitted that regardless of the game, they always explored rooms top to bottom, left to right. This was a conscious decision in both cases, and overrode almost all cues or signposting within the environment itself.

These could all be seen as very simple, reflexive methods of exploration and navigation. Interestingly, these methods were raised by those participants with a lot of FPS gaming experience, suggesting again a 'tunnel vision' effect of being familiar with the genre; particularly noticeable with regards to the participants that always explore in a fixed manner.

### **ii. Feedback on Environment Lighting**

When asked the question "What were your general impressions of the level having played it?" participants were quick to offer feedback on various topics. However, one of the most common aspects of the environment that was discussed was the lighting, its more general use and suitability in the context of the level.

The feedback offered by participants in this respect is equally as important as the feedback gathered regarding lighting as an influence on decision making. This is because the ultimate aim of any game is to be an enjoyable, entertaining and rewarding experience for the player. If the lighting or any other aspect of the design detracts from this enjoyment the game will not be as successful; no element of design should take precedence over game play.

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The majority of interviewees were positive when speaking about the lighting in the level. Five stated that the lighting scheme was "good", and that the lighting was "clear". One participant noted that there was lighting used to highlight paths and doorways.

Six participants noted that "brightly lit areas stood out" and so they made an effort to explore them. This is in keeping with the common assumption that players will be drawn towards light over dark. However, these participants stated that they only noticed these brightly lit areas occasionally, despite their frequent use in the environment. This is again a possible indication of the more subconscious nature of lighting impact.

Five participants said they noticed that objectives or interactive objects such as buttons and computer terminals stood out. This was due to their either being red or blue. One participant also noted the use of green lighting (which was limited in its use in the environment to only three places) and stated that initially they made a decision to go towards it. These participants all stated that they saw these types of lighting as highly contrasting to the rest of the environment, as the majority of the level was very subdued in terms of its use of colour; a decision made during the design stage, as stated in the Methodology chapter.

Coloured lighting was commented on by four other participants also, who stated that they felt the level could have benefitted from a heavier use of it to give more visual variation to different areas and rooms. These participants felt that the level was confusing as some areas looked similar and used a similar texture and colour palette.

Given that this study intentionally limited the use of coloured lighting, it is interesting to discover that players noticed its absence. This is especially interesting when combined with the possibility that players appear to not consciously notice lighting being used to aid navigation. A reasonable conclusion could be that the human brain recognises colour, or its absence, much more readily than it recognises lighting as a whole. The brain has to deal with colour on a day-to-day basis in most aspects of life and so becomes accustomed to its

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presence; thus, when faced with a situation that is noticeably devoid of high contrast colour variations it will pick up on this as being unusual.

In order for the Lighting Models used in this study to have the intended effect on players it was necessary to set the environment in a dark locale, to allow the lighting being used to stand out. The intention was to use a dark environment that could potentially fit into a game world, so as to not feel out of context for participants playing it.

A large percentage of participants (**40%**, or six participants out of fifteen) still commented however, that the environment was too dark in some places. Of these six participants, three commented that the light levels in some areas were too low to allow them to defend themselves from enemies. This would clearly be a problem in a retail game, as the game play is suffering for the sake of a design feature.

These participants were asked additionally to compare the lighting in the research environment to the lighting used in *Doom 3* (2004). All participants indicated that it was suited to the game play in *Doom 3* (2004) because of its slower pace, but was still too dark in some places. This would suggest that players are willing to accept darker, less easily navigable environments in some games, based on the atmosphere that that game promotes. This would be a vital consideration both for future research in this field and for level design as a whole; what may be proven to work in one genre may not work in another – even what may be proven in one game may not work in another game despite it falling into the same genre.

### **iii. Level Ambience and Atmosphere**

One of the questions asked to interviewees was “How would you describe the ambience, or atmosphere of the level?”

This was intended to discover how the participants interpreted ‘atmosphere’ and ‘ambience’. If participants viewed lighting as being part of the atmosphere of the level it

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would support the assumption that lighting is not viewed as being a large part of the mechanics of the game, but more as an aesthetic feature.

Of the eleven participants that responded meaningfully to this question, five initially discussed lighting as being the predominant component of 'ambience'. These participants stated that the lighting contributed to the "feel" of the level well and created an immersive environment which, while too dark in some areas, suited the game play for the majority of the level.

However, the remaining six participants of the eleven all cited the level's soundtrack as being the key component of the 'ambience'. Two participants felt that the music suited the level well and helped create a sense of urgency which kept them playing. The other four participants felt that the music suited during combat but needed to be less predominant when there were no enemies to attack, as it would suit the game play more.

Given this evidence, it would seem that, whilst lighting clearly plays a role in creating atmosphere in a game it is possible that music is actually the more predominantly noticed feature by players. This shows that gamers do notice certain aspects over others which could have implications for how designers go about creating environments for games; this study has shown an almost 50:50 split in players predominantly noticing lighting to predominantly noticing music. Further research would be required to prove or disprove this, as it is impossible to generalise the results of this study to the wider populous, due to them small cohort used; however, if further study were to prove that this ratio *can* be generalised to the wider gaming audience it would show that neither aspect is more important than another. This is something that designers could then take into account when budgeting for sound and lighting artists on their projects.

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### **iv. Connotations and Conditioning**

Is it possible to have direct control over how a player will respond to a situation? Can an individual's own personal preferences be overwritten by careful, targeted use of specific lighting?

The answers to both of these questions can be found by looking at specific points raised by participants in their interviews.

The most significant problem with having direct control over a player's response to a given situation is that player's own inter-textual connotations and expectations. For example, one participant said that they expected the red barrels in the level to explode when shot "because that is what happens in a lot of other games". Similarly the four participants that stated they avoided heading towards flickering lights unless necessary said that this was because flickering lights "usually indicated a trap or other danger" in other games. These participants all described themselves as being experienced, which means they would have played a wide variety of other FPS games. However, three participants that described themselves as being novice or intermediate FPS players stated that they specifically moved towards flickering lights because they thought they may be hiding an item or something that could be interacted with.

This raises an interesting theory based on the idea of schemata, or schemas. A schema is "an active organisation of past reactions, or of past experiences, which must always be supposed to be operating in any well-adapted organismic response" (Bartlett, 1932 cited by Hayes, 1998). Applied to game players, this means that they can build up a mental preconception of what to expect from a particular genre or subgenre of game. For example, a player may have a schema for FPS games which contains past experience of red barrels exploding when shot. If they then play a game in which red barrels do not explode, they may initially be confused as it does not fit their expectation. This would lead to the player



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building a new schema for that specific game, with the new knowledge that red barrels do not explode.

It is conceivable that players would have a separate schema for each game they play, which is based off of the original schema for FPS games in general.

This suggests that it is largely impossible to have definite control over what choices a player will make. Whilst it may be possible to condition players to react in a particular manner to particular things within a single game, it is impossible to negate the effect of the broad schema that player has for the category of game being played. If a technique is used that is particularly obscure, either in the context of the genre or of games themselves, it may not have the desired effect due to what the player is expecting from the game experience, based on their past experiences.

The effect of both in-game conditioning and the impact of schemas can be seen to a small extent in this study.

Two participants stated that they realised after a while that all buttons were red, and that all computer terminals glowed blue. They therefore were more inclined to head towards red or blue objects as they expected them to be interactive. This conditioning of the player to make these assumptions is a powerful tool that can be used to the level designer's advantage. By building up a connotation such as this, they are then able to use it to make players carry out certain actions; for example, to draw them towards a specific area by placing a red or blue object in sight.

Out of all the participants, nine struggled to work out what was required when they reached the penultimate room. The correct action is to use a button to deactivate the shields surrounding the bridge power generators, and then to shoot and destroy them, thus making the bridge extend so that they may cross.

Of these nine, five cited the fact that a puzzle like this had not been presented to them in the level up to this point as the main factor for not being able to work out the solution. The

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design of this puzzle was to emphasise the power conduits by making them glow blue. This was intended to portray their importance as an objective point by mimicking the blue glow that accompanied the computer terminals the player had to activate earlier in the level. However, this did not work correctly, possibly because the objects that were blue previously had to be directly interacted with; in this puzzle they were required to be shot.

This is an interesting point given the number of participants that noted either that blue lighting had been leading them towards objective points, or that the cases where coloured lighting had been used had had significance.

This is then an example of a lack of clear in-game conditioning leading to player confusion. These participants all agreed that, had a similar puzzle been presented to them already, (whereby something needed to be shot in order to trigger an event) the solution would most likely have been easier to work out.

To this extent, it is possible to have a degree of control over a player's decisions and indeed, it is vital to in some situations so that a player can make sense of their surroundings. However, as stated, the effect of other schemas on the player is a factor that cannot be planned for directly, and can be seen in this study.

Upon reaching the large elevator that leads to the penultimate area, four participants made a conscious decision to avoid it and take the smaller door nearby. This was despite the use of bright lighting to emphasise the two other exits to this room. When questioned on this decision, they cited previous game experience that gave them the knowledge that a large feature such as that usually leads to a boss battle or some other large danger. This relates to the 'Light versus Architecture' section of the previous chapter, with the large architectural feature in this room overriding the lighting in terms of significance in the eyes of the player.

It is even possible for a player to associate in-game objects with real-world experiences. Three participants said that they found themselves "using landmarks to navigate", in much the same way that they would in real life. One participant said that the experience was

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similar to finding their way around a city. This suggests that even schemas from completely unrelated areas are called upon by the brain when faced with new situations in order to try and make sense of it; a factor that again a level designer can have very little influence over.

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### **VII. Conclusions**

The questions set out at the start of this study are much broader than originally anticipated, and touch on psychological subjects largely beyond the scope of this study.

However, some possible answers have been drawn from the results of this research, which may be beneficial in directing the course of further investigation into the true relationship of lighting with the player.

It is clear that the participants used in this study were not affected by environmental lighting as much as was expected; although a small difference in favour of the expected result was observed. It is possible that the ratio displayed in these results would widen given further study, however there is no definitive evidence of this yet.

Is it possible to influence how a player behaves, the choices they make when playing a game and the experience they take away from it solely through the use of various lighting techniques? To an extent, this has been observed to theoretically be possible; participants' positive response to the quality of the lighting in the level showed that it had an impact on their enjoyment of the game and some Analysis Points showed a heavy influence of lighting on decision making. However, this study has also shown that there are many other factors that may influence a player and these must be taken into account when designing lighting for an environment.

What implications could this have for level design? It may be beneficial to take into account the deeper human psychological processes when designing game environments. It may be too basic to view lighting in games as similar to other media; indeed, it may be too basic to assume lighting to be a separate aspect at all. It has been shown in this study that even the same lighting technique can have differing effects on a player's perception and decision making based on the wider context it is set in.

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The findings of this project, most notably those relating to the importance of schemas or pre-existing expectations of a genre or game, are in line with previous theoretical papers. Lindley (2002, p.4-5) suggests the idea of a 'game play gestalt'; a set of rules that apply to a particular game that a player must learn in order to become successful and complete that game. This is essentially the same idea as the psychological theory of schemas, which are banks of knowledge built up by a person regarding a particular topic or experience.

Further supporting this theory is Perron's (2006) paper in which he proposes a 'heuristic circle of game play' (Appendix XI). This model is again essentially a representation of schemas being applied directly to game play. Input from the player affects the state of the game; this in turn modifies the output that the game provides the player; this output again in turn directs the succeeding input by the player and so forth. Each time this circle completes, the player's schema is being updated with the new information provided by the output from the game.

The idea of in-game conditioning (as opposed to a player's reliance on schemas to make sense of the game world) mentioned in this study has been researched previously by Linderoth & Bennerstedt (2007) under the term of an 'ecological approach' to computer games. This study proposes that the use of in-game conditioning, referred to as differentiation between game world rules to create understanding, is a much bigger influence on a player than the use of existing knowledge, or schemas, from sources external to the game.

The current study suggests a much more balanced influence of these two factors, with the precise influence of each altering depending on factors such as player experience level and knowledge of other games.

So ultimately, can making a greater use of lighting as a game play mechanic result in games that are more entertaining?

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This is a difficult question to answer in terms of this study. There is the possibility that this is true when the game being developed is based in a particular genre. What may be successful in one game (*Doom 3* (2004) for example) may not be successful if used in another game. This paper has shown that lighting can be interpreted in numerous different ways depending on the immediate context (in-game conditioning) and on a player's past experience (schemas). To this end, it can be concluded that while lighting has the potential to enhance entertainment value by making more intelligent, diverse use of it, it is first necessary to determine its place with relation to other game world factors and also in relation to the expectations of the player.

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### **VIII. Retrospective and Further Research**

The methods employed in this paper to analyse both the game play data and the participant interviews are only one possible way of looking at the information presented here. By further cross-referencing of game play and interview data, other patterns could possibly begin to emerge. Of course, a much larger cohort would be required for this to be possible and for results to be more generalisable, the participants should be from a range of age brackets, genders and backgrounds.

Much further study is clearly needed in this area, with less focus on lighting as an individual aspect of design. It is possibly not useful, from a research perspective, to attempt to emulate a 'real' game environment, due to the large amount of extraneous variables created, even within an environment designed specifically for research purposes. However, it is also likely that studies such as Knez & Niedenthal (2008) are also not the most practical approach, due to their highly research focussed nature.

A balance between these would likely result in useful results that are not jeopardised either by extraneous variables or out of context game play. For example, a very structured level that includes combat which is heavily scripted to always behave the same way for each participant in the study. This means results can be compared more reliably due to participants having the same experience and not being influenced by anything other than the factors being studied.

Further to this, more focus should also be placed on the psychological processes in action when a player is playing a game. These appear to be much more significant than the actual in-game design aspects. The interaction between a player's preconceptions and what the game offers seem to result in the experience the player takes away from playing, rather than attempting to separate any one feature over another.

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### **IX. Glossary of Terms**

#### **ALVA**

An acronym for Adaptive Lighting for Visual Attention. A proposed method of lighting in games that highlights key items and enemies, making them easier to pick out, leading to a more enjoyable game experience.

#### **Artificial Intelligence**

The ability of computer controlled characters to behave in a realistic manner in a variety of situations.

#### **Avatar**

The term used to describe the representation of the player in the game world; also referred to as the player character.

#### **Classical Conditioning**

The term given to the process of learning whereby a neutral stimulus is given a particular meaning to the learner by way of association.

#### **Doom 3**

A game released in 2004 by id Software, criticised for its use of very dark environments and the inability for the player to use a weapon and a flashlight at the same time.

#### **Dynamic Lighting**

A method of lighting a game environment whereby the lights are calculated in real-time while the game is running. This method produces more realistic results that can be changed and updated during gameplay but is much more processing-intensive.



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### **FPS**

An acronym used to describe the First-Person-Shooter genre of video and computer games, in which players view the world from the perspective of their in-game avatar.

### **Game Engine**

An overarching term used to describe the programming assets that make a game function.

### **Half-Life 2: Episode 2**

Second episodic game released by Valve Software that follows on from the original story of Half-Life 2.

### **Hub**

A term used to describe a part of a game world that provides the only access to other areas.

### **Lightmapping**

A method of creating realistic lighting in a game environment without having to calculate the lights in real-time. Lighting is calculated in the building phase (most often in the level editor, but occasionally in an external piece of software) and 'baked' into the level. This lighting cannot be changed during gameplay.

### **Mise-en-Scène**

An expression used within theatre and film to describe the design aspects of a production. It can also be used in other creative fields such as games in a looser context.

### **Multiplayer**

A term used to describe any game that can be played simultaneously by more than one player, either on the same machine or over a network.

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### **Observer's Paradox**

A term used to describe the problem of research results being affected by the presence of the researcher, or by the knowledge of the participant that they are being observed.

### **Operant Conditioning**

The term given to the process of learning whereby behaviour is either positively or negatively reinforced, by way of reward or punishment. This encourages or discourages the learner to repeat this behaviour.

### **Pathway Lighting**

A term used in this paper to refer to a method of lighting a route for the player to follow. In this research, small yellow floor-lights that created a glowing cone of light in front of them were used to highlight a specific path.

### **Powerups/Pickups**

Terms used to describe items that can be collected by the player in a game. Powerups will usually grant additional special abilities, whilst pickups will usually be more mundane or common items.

### **Schema**

A psychological term used to describe a 'knowledge set' about a particular topic. This schema is then the basis of a person's preconceptions and expectations when faced with that topic in future.

### **Signposting**

A term used to describe the methods by which players are guided or led through a game environment.

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### **Static Lighting**

See Lightmapping.

### **Thief: Deadly Shadows**

One of the earlier examples of a game which utilises lighting in game play, released by Ion Storm Inc. in 2004 to critical acclaim.

### **Toolset**

A collection of game assets and scripts that allow additional functionality to be added to a pre-existing game engine.

### **UnrealEd 2**

A piece of software that is included in the retail package of Unreal Tournament 2004, used for building maps for the game.

### **Unreal Tournament 2004**

Third game in the Unreal Tournament series of game developed by Epic Games and Digital Extremes, praised as being the best in the series, even after the later Unreal Tournament 3 was released.

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### Appendix I - Lighting Model A: Decision Table

The choice highlighted in **bold** is the choice that players were expected to take.

	<i>CHOICE A</i>	<i>CHOICE B</i>	<i>CHOICE C</i>
<b>1st Room - Pathway</b>	<b>Straight</b>	Left	
Collect Assault Rifle?	<b>Yes</b>	No	
Leave room via...	<b>Right Path</b>	Left Path	
<b>2nd Room – Leave Via</b>	<b>Lower Path</b>	Upper Path	
Activate Terminal?	<b>Yes</b>	No	
<b>Corridor To Mini Core</b>	<b>Use Right Side</b>	Use Left Side	
<b>Mini Core</b>	<b>Left Side First</b>	Right Side First	
Find Vent?	<b>No</b>	Yes	
Use Vent?	<b>Yes</b>	No	
<b>Lava Room</b>	<b>Right Route</b>	Left Route	
Find Ammo?	<b>Yes</b>	No	
<b>Dark Corridor</b>	<b>Left First</b>	Right First	
Find Keg?	<b>No</b>	Yes	
<b>Machine Room</b>	<b>Right Route</b>	Left Route	
<b>Pit Room</b>			
Find Terminal?	<b>Yes</b>	No	
Find Gun?	<b>Yes</b>	No	
<b>Split Corridor</b>	<b>Non-Flickering Lit Path</b>	Flickering Lit Path	
<b>Big Room – Where First?</b>	<b>Right</b>	<b>Down</b>	Left
Find Vent?	<b>Yes</b>	No	
Use Vent?	<b>Yes</b>	No	
<b>Lava Room 2</b>			
Followed Light Path?	<b>Yes</b>	No	
Shot Highlighted Gen?	<b>Yes</b>	No	
Found Ammo Caches?	<b>No</b>	Yes	
<b>Core – Which way?</b>	<b>Clockwise</b>	Anticlockwise	

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### Appendix II - Lighting Model B: Decision Table

The choice highlighted in **bold** is the choice that players were expected to take.

	<i>CHOICE A</i>	<i>CHOICE B</i>	<i>CHOICE C</i>
<b>1st Room - Pathway</b>	Straight	<b>Left</b>	
Collect Assault Rifle?	Yes	<b>No</b>	
Leave room via...	<b>Right Path</b>	Left Path	
<b>2nd Room – Leave Via</b>	Lower Path	<b>Upper Path</b>	
Activate Terminal?	<b>Yes</b>	No	
<b>Big Room – Where First?</b>	<b>Right</b>	Down	Left
Find Vent?	Yes	<b>No</b>	
Use Vent?	Yes	<b>No</b>	
<b>Split Corridor</b>	Non-Flickering Lit Path	<b>Flickering Lit Path</b>	
<b>Pit Room</b>			
Find Terminal?	<b>Yes</b>	No	
Find Gun?	Yes	<b>No</b>	
<b>Machine Room</b>	Right Route	<b>Left Route</b>	
<b>Dark Corridor</b>			
Find Keg?	No	<b>Yes</b>	
<b>Lava Room</b>	<b>Right (Up Catwalk)</b>	Left (To Main Door)	
Find Ammo?	Yes	<b>No</b>	
<b>Mini Core</b>	<b>Left Side First</b>	Right Side First	
Find Vent?	No	<b>Yes</b>	
Use Vent?	<b>Yes</b>	No	
<b>Corridor To Mini Core</b>	<b>Use Right Side</b>	Use Left Side	
Lava Room 2			
Followed Light Path?	<b>Yes</b>	No	
Shot Highlighted Gen?	<b>Yes</b>	No	
Found Ammo Caches?	No	<b>Yes</b>	
<b>Core – Which way?</b>	Clockwise	<b>Anticlockwise</b>	



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### Appendix III - Participant Interview Questions

1. What were your general impressions of the level having played it?
  
2. How did you navigate your way through the level?
  - a) Was there an element, or elements of the level that you noticed particularly over others?
  - b) Did you ever feel lost, confused or not know where to go next?
  - c) Did you ever feel 'pushed' in a particular direction or as if one route was emphasised more than another?
  
3. Which if any areas of the level stand out to you most and why?
  
4. How would you describe the ambience, or atmosphere of the level?
  - a) What were your impressions of the lighting in the level? Did it add to or detract from the game play or was it more passive?
  
5. Did you enjoy playing the level? Is there anything that could have made it more fun or interesting in your opinion?

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### Appendix IV - Time-Stamped List of Analysis Points

This video can be found on the accompanying DVD, under the file name 'Reference Video.wmv'

<b>Analysis Point</b>	<b>CHOICE A</b>	<b>CHOICE B</b>	<b>CHOICE C</b>	<b>Time-Stamp in Video</b>
<b>1st Room - Pathway</b>	Straight	Left		1:02
Collect Assault Rifle?	Yes	No		1:08 - 1:17
Leave room via...	Right Path	Left Path		1:23 - 1:35
<b>2nd Room - Leave Via</b>	Lower Path	Upper Path		2:13 - 2:19
Activate Terminal?	Yes	No		2:00
<b>Big Room - Where First?</b>	Right	Down	Left	10:25 - 10:36
Find Vent?	Yes	No		10:58 - 11:04
Use Vent?	Yes	No		10:58 - 11:04
<b>Split Corridor</b>	Non-Flickering Lit Path	Flickering Lit Path		09:52 - 10:00
<b>Pit Room</b>				
Find Terminal?	Yes	No		8:22 - 8:42
Find Gun?	Yes	No		9:22 - 9:30
<b>Machine Room</b>	Right Route	Left Route		7:28 - 7:35
<b>Dark Corridor</b>	Left First	Right First		6:23 - 6:31
Find Keg?	No	Yes		6:39 - 6:50
<b>Lava Room</b>	Right Path	Left Path		5:00 - 5:07
Find Ammo?	Yes	No		6:00 - 6:15
<b>Mini Core</b>	Left Side First	Right Side First		3:22 - 3:30
Find Vent?	No	Yes		4:00 - 4:06
Use Vent?	Yes	No		4:00 - 4:06
<b>Corridor To Mini Core</b>	Use Right Side	Use Left Side		2:24
<b>Lava Room 2</b>				
Followed Light Path?	Yes	No		14:03 - 14:10
Shot Highlighted Gen?	Yes	No		14:12 - 14:20
Found Ammo Caches?	No	Yes		15:32 - 15:54
<b>Core - Which way?</b>	Clockwise	Anticlockwise		16:28 - 16:42

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### Appendix V - Analysis Point Decision Ratios from Lighting Model A

The choice highlighted in **bold** is the choice that players were expected to take.

<b>1st Room - Pathway</b>	<b>Straight 4</b>	Left 4	
Collect Assault Rifle?	<b>Yes 7</b>	No 1	
Leave room via...	<b>Right Path 8</b>	Left Path 0	
<b>2nd Room – Leave Via</b>	<b>Lower Route 7</b>	Upper Route 1	
Activate Terminal?	<b>Yes 3</b>	No 5	
<b>Corridor To Mini Core</b>	<b>Use Right Side1</b>	Use Left Side 7	
<b>Mini Core</b>	<b>Left Side First 6</b>	Right Side First 2	
Find Vent?	<b>No 7</b>	Yes 1	
Use Vent?	Yes 1	<b>No 7</b>	
<b>Lava Room</b>	<b>Right Path 1</b>	Left Path 7	
Find Ammo?	<b>Yes 6</b>	No 2	
<b>Dark Corridor</b>	<b>Left First 8</b>	Right First 0	
Find Keg?	<b>No 2</b>	Yes 5	One result not used
<b>Machine Room</b>	<b>Right Route 5</b>	Left Route 3	
<b>Pit Room</b>			
Find Terminal?	<b>Yes 7</b>	No 1	
Find Gun?	<b>Yes 6</b>	No 2	
<b>Split Corridor</b>	<b>Non-Flickering Lit 5</b>	Flickering Lit 3	
<b>Big Room – Where First?</b>	<b>Right 4</b>	<b>Down 0</b>	Left 4
Find Vent?	<b>Yes 5</b>	No 3	
Use Vent?	<b>Yes 3</b>	No 5	
<b>Lava Room 2</b>			
Followed Light Path?	<b>Yes 5</b>	No 3	
Shot Highlighted Gen?	<b>Yes 4</b>	No 4	
Found Ammo Caches?	<b>No 6</b>	Yes 2	
<b>Core – Which way?</b>	<b>Clockwise 6</b>	Anticlockwise 2	

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### Appendix VI - Analysis Point Decision Ratios from Lighting Model B

The choice highlighted in **bold** is the choice that players were expected to take.

<b>1st Room - Pathway</b>	Straight 3	<b>Left 4</b>	
Collect Assault Rifle?	Yes 3	<b>No 4</b>	
Leave room via...	<b>Right Path 4</b>	Left Path 3	
<b>2nd Room – Leave Via</b>	Lower Route 6	<b>Upper Route 1</b>	
Activate Terminal?	<b>Yes 4</b>	No 3	
<b>Big Room – Where First?</b>	<b>Right 5</b>	Down 0	Left 2
Find Vent?	Yes 4	<b>No 3</b>	
Use Vent?	Yes 2	<b>No 5</b>	
<b>Split Corridor</b>	<b>Non-Flickering Lit 4</b>	Flickering Lit 3	
<b>Pit Room</b>			
Find Terminal?	<b>Yes 6</b>	No 1	
Find Gun?	Yes 1	<b>No 6</b>	
<b>Machine Room</b>	Right Route 4	<b>Left Route 3</b>	
<b>Dark Corridor</b>			
Find Keg?	No 1	<b>Yes 5</b>	One result not used
<b>Lava Room</b>	<b>Right (Up Catwalk) 6</b>	Left (To Main Door) 1	
Find Ammo?	Yes 4	<b>No 3</b>	
<b>Mini Core</b>	<b>Left Side First 5</b>	Right Side First 2	
Find Vent?	No 5	<b>Yes 2</b>	
Use Vent?	<b>Yes 0</b>	No 7	
<b>Corridor To Mini Core</b>	<b>Use Right Side 6</b>	Use Left Side 1	
Lava Room 2			
Followed Light Path?	<b>Yes 3</b>	No 3	One result not used
Shot Highlighted Gen?	<b>Yes 4</b>	No 2	One result not used
Found Ammo Caches?	No 0	<b>Yes 6</b>	One result not used
<b>Core – Which way?</b>	Clockwise 1	<b>Anticlockwise 5</b>	One result not used

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### Appendix VII - Combined Analysis Point Decision Ratios from Both Lighting Models

<b>1st Room - Pathway</b>	Expected 8	Unexpected 7	<b>8:7 in favour</b>
Collect Assault Rifle?	Expected 11	Unexpected 5	<b>11:5 in favour</b>
Leave room via...	Expected 12	Unexpected 3	<b>12:3 in favour</b>
<b>2nd Room – Leave Via</b>	Expected 7	Unexpected 7	<b>7:7 even</b>
Activate Terminal?	Expected 7	Unexpected 8	<b>8:7 against</b>
<b>Corridor To Mini Core</b>	Expected 7	Unexpected 7	<b>7:7 even</b>
<b>Mini Core</b>	Expected 11	Unexpected 4	<b>11:4 in favour</b>
Find Vent?	Expected 10	Unexpected 5	<b>10:5 in favour</b>
Use Vent?	Expected 9	Unexpected 6	<b>9:6 in favour</b>
<b>Lava Room</b>	Expected 7	Unexpected 8	<b>8:7 against</b>
Find Ammo?	Expected 9	Unexpected 6	<b>9:6 in favour</b>
<b>Dark Corridor</b>	Expected 12	Unexpected 3	<b>12:3 in favour</b>
Find Keg?	Expected 7	Unexpected 7	<b>7:7 even</b>
<b>Machine Room</b>	Expected 8	Unexpected 7	<b>8:7 in favour</b>
<b>Pit Room</b>			
Find Terminal?	Expected 13	Unexpected 2	<b>13:2 in favour</b>
Find Gun?	Expected 12	Unexpected 3	<b>12:3 in favour</b>
<b>Split Corridor</b>	Expected 9	Unexpected 6	<b>9:6 in favour</b>
<b>Big Room – Where First?</b>	Expected 9	Unexpected 6	<b>9:6 in favour</b>
Find Vent?	Expected 8	Unexpected 7	<b>8:7 in favour</b>
Use Vent?	Expected 8	Unexpected 7	<b>8:7 in favour</b>
<b>Lava Room 2</b>			
Followed Light Path?	Expected 8	Unexpected 6	<b>8:6 in favour</b>
Shot Highlighted Gen?	Expected 8	Unexpected 6	<b>8:6 in favour</b>
Found Ammo Caches?	Expected 12	Unexpected 2	<b>12:2 in favour</b>
<b>Core – Which way?</b>	Expected 11	Unexpected 3	<b>11:3 in favour</b>

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### Appendix VIII – Full Statistical Results

#### i. Guiding the Player

This was the main category used in this study. These parts of the level were designed to draw players through the environment in a particular manner which differs between the two lighting models.

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##### *Analysis Point 1*

	<i>CHOICE A</i>	<i>CHOICE B</i>	<i>Time-Stamp in Video</i>
<b>1st Room – Pathway</b>	Straight	Left	1:02

This room offered two paths for the player to take. Each lighting model emphasised a different path by using 'pathway lighting', whereby small lights were placed along the edges of the desired path to create a glowing trail for the player to follow.

This was intended to see how players would react to a literal path being illuminated in front of them. This method of lighting is repeated throughout the level also, to study whether players build up connotations of certain types of lighting in a level. The expected result was that players would most often follow the lit path first.

The ratio of players taking the lit pathway to players taking the unlit pathway across all participants was **8:7**. When the left path was emphasised, this ratio was **4:3**. When the straight forward path was emphasised, this ratio was **4:4**.

##### *Analysis Point 2*

	<i>CHOICE A</i>	<i>CHOICE B</i>	<i>Time-Stamp in Video</i>
<b>Leave Room Via...</b>	Right Path	Left Path	1:23 – 1:35

The first room in the level offers two routes forward. One is directly next to the button that opens both exits (Right Path); the other is on the opposite side of the room. Upon activating

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the button, pulsing green lights appear along the electrical cables connecting the button to the far door (Left Path).

This was intended to discover if a player would be more inclined to follow a path of lights despite having an obvious way forward presented directly next to them. The expected result was that the player would still take the path nearest to them.

The ratio of players taking the right pathway (the nearest) to those taking the left pathway (the farthest) across all participants was **12:3**.

### ***Analysis Point 3***

	<b><i>CHOICE A</i></b>	<b><i>CHOICE B</i></b>	<b><i>Time-Stamp in Video</i></b>
<b>2nd Room – Leave Via</b>	Lower Path	Upper Path	2:13 – 2:19

The second main room of the level is where the hub area splits, giving the player the option to traverse the environment in a broadly clockwise or anticlockwise route. The ground level exit to this room goes clockwise, whilst the exit on the upper catwalk goes anticlockwise.

One lighting model emphasises the route to the lower exit using pathway lighting similar to Analysis Point 1 of this category, whilst also placing the elevator to the upper catwalk level in darkness, making it harder for the player to detect. The other lighting model turns off the pathway lighting, and instead illuminates the elevator to draw attention to it.

This Point was intended to see the impact of lighting on directing a player's eye, and whether it had any effect on the decisions they made about which route to take. The expected result was that players would initially investigate the more illuminated areas of the room, theoretically leading them to continue to the intended exit from the room.

In both lighting models, all but one participant took the lower route, with the overall ratio of participants taking the lower route to those taking the upper route being **13:2**.

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### *Analysis Point 4*

	<i>CHOICE A</i>	<i>CHOICE B</i>	<i>Time-Stamp in Video</i>
<b>Corridor to Mini Core</b>	Use Right Side	Use Left Side	2:24

This corridor follows the second room when leaving through the lower exit. A health pack is located on the left hand side. Moving along the right hand side will allow the player to move into a sniping position to better attack the enemies in the next room. One lighting model uses pathway lighting to emphasise this route to the sniping position, whilst the other turns these lights off.

This was intended to see if lighting could be used to make a player move away from a pickup, rather than immediately aiming for it, as many level designers may believe the expected reaction to be. The lighting used in this room is identical to the pathway lighting used previously, to see whether players had been conditioned by this early stage of the level to follow this type of lighting. The expected result was that players would most likely still head towards the pickup initially.

In both lighting models, all but one participant went towards the pickup first, with the overall ratio of participants doing this rather than heading towards the other side of the corridor being **13:2**.

### *Analysis Point 5*

	<i>CHOICE A</i>	<i>CHOICE B</i>	<i>Time-Stamp in Video</i>
<b>Mini Core</b>	Left Side First	Right Side First	3:22 – 3:30

This room's main architectural features are perfectly symmetrical, with enemies placed in asymmetrical but balanced locations. The player must activate two buttons on mezzanine levels on either side of the room, which are accessed via walkways.

Each lighting model emphasises a different side of the room and a different walkway. This is done by placing a spotlight, with a visible cone of light emitting from it, pointing at the doorway to the mezzanine level. The sides of the walkway being emphasised also have computer panels with small scrolling red arrows on them pointing in the same direction.



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Lastly, the lighting is weighted towards one side of the room or the other by altering the intensity of the remaining light sources in the room.

This was intended to look at the effect of more literal lighting clues; essentially arrows created using lighting. The expected result was that players would head towards the more brightly lit side of the room first.

Across both lighting models, the number of participants that went to the emphasised mezzanine level first to those that went to the opposite one was **11:4**.

### ***Analysis Point 6***

	<b><i>CHOICE A</i></b>	<b><i>CHOICE B</i></b>	<b><i>Time-Stamp in Video</i></b>
<b>Lava Room</b>	Right Path	Left Path	5:00 – 5:07

This room features a large, open archway which opens up into a long tunnel. This tunnel has lava flowing along the bottom, and glows a deep pulsing red. Just before this arch is a small door on the right hand side.

One lighting model uses three spotlights, the same as used in Analysis Point 5, to point at this smaller door, as well as using pathway lighting to lead the player towards it. The other lighting model removes the spotlights, and the pathway lighting is changed to lead through the archway.

This was intended to look at the relationship between lighting and the use of two very different types of architecture (a large open entrance and a smaller entrance with a door) and how the player would choose to proceed through the area. It was expected that the players would follow the spotlighting through the smaller entrance in that lighting model, however not as frequently as they followed the spotlighting in Analysis Point 5.

The ratio of players taking the route through the archway first to those going through the smaller doorway across both lighting models was **8:7**, with this ratio in the lighting model that emphasised the smaller doorway being **7:1**.

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### *Analysis Point 7*

	<i><b>CHOICE A</b></i>	<i><b>CHOICE B</b></i>	<i><b>Time-Stamp in Video</b></i>
<b>Dark Corridor</b>	Left First	Right First	6:23 – 6:31

This Analysis Point was only taken into account in one of the lighting models. This was because each model was designed to draw the player through the level in opposite directions, and when entering this corridor from the direction expected in Lighting Model B this Point was not applicable. The results for this Point are based on the eight participants that played Lighting Model A.

When the player enters this corridor they can turn left or right. Turning right, the player is faced with an almost completely dark corridor, lit only by pathway lighting. However, this pathway lighting is spaced much farther apart than previous examples in the level. Turning left, the player is faced with a much more brightly illuminated corridor leading to an elevator, above which the corridor visibly continues into a room.

The intention of this room was two-fold; firstly, to look at whether the assumption that players will usually choose the lighter path over the darker path was true, and secondly, to see if players had been conditioned to head towards the pathway lighting. If they had, they may be more inclined to follow it. If this occurred, it would prove that players could be conditioned to make a decision that may well be against their more instinctive judgement; namely that the lighter path will be safer.

The ratio of players that took the left, brighter path to those that took the right, darker path was **8:0**.

### *Analysis Point 8*

	<i><b>CHOICE A</b></i>	<i><b>CHOICE B</b></i>	<i><b>Time-Stamp in Video</b></i>
<b>Machine Room</b>	Right Route	Left Route	7:28 – 7:35

This is the only Analysis Point that uses coloured lighting. It was decided during the design phase of the environment that not including an area to gather information on light colour would be a large oversight, given the known importance of colour in human psychology.

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This room's architecture is again symmetrical, with machinery in the centre and two navigable paths, one on each side. One side has a red ambient light, which is created by red writing on monitors. The other has blue ambient light, created in the same way with blue text on monitors.

The intention of this was to study whether players would be more inclined to take the light lit with blue lighting as opposed to red, given the natural connotation of red with danger. The expected result was that a very high percentage of participants would do this.

The ratio of players taking the blue lit pathway to those taking the red across all participants was **8:7**.

### *Analysis Point 9*

	<i>CHOICE A</i>	<i>CHOICE B</i>	<i>CHOICE C</i>	<i>Time-Stamp in Video</i>
<b>Big Room – Where First?</b>	Right	Down	Left	10:25 – 10:36

This is the second largest room in the level consisting of a central area with a lower floor, and a walkway around the top. A mezzanine level comes off of this walkway on one side, and a stairwell links the upper and lower levels on the opposite side of the room. Each end of the room are the entrance and exit doors, on the upper level.

One lighting model uses spotlights directed towards both the stairwell, and the exit door at the far end of the room. The other lighting model removes the spotlights pointing towards the stairwell and instead uses a row of spotlights to illuminate the whole of the mezzanine level.

The intention in this room was to look at the effect lighting has on the player when it is used in a very obvious manner in a large, open area. The difference in lighting from one side of the room to another is very apparent; the expected result was that the player would head towards the lit areas first, in order of which is closest to them. For example, they would first head to either the stairwell or the mezzanine level and then to the exit door, as that is the natural progression through the room.

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The ratio of players that followed this pattern of exploration to those that did not across all participants was **9:6**. When the stairwell was illuminated, this ratio was **4:4**. When the mezzanine level was illuminated, this ratio was **5:2**.

### *Analysis Point 10*

	<b>CHOICE A</b>	<b>CHOICE B</b>	<b>Time-Stamp in Video</b>
<b>Followed Light Path?</b>	Yes	No	14:03 – 14:10

This is the last area in the level where pathway lighting is used. As the player enters the penultimate room, they can either continue straight forwards, up a small set of steps that lead to a bridge across the lava river, or explore the left or right side of the room.

One lighting model places pathway lighting that leads to the right, and one places the lighting leading to the left. The button the player must interact with to deactivate the shields surrounding the power generators in this room is cited on the left in both lighting models, with nothing of benefit to the player on the right side of the room.

The intention of this was to see whether, after having played the whole level, players had been conditioned to follow this type of lighting. The expected result was that the majority of players would follow the lighting in both lighting models, regardless of which direction it led in.

The ratio of players that followed the lighting to those that did not across all participants was **8:6**.

### *Analysis Point 11*

	<b>CHOICE A</b>	<b>CHOICE B</b>	<b>Time-Stamp in Video</b>
<b>Core – Which way?</b>	Clockwise	Anticlockwise	16:28 – 16:42

This is the final area of the level where the player encounters the boss. This room is perfectly symmetrical and circular, with the power core in the centre and a suspended walkway around the outside.

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The two lighting models only alter one feature of this room, which is a set of two spotlights that are placed on either the left or right hand side of the room, pointing at the opposite wall. They are clearly visible to the player as they enter.

The intention of this was to study the impact of asymmetrical lighting in an otherwise symmetrical space. The expected result was that players would tend to head towards the asymmetrical feature first, thus circling the room in a clockwise or anticlockwise route.

The ratio of players that initially headed towards the spotlights to those that did not across all participants was **11:3**.

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### ii. Attracting the Player

This was the second most used type of analysis. These parts of the level were intended to attract the player towards a specific area or item in a room. Some of these stayed the same across both lighting models while others were changed.

#### *Analysis Point 1*

	<i>CHOICE A</i>	<i>CHOICE B</i>	<i>Time-Stamp in Video</i>
<b>Collect Assault Rifle?</b>	Yes	No	1:08 - 1:17

The Assault Rifle pickup at this point was placed next to a light. In one variant of the map, this light was flickering; in the other, the light was off. This point was intended to find out if a player would be more inclined to investigate an area with a flickering light due to it being more visually interesting.

The ratio of players that located the assault rifle to those that did not in the lighting model with the flickering light was **7:1**. This ratio was **3:4** in the lighting model that did not use a flickering light.

#### *Analysis Point 2*

	<i>CHOICE A</i>	<i>CHOICE B</i>	<i>Time-Stamp in Video</i>
<b>Activate Terminal?</b>	Yes	No	2:00

In the second main room of the level, the first computer terminal of five that the player must activate is located behind a group of tall columns, in a fenced in area. The terminal, as with all others in the level, has a large, bright spotlight placed directly above it, differentiating it from its neighbouring terminal. A Shock Rifle pickup was placed inside the fenced off area, in front of the pillars, in order to provide players with an incentive to initially explore the area.

The intention of this particular terminal was to see how quickly players identified the terminal that they needed to activate, based on the lighting. The expected result was that all

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players that located the Shock Rifle pickup would also activate the terminal with little difficulty.

The ratio of players that located and activated the terminal to those that did not was **7:8**.

### *Analysis Point 3*

Mini Core			
Find Vent?	No	Yes	4:00 – 4:06
Use Vent?	Yes	No	4:00 – 4:06

This air-vent system is one of two in the level, can be accessed from the Mini Core room, or from the Big Room. This Analysis Point looks at the Mini Core entrance. This entrance is hidden behind a large pile of debris, crates and barrels, and has a Rocket Launcher pickup placed beside it.

One lighting model illuminates the area behind the debris, whilst the other leaves the area in relative darkness.

The intention of this was to see if players would be more inclined to attempt to jump over the obstacles to reach the illuminated area and the air vent than they would be when there was no lighting to highlight it. The expected result was that a far higher number of players would locate and use the air vent in the illuminated lighting model than in the non-illuminated model.

The ratio of players that found the vent to those that did not in the non-illuminated model was **0:7**. This ratio was **2:5** in the illuminated model; however the two players that located the vent did not use it.

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### *Analysis Point 4*

<b>Big Room</b>			
<b>Find Vent?</b>	No	Yes	10:58 – 11:04
<b>Use Vent?</b>	Yes	No	10:58 – 11:04

This is the second entrance to the air vent in the level. This entrance is not hidden, placed in the corner of a room that the player is likely to move through at least once during their play session.

One lighting model places a group of three small lights on the floor in front of the vent, while the other leaves the corner with only the ambient lighting to illuminate it.

The intention of this was to study the impact on a player's tendency to explore a room that additional lighting has. The expected result was that more players would notice and possibly use the vent when the additional lighting was in place.

The ratio of players that located the vent when it was illuminated to those that did not was **5:3**; however of those five players only three used the vent. This ratio was **4:3** when the area was not illuminated by the additional lighting with two of those four players using the vent.

### *Analysis Point 5*

	<b>CHOICE A</b>	<b>CHOICE B</b>	<b>Time-Stamp in Video</b>
<b>Find Ammo?</b>	Yes	No	6:00 – 6:15

This ammo pickup is located at the end of a corridor that the player must go down to reach the bridge over the lava river. It is hidden underneath a large pipe that the player must jump on top of and drop down in order to reach. It is only just visible from the corridor.

One lighting model places a very subtle blue glow underneath the pipe, while the other leaves the area dark.



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The intention of this was to study how much of an effect lighting can have on how much time a player will spend attempting to reach an area that appears to be hiding an item or other desirable pickup. The expected result was that, when there was no light underneath the pipe, players would be unlikely to even attempt to reach the pickups; when the blue glow was added, players were expected to notice the pickups more often and attempt to reach them.

The ratio of players that noticed the pickups to those that did not in the lighting model with the blue glow was **6:2**. This ratio was **4:3** when the blue glow was removed.

### *Analysis Point 6*

	<i>CHOICE A</i>	<i>CHOICE B</i>	<i>Time-Stamp in Video</i>
<b>Find Keg?</b>	No	Yes	6:39 – 6:50

The elevator in the Dark Corridor (Analysis Point 7 of the 'Guiding the Player' category) leads to a small room containing a weapon locker and a 'Big Keg O' Health' pickup. The health pickup is located at one end of the room that is a dead end, behind a large stack of crates.

One lighting model places a glowing light behind these boxes, while the other does not.

The intention of this was to study the impact of lighting on drawing a player into an area of the room that would otherwise appear to have no purpose. The expected result was that a slightly higher number of players would locate the pickup when the light was placed behind the boxes, although it was expected that more explorative players would locate it regardless.

The ratio of players locating the pickup to those no locating it across all participants was **10:3**. This ratio was **5:1** when the light was placed behind the crates, and **5:2** when the light was removed.

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### *Analysis Point 7*

	<i>CHOICE A</i>	<i>CHOICE B</i>	<i>Time-Stamp in Video</i>
<b>Find Terminal?</b>	Yes	No	8:22 – 8:42

The Pit Room has a walkway running round the edge on the upper level, which is mostly enclosed by a chain-link fence. One of the five terminals that the player must activate is placed in a corner. The player must move through a narrow section with crates and debris either side to reach it.

Both lighting models are identical for this Analysis Point, with the terminal being highlighted by a bright spotlight.

The intention of this was to study whether players would notice this terminal placed in a well camouflaged area, given that it is highlighted by a bright light in an otherwise relatively dark room. The expected result was that most players would locate this terminal with minimal difficulty.

The ratio of players that found the terminal to those that did not across all participants was **13:2**.

### *Analysis Point 8*

	<i>CHOICE A</i>	<i>CHOICE B</i>	<i>Time-Stamp in Video</i>
<b>Find Gun?</b>	Yes	No	8:22 – 8:42

On the lower level of the Pit Room, a Flak Cannon pickup is located behind a group of large storage crates, underneath the walkway that leads to the upper level. It is not visible to the player from the central area of the room.

One lighting model places a bright light behind the boxes that creates a glow that can be seen from the rest of the room. The other lighting model leaves the area behind the boxes dark.

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The intention of this was the same as Analysis Point 5 of this category; to study whether lighting effects players' willingness to explore the environment. The expected result was that few players would locate the pickup when the light was not present, and that most players would locate it when the glowing light was used.

The ratio of players that located the pickup to those that did not when the light was used was **6:2**. This ratio was **1:6** when the light was removed.

### ***Analysis Point 9***

	<b><i>CHOICE A</i></b>	<b><i>CHOICE B</i></b>	<b><i>Time-Stamp in Video</i></b>
<b>Split Corridor</b>	Non-Flickering Lit Path	Flickering Lit Path	09:52 – 10:00

This corridor splits into two paths that join back up again after a short while. One path has two ammo pickups placed along it but is slightly longer; the other is shorter but with no pickups. When a player enters this corridor from either direction they are faced with an identical choice of two possible paths to take.

Each lighting model places a flickering light down one route, which is switched between the two models.

The intention of this was to look for correlations between this occurrence of a flickering light, and the one used previously in the level (Analysis Point 1 of this category). Here, the flickering light is intended to repel the player, as they have the option of taking a route lit with normal lighting. The expected result was that most players would choose the path lit with normal lighting over the path with the flickering light, regardless of which path it was placed on.

The ratio of players that took the non-flickering path to those that took the flickering path across all participants was **9:6**.

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### *Analysis Point 10*

	<i>CHOICE A</i>	<i>CHOICE B</i>	<i>Time-Stamp in Video</i>
<b>Shot Highlighted Gen?</b>	Yes	No	14:12 – 14:20

The two generators in the penultimate room must be destroyed in order to make the bridge extend for the player to cross the lava river. Two large spotlights are pointing at one of them, and this is switched between the two lighting models.

The intention of this was to study the effect of more subtle lighting techniques. The spotlights used project light beams that are only slightly visible from the position the player enters the room, with the only visible difference on the targeted generator being a white highlight. The expected result was that, when shooting the two generators to destroy them, the players would shoot the highlighted one first. This effect was expected to be noticeable, but not as pronounced as the ratio weightings from other Analysis Point, due to the more subtle nature of the lighting effect.

The ratio of players that shot the highlighted generator first to those that did not across all participants was **8:6**.

### *Analysis Point 11*

	<i>CHOICE A</i>	<i>CHOICE B</i>	<i>Time-Stamp in Video</i>
<b>Found Ammo Caches?</b>	No	Yes	15:32 – 15:54

Once the player has crossed the bridge over the lava river, they reach a large area with a storage platform on the right and in front of them with the route to the final room leading off to their left. The storage platform has three sets of pickups; one inside a storage crate, and two others placed behind other obstacles. None of the pickups are visible from the main area of the room and must be found through exploration.

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One lighting model places more ambient lighting around the storage area as well as a small glowing light inside the storage crate containing one of the pickups. The other lighting model uses fewer lights to illuminate the area and removes the glowing light in the crate.

The intention of this was to see whether players would be motivated to explore a large area without any immediately visible rewards. It would also look at how players decide on which direction to go; the way forward is very prominent in this area, with a large well lit corridor leading to the main entrance to the core, with the core itself visible beyond. The expected result was that few players would locate all three pickups, but that more players would be inclined to investigate the area when it was illuminated by more ambient lighting.

The ratio of players that located the pickups to those that did not when the ambient lighting was brighter was **6:0**. This ratio was **2:6** when the lighting was darker.

### iii. Statistical Totals

The number of decisions that all participants made was **343**. Of this, **217** were the decisions that were 'expected' from the level design.

In Lighting Model A, the ratio of expected decisions to unexpected decisions was **123:63**.

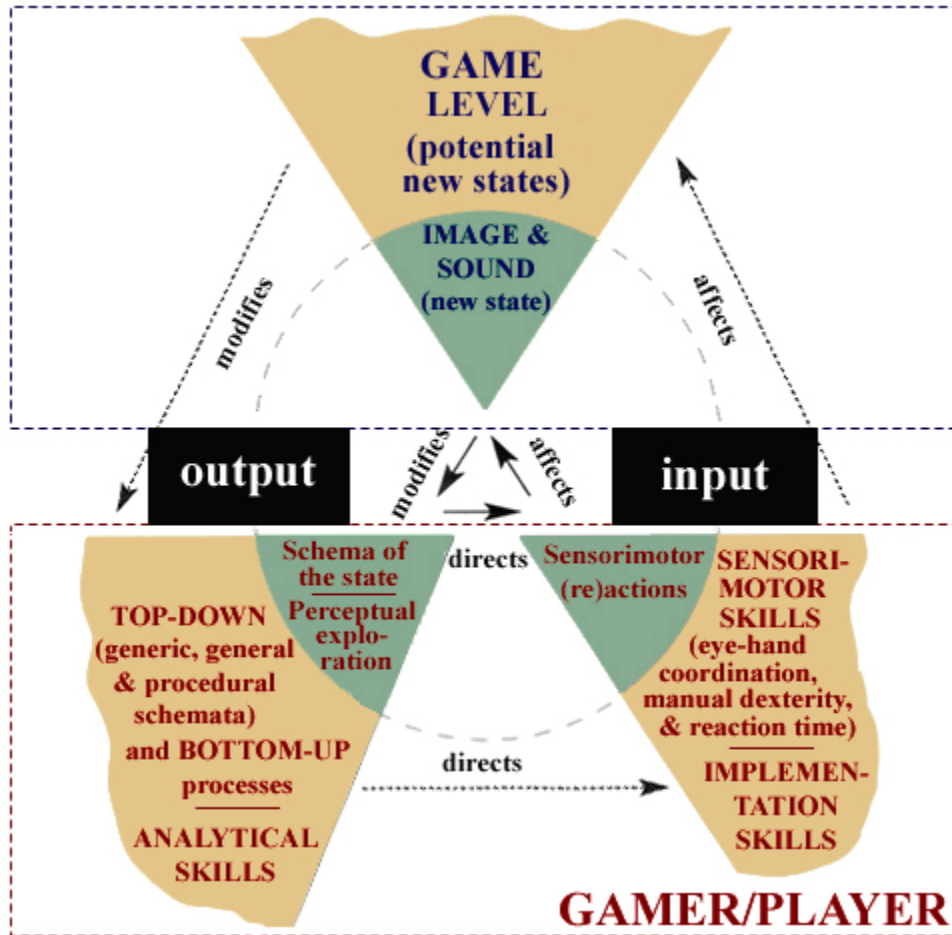
In Lighting Model B, the ratio of expected decisions to unexpected decisions was **94:63**. This difference in totals is due to Lighting Model A being played by one more participant than Lighting Model B.

The total ratio (shown as a percentage) of expected to unexpected decisions made across the entire cohort used for this study was **63.2%** to **36.8%**.

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Appendix IX – Perron's Heuristic Circle of Game play



The Heuristic Circle of Game Play (Perron, 2006)

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### **Appendix X - Overview of Participant Interview Transcripts**

Each participant's interview was recorded using an analogue cassette recorder. These interviews were then transcribed by the researcher into the transcripts in this volume.

The transcripts were not recorded directly in order to aid easy reading and reference; however all that has been removed is material not relevant to the study, interjections and single phoneme 'non-words' such as 'erm' or 'hmm'.

Participants were described using a three-part identifier. The first part shows which version of the level they played, A or B; the second part shows which number participant they were, 1 to 15 and the third part shows whether they were male or female, M or F.

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### Appendix XI - Participant A-1-M

- Interviewer:** What were your general impressions of the level and the game play? Is there anything which stands out?
- Participant:** I thought a lot of aspects of the level were fairly similar to other PC games – I don't play them a lot now, but when I did, that would be the kind of thing I would have expected. I thought the enemies were sometimes a bit unresponsive – although the spiders were good, I like being scared, so their behaviour was quite good and I think they were one of the better enemies. Other enemies, you knew they were there, but the spiders crept up on you.
- Interviewer:** How did you find yourself navigating through the level?
- Participant:** At times I didn't really know where I was supposed to be going.
- Interviewer:** Do you think that was due to the bug with the spawn points placing you back at random places when you died, or do you think it was more than that?
- Participant:** It was more that I didn't know how the level was laid out – when I saw the big door in the cutscenes [after activating security panels] I knew that was where I needed to go, but didn't know how to get there. I could have done with an arrow or something similar.
- Interviewer:** Did you feel the level was pushing you in a specific direction, or did you feel it was fairly open?
- Participant:** It was fairly open – it wasn't too obvious where you had to go. The things that you wanted us to go towards were red, so that helped as a guide.
- Interviewer:** Was there anything geometry-wise or lighting-wise that you think helped with signposting the level?
- Participant:** I think after a couple of minutes, as with most games you get used to what you're looking for, like the computer screens or the red buttons.
- Interviewer:** How would you describe the ambience or the atmosphere of the level in general?
- Participant:** I think you've done quite well, the sound is good and the music suits the level well – the sounds go with the enemies very well, I think it was all quite good.



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- Interviewer:** Do you think that some areas were perhaps a bit too dark?
- Participant:** I don't think they were too dark; there were some things that I saw but then didn't know how to get to, but I don't think they were too dark.
- Interviewer:** Overall then, did you enjoy the level? Was there anything that you think could have improved it?
- Participant:** I think it was good, I think maybe if you had a little bit more navigation. Like I said, I liked the spiders, because I didn't expect them and they made me jump.
- Interviewer:** When you say 'navigation' what is it you have in mind exactly?
- Participant:** Just having more of an idea as to where I'm going – like at the end, I could not find that place at all.
- Interviewer:** So perhaps to the extent of literal signs in the level?
- Participant:** I don't think you need that, perhaps a radar; a radar would be better as it's not so obvious. A big arrow on the screen would be too obvious.
- Interviewer:** So not Bioshock style, with the objective marker on the screen at all times?
- Participant:** No I don't like that, I think a small radar with a dot showing you where the next objective is – no enemies on it, just where you need to go next.
- Interviewer:** Ok, I think that's pretty much everything, thank you for your time.
- Participant:** No problem.

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### Appendix XII - Participant B-2-F

- Interviewer:** What were your general impressions of the level as a whole? Is there anything in particular which stands out?
- Participant:** Well it was very entertaining – maybe the running was a little bit fast when you had to turn quite quickly and stuff. Overall though I think it was almost at the same quality of other games that I've played on the PC, like games from about, maybe ten years ago.
- I think the graphics are really good, but the game play is a little bit too fast which is a bit distracting, but otherwise it's good.
- Interviewer:** Is it too fast for a single player game, or do you think it's too fast in general?
- Participant:** I think it would be ok in multiplayer if you had to look at multiple targets at once, but because you're only looking at a few enemies at once it's a bit too fast.
- Interviewer:** Did you find yourself navigating through the level using any particular cues?
- Participant:** I found that there were a few key points in the game, like there was a huge red generator that was kind of the centre and I knew that that was the centre of everything. I knew that the room next to that would lead me upstairs. It was like, when you walk round a town and you see places that you recognise, I found that happening in the game, so I could navigate my way around quite easily.
- Interviewer:** I noticed after you had found all 5 security terminals that you were backtracking quite a lot. Was that because you didn't know where to go, or something else?
- Participant:** It was a combination of not knowing where to go, and trying to find more ammo, because I found that where I kept dying my guns kept disappearing so I had to go back and find more guns.
- Interviewer:** When you first went into the various rooms, did you feel as though you were being led in one direction over another, or did it feel quite balanced as to the choices of which ways to go?
- Participant:** It was quite balanced, because you didn't just unlock one room, you were quite free to roam between different rooms. At the start it was obviously

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leading in quite a steady direction, but afterwards you could pretty much go through any door you wanted, which I thought was pretty good.

**Interviewer:** Did you feel that there was any aspect of the geometry, the architecture or the lighting or anything like that that was particularly influential more so than another aspect?

**Participant:** I think the lighting, the fact that it was pointing towards ways that I could go was good. I find in some games, they don't point the light towards doors, for example, you might go into a dark corner and run into a door that you didn't see before. I think it's quite nice that you've got that light there to show you the options, rather than just wandering around not knowing where to go.

**Interviewer:** Do you think that some areas were perhaps a bit too dark?

**Participant:** I think the little insects, when they appeared; sometimes it was too dark to really focus on them. There were certain areas where it was ok, but when you were right down at the bottom it was quite disorientating and you could only see them when they were close.

**Interviewer:** Were then any areas or rooms, apart from the big generator you mentioned previously, that stood out as big set pieces?

**Participant:** The big lift room. I noticed that was quite influential, because I realised I couldn't go there yet, because of the generators. Once I figured out what it was I realised I had to go back up and finish the rest [of the security terminals]. That was like a main point for me.

**Interviewer:** You have already answered this I think, but did you enjoy the level as a whole?

**Participant:** Yes, I enjoyed it.

**Interviewer:** Is there anything, apart from the aspects you've already mentioned that you would do to improve it?

**Participant:** The enemies were a bit dumb – but they were quite challenging, because they were always moving, they were rarely standing still. Some of the enemies were a bit overpowered – the little ones [the spiders] especially, they were just all over the place.

**Interviewer:** Was it the number of them, or was it just that they were hard to hit?

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**Participant:** I think it was the fact that they were always so close to you; the only way you could really shoot them was if they were biting you. I think maybe have them not attacking quite so much at close range, maybe have them spitting or something similar.

**Interviewer:** Ok, I think that's about it, thanks for your time.

**Participant:** That's ok.

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### Appendix XIII - Participant A-3-M

- Interviewer:** What were your general impressions of the level as a whole? Is there anything in particular which stands out?
- Participant:** Well I thought it was really quite good, although the structure of it was a bit obscure – I found that the end bit was in the middle. I couldn't work out if you start at the beginning, the end bit is in the middle and then you circle around, or if it was a dead end. I found the vent in the big room, which I could have found at the beginning but I didn't see it. Overall though I think the level was quite good.
- Interviewer:** You said it was hard to work out the structure of the level – was there anything in particular that helped you navigate? It seemed that you were finding your way around reasonably well.
- Participant:** I just tended to explore every room that was available. Floor details that were marked out, like paths, helped me. Also I found that the doors stood out from the walls quite well.
- Interviewer:** Was there any element of the level, such as architecture or lighting or ambience that stood out over anything else?
- Participant:** The buttons were very bright – although at first I didn't think they were buttons, as they glowed on the outside but the middle was dark. The gun pickups stood out because they were brightly lit, the lighting stood out and was very clear. The computer screens stood out too. Everything else was fairly dark though.
- Interviewer:** When you say "dark", do you reckon any of the areas were particularly too dark?
- Participant:** I wouldn't say too dark, I didn't have any problems with seeing things.
- Interviewer:** When you got to the core the first time and found that the door was locked, did you feel confused, or did you realise that the reason it was closed was because you hadn't activated all of the terminals?
- Participant:** Because of the cutscenes of the door that I saw having activated two terminals, and seeing that there were lights on the wall, from my experience as a gamer I guessed that I needed to find all of the terminals. Before, I wasn't looking for terminals I was just making my way through the game but

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when I realised I had to get through that door I realised I needed to find all the terminals.

**Interviewer:** When you went into the various rooms for the first time, if there was more than one exit did you feel that you were being led in one particular direction?

**Participant:** There were cases where I didn't know if I should go down one route or another and I usually found myself taking the route that was closest to my path. For example, the big lift, I went down that as opposed to the other way.

**Interviewer:** Was that maybe because it was more prominent in the room, or it looked more interesting?

**Participant:** I went the other way first [through the flickering corridor] but then after a few moments I realised that was going somewhere else so I thought perhaps I should do the lift first. I was tempted, when I came to the lava bridge to actually go back and see where the other route went – I was torn a bit at this point as to which way to go.

**Interviewer:** What areas stood out most to you as either set pieces, or as key points in the level?

**Participant:** Well, things like small areas at the end of rooms where weapons might be stood out as being interesting and worth exploring. Anything bright stood out. Other than that I mainly stuck to the path – doors stood out as I said, and enemies I could see from quite a distance away.

**Interviewer:** How would you describe the ambience of the level?

**Participant:** Fairly dark, it gives the sense of being underground. It certainly wasn't a happy level, very dark and mysterious, as if you're not supposed to be there.

**Interviewer:** Did you enjoy the level as a whole? Was there anything you would change to make it more entertaining?

**Participant:** Perhaps more enemies, I found it a bit easy throughout most of it, although the boss was a quite powerful with his homing rocket launchers.

Perhaps giving the level a more linear approach, or keeping it as it is but making the rooms less cluttered so I have a good idea of where I am. I did find myself getting lost because some of the rooms look quite similar.

**Interviewer:** Do you like the fact that you can go [researcher explains how the level can be

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played in both directions] either way through the level? Maybe if the big lift wasn't in that location as a distraction half way 'round' but in a different part of the level?

**Participant:** I think if the terminals were a lot more obvious, I know they were explained in the opening cutscene but I'm not sure why, it seemed to leave my mind immediately. I knew I had to do stuff but I wasn't thinking what exactly most of the time.

**Interviewer:** The lighting specifically, you said it picked out things like the guns and the doors – do you think maybe more use of specific types of lighting, like spotlights to pick things out would have helped more?

**Participant:** I found that anything that glowed tended to be interactive.

**Interviewer:** When you were in the core, after you killed the boss, I noticed you were trying to shoot the glowing lights.

**Participant:** It was because of the dust effect on them when they were being shot, it made me think I was damaging them. I was a bit confused.

**Interviewer:** Do you think the core would have made more sense if those white lights hadn't been there?

**Participant:** Yes I think they were quite off putting. The fact that you had to shoot the holes, they weren't quite defined enough, it didn't occur to me straight away that I needed to shoot them.

**Interviewer:** Do you think it might have been more obvious if the opening core cutscene had focused in closer on those holes?

**Participant:** Possibly, I'm not sure, the cutscenes just sort of went through me – I haven't played a shooter in ages so maybe I'm a bit out of practice!

**Interviewer:** Ok thank you; I think that's just about everything.

**Participant:** Ok.

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### Appendix XIV - Participant B-4-F

#### Participant Notes:

Participant did not complete entire experiment. The interview is based on the section that was completed.

- Interviewer:** What were your general impressions of the level as a whole? Obviously having not played a lot of shooters it might be quite difficult to compare, but in general did you find the design was easy to navigate? Were there things that stood out, or did you find yourself feeling quite lost?
- Participant:** I did feel quite lost, because there is no real clear path anywhere and no map to act as a guide. It was very confusing, because you can go back to where you have already been and end up going in circles.
- Interviewer:** Do you think you would prefer it if it were more linear, perhaps with just one single path?
- Participant:** Not just one path, there should be some side paths, but you should be able to tell that it is a side path. When I play other games, I do like to go off somewhere else, and maybe find a treasure chest or something, but this one was just so confusing.
- Interviewer:** Was there anything that you tried to do to help you find your way as best you could? Was there any sort of architecture or lighting that you found helped at all?
- Participant:** Some of the areas were too dark, and I thought that doors that I had opened would stay open so that I knew where I was and where I had been, but they closed behind me.
- Interviewer:** Did you feel that one path was more emphasised over another, or was it quite balanced?
- Participant:** I would say quite balanced.
- Interviewer:** So you didn't feel as though you were being led in one particular direction?
- Participant:** No not really, that was the confusing part I think.



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- Interviewer:** Of the bits that you played through, were there any areas that stood out or that were more recognisable than other areas?
- Participant:** The room where I had to push the power buttons to open the door, I felt that was the most 'game-like' bit, because I had to interact with something.
- Interviewer:** Do you think the ambience of the level was too dark, too oppressive? Would you have found it easier to find your way around if it was more brightly lit?
- Participant:** It is quite dark, but I think that suits the environment and the style so I think its ok.
- Interviewer:** So you've already said that you don't play a lot of shooters -
- Participant:** I don't, but I watch people play them, my boyfriend plays Call of Duty and Fallout and things like that. I haven't played them though; I've been playing Dragon Age recently.
- Interviewer:** How do you think the environment in the level compares to some of the environments in Dragon Age for example? How do find yourself getting about in the game?
- Participant:** I use the map mainly, although it starts off black until you start exploring. There are some missions where you have two separate paths, and if I go one way and it looks like it's going to be a long route, I think perhaps I should take the other route instead. Saying that, I like to explore everywhere when I play games I don't want to miss anything. So, I kind of like things to be a bit linear, but to have some side paths too, if you get what I mean.
- Interviewer:** So you like to be led in the general right direction, but to have the option of deviating from the main path occasionally?
- Participant:** Yes, that's about right.
- Interviewer:** I noticed a couple of areas where there were flickering lights you tended to head in that direction rather than perhaps taking the route that was more brightly lit.
- Participant:** It looked interesting, and I thought it would maybe be something I can interact with, or there was another reason that I should probably go there.
- Interviewer:** Of what you played, what do you think you would change to improve the

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experience? I could see you were getting quite frustrated towards the end there.

**Participant:** I would have liked to be able to save the game at any time, or to have a checkpoint when I pass through each door. I didn't really know what my goal was in the game, I know I watched the cutscene but I completely forgot about it when I got into the game. There was no main goal, I just went in and shot things that were in the way!

**Interviewer:** Ok, I think that's pretty much everything.

**Participant:** Ok, no problem.

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### Appendix XV - Participant A-5-M

- Interviewer:** What were your general impressions of the level as a whole – specific points or just general feedback on it?
- Participant:** I think it opened quite well, I think I forgot a few of the objectives from the beginning, possibly because there were a lot of camera angles and it was a lot to take in. Half way through when I got to the armoury I kind of forgot what I was doing, although then I found the monitors, so I started going back. Overall I thought it was very good, I thought it was some sort of industrial mining facility on some alien planet, obviously not Earth.
- The colour scheme as well – You've got the red and orange lighting, and then you've got the lava. There are the blue lightning bolts that run down some corridors; the central core looks pretty cool as well.
- Interviewer:** Did you find yourself using any cues to navigate your way through the level, like architecture or lighting or anything like that?
- Participant:** The big room with the armoury in, you come in one door and there's a top level, and a ramp which goes down to the bottom level. As I was running around, I noticed that there was a big light pointing towards the door which takes you back to the room where the Shock Rifle is [The second main room in the level, where the paths initially split]. So that was a visual cue – only after I found the red buttons actually did I start going towards red lights as well.
- I thought the monitors would do something as well as they were orange [the participant found the detection boxes around the monitors for registering button presses too small, hence the confusion] and I eventually managed to activate them and they then turned green.
- The lightning going through the corridors also helped as a guide – whether that was intentional or not I don't know.
- Interviewer:** Did you ever feel lost or not know quite what you were supposed to be doing?
- Participant:** In the very first room I was a bit lost because given the appearance of the fences on the left hand side, I expected there to be a door or a room there. I found the Assault Rifle in a crate. Only after a little while, as I'd played the game before I remembered that they had subtle lifts that were half hidden in

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the floor, so I started looking around.

I saw the walkway up above with the lighting on it and was thinking 'how do I get up there', realised there was no way to jump up and then saw the thing on the floor, so I stood on that and it went up.

Again in the main room with the armoury, it's got small rooms on both sides as well and I got a bit lost when I was navigating through there but when I came back into the main central room I knew where I was.

I found that the dark doorway is where I came from, and the one that is lit up is where I need to go. I didn't think I was going to have to backtrack through the level, but I'm glad I did. The room just before the final core with the lava bridge was a problem, because I couldn't find the button [to deactivate the shields on the power generators].

**Interviewer:** Was that because the button was maybe in a bit of an odd place?

**Participant:** Well it was on the side of the stairs, and it was red, as were a lot of other things in the room so I couldn't really pick it out. I tried shooting the two generators with the lightning gun but it didn't really do anything, then I hit the red button and realised the shields had come down so then I shot them again.

I also tended to explore all parts of a room before moving on to the next.

**Interviewer:** Yes I noticed that, quite an explorative player.

In the rooms that offered multiple routes out of them, did you ever feel like you were being pushed or led in one specific direction, or did you feel it was quite balanced in the way the various routes were emphasised?

**Participant:** Well from what I found, one room did eventually lead to another room, but the different routes you can take there have always got different power ups, different weapons, and different enemies. I was a bit confused by the corridor where those bugs start attacking you, I thought it was going to be a subtle introduction to a new enemy, but once I'd got past the corridors in there I didn't really see them again, so I was a bit confused about why I was running through there, I was expecting there to be something there.

Other than that I think I mainly knew where I was going; the big lift that goes down to the penultimate room, the first time I went past it I knew it was something big I thought it was like a door or something and I thought 'well, that's obviously something big and I'm not ready to go there yet' so I carried

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on into the room where the armoury is.

However once I did that, I thought that that was starting to look like an even bigger room so I went back and went down the lift to the lava, but then ended up thinking 'I really shouldn't be here yet!'

**Interviewer:** I noticed when you were looking at the big lift and sizing it up you noticed the fan in the ceiling – did you think that that might be a trap?

**Participant:** I thought it might be a trap, I thought the texture on the floor was quite like the one on the lifts previously and I thought it might send me up [towards the fan]. Then I thought it might be a door instead, because I hadn't seen that wall texture before so I thought I'd just press the button and run away; then the lift started going down so I just went down with it.

**Interviewer:** What areas or rooms in particular stand out as being central points or key events in the level?

**Participant:** Well I keep referring back to it, but the room with the armoury that seems like the main room, because there are two monitors in there, plus the armoury which I couldn't get into unfortunately. There's enemies on either side, and also it's where the rocket launcher is [the rocket launcher is actually out of this room through a ventilation shaft].

That was quite a good reference though, because I could get back to the very start of the level by going through the door with the light behind it back to the area with the Shock Rifle – I've just realised actually, when I first went through the level, I went up a lift to the top level of that room, but then jumped down to get the Shock Rifle and never went back up again. If I'd have gone back up then I could have gone through the whole level backwards.

**Interviewer:** If you'd done the level the other way round, do you think that some of the things which weren't clear to you may have been clearer?

**Participant:** I think what would have happened, if I'd gone into the room with the armoury, there are lots of computers and two monitors in there and I would have realised that the monitors are important much earlier. I think the level played better the way that I did it, because the corridors with the bugs were sending me down slightly. This made it feel more like I was heading deeper into the facility. I think if I had been going upwards it would have felt like I was moving away from my objective.

**Interviewer:** How would you describe the ambience or atmosphere of the level? Did you

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find some areas too dark, was it illuminated well enough? If it had been brighter may it have made the combat any easier?

**Participant:** In terms of ambience, the music helped a lot, because it kept things going. Without that, things might have got a bit stale when I discovered the monitors do something and had to start backtracking.

I found a lot of the corners were quite dark which made me think something might be down there – I think at one point you saw me use the lightning gun to light up the corner. I think the corridors are fairly well lit, with the exception of the one with the flashing light that splits into two.

**Interviewer:** Did you think there that maybe you should avoid the dark path?

**Participant:** I went round the brightly lit one first, and then thought that it was quite short, so I went back round the dark one and thought that the light must just be broken. The first time I encountered a flickering light along with the sparking sound effect I thought that something was probably going to go wrong.

I got the Shock Rifle pretty early on, and once I got it I thought I was going to have to do some long-range things, so as I was going through doors I was checking both sides as I went. But yes I thought the lighting was very adequate, especially in the big room with the lava. I got a bit confused by the rotary bridge as I saw it turn but then couldn't see a door either side, it just looked dark. Then I found the door next to the link gun and realised that was the way to go.

The lift that is activated by buttons would have made more sense if the buttons didn't look like all of the other buttons. Maybe put them in the shape of an arrow, or just have a keypad there. Like in the first Half-Life, they have these big rotary lifts and they have one button on them and you can tell what it does because it the only button on there.

**Interviewer:** Overall, did you enjoy playing the level? Was there anything other than what you've said already that you would add or take out to make it any better?

**Participant:** I think you made good use of the vertical – I remember I was playing Portal with the developer's commentary on, and they said that "it's very hard to make players look up in First Person Shooters". In your level, after the bugs were introduced I found myself looking up a lot.

**Interviewer:** Do you think then that it might have been beneficial to introduce them

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- earlier on?
- Participant:** No I think it worked well, because especially as I was playing the level going 'down', it felt like I was going deeper and thus facing a new threat. Whereas if I was playing it the other way round they would have just been a random threat.
- I did find a couple of instances where the steam coming out of the vents on the walls and raising up gave the impression that there was a ladder there. I would say overall the level is really good to be honest.
- Interviewer:** When you went into the core, did you think that the aim was to destroy the core, or to kill the boss, or both?
- Participant:** Well by this point I had forgotten my objectives completely, and the boss had a gun whereas the core didn't, so I went after the boss as he was the larger threat.
- I think you could have made use of the smaller health pickups [health vials which add +5 per pickup] to make the boss a bit fairer, as the player would have to keep moving to pick them up, but would then be being rewarded for being agile.
- When I started shooting at the core, I couldn't really tell if it was taking damage or not and ended up firing quite blindly until something happened.
- Interviewer:** Do you think it would have made more sense if they had taken one hit so you got instant feedback?
- Participant:** It might have been better; I don't know if it's possible, but to have the central core kind of spark or fizz when it has taken some damage, or even just a sound effect.
- Interviewer:** Ok I think that's probably about all, thanks for your time.
- Participant:** Ok then no problem.

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### Appendix XVI - Participant B-6-M

- Interviewer:** What were your general impressions of the level as a whole?
- Participant:** It was pretty good, slightly dark but that's obviously something you can change.
- It would be good to have when you stand in front of a button a little prompt that says something like "Press" or something like that. Other than that, pretty good.
- Interviewer:** How did you find yourself navigating through the level?
- Participant:** I got lost a couple of times, but once I sort of realised where I had to go it was alright.
- Interviewer:** Did you think the level layout was confusing, were there not enough points of reference?
- Participant:** Possibly, there were a couple of quite big rooms that helped you realise where you were, but some of the smaller rooms didn't have much variation between them. Perhaps if there were some different things in each corridor it would make it easier to remember where I'd been.
- Interviewer:** Were there any elements in particular, such as architecture or lighting that stood out as either being important or useful as a navigational tool?
- Participant:** There were little sparks on the wall [electricity conduits] at some points which made me think that was the way to go. You've obviously also got the glowing blue monitors, I remember that. There was one point with a room that was slightly brighter with a bridge towards it; I didn't notice that too much though.
- Interviewer:** So you didn't notice in any areas that you were specifically being led in any one direction?
- Participant:** Not by lighting, maybe by the actual map layout. The way I was going just felt like being the logical way to go.
- Interviewer:** Which areas of the level stood out as being most important, or as being set pieces or anything like that?



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- Participant:** The bit that was sort of like a boss, with the enemies up top and down below, that was pretty good. [The Mini-Core] That sort of felt like a mid-way point.
- Interviewer:** You've already said that the level was quite dark – how would you describe the ambience or atmosphere?
- Participant:** It was good, had a very good feeling of the 'Unreal' style.
- Interviewer:** Was it fitting just because you're used to playing other Unreal maps, or was it fitting for an FPS in general?
- Participant:** Definitely in general.
- Interviewer:** Was the problem that some areas were too dark to see enemies, or to see where you were supposed to be going?
- Participant:** The little bug aliens they were pretty hard to see. There was one point, in the room with sparks and stuff [Split Corridor] there was a corridor that went down the right hand side, I possibly didn't look properly but I thought it was just a dead end, rather than leading round and joining back up again. I just sort of kept going and hoped for the best, I couldn't really see where I was going.
- Interviewer:** You needed me to tell you where to go half way through – was that because you thought there was something else you were supposed to have done in the rest of the level before you got to that point?
- Participant:** I thought what I was going to be doing was making the bridge activate – I think it's because you're unlocking the door which is after the bridge, and you haven't actually seen it yet, it gets a bit confusing.
- Interviewer:** Did the computer consoles that you had to activate as you went through the level stand out as being objective points, or did they blend in with the rest of the level?
- Participant:** I think they were alright; there were some that I only just noticed on the way back luckily when I was just sort of looking around. Some people probably would have noticed that more and if not you would go back and check through the level anyway.
- Interviewer:** The cutscene at the beginning, did they lay out what you had to do quite well? It was just a case of thinking you'd missed things?

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- Participant:** Yea, yea.
- Interviewer:** Overall then did you enjoy playing the level? Other than what you've said was there anything else that bugged you that you would change to make it better?
- Participant:** I think literally the prompts coming up at buttons; that would have made it a lot easier.
- Interviewer:** Ok, that's about it, thank you.
- Participant:** That's alright, no problem.

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### Appendix XVII - Participant A-7-M

- Interviewer:** What were your general impressions of the level as a whole?
- Participant:** I think it was quite fitting for what it actually was; I thought some sort of gritty adventure game? It was a bit dark though.
- Interviewer:** A bit too dark?
- Participant:** Yea, some places you sort of thought like, is that a wall or is that another corridor. Maybe some more ambient lighting would help that.
- Interviewer:** Anywhere in particular?
- Participant:** Before you get to the core you have go down like those corridors don't you [Split Corridor & Machine Room/Pit Room Corridor], that was pretty much pitch black for me.
- Interviewer:** At the beginning after you came through the first set of rooms, you went back to where you started, was that because you thought you were going the right way, or were just exploring?
- Participant:** Well at first it was more because I thought it was going in a loop, but then I thought maybe I missed something. More of a case of confusion at first really.
- Interviewer:** How did you find yourself navigating your way through the level, was there any particular cues?
- Participant:** Well I thought, "oh, I've activated a panel, so I need to progress down this corridor or something. Then I went down there and found another panel, so I just basically followed the panels. If I didn't know where to go I just went into the side rooms until I found the next panel.
- Interviewer:** Was there anything either architecture-wise, or lighting-wise or anything like that that was particularly guiding you?
- Participant:** I'm not sure; I think it was more curiosity rather than anything in the environment that was doing it. Sort of like, if I go down here what will I find.
- Interviewer:** When you went into rooms for the first time, for example the room with the first enemy with a rocket launcher [Mini-Core], was there anything that

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particularly drew you to either side?

**Participant:** When I play games I sort of just tend to naturally go left first.

**Interviewer:** Was that the sort of rule you followed, I'll look everywhere but I'll go left first?

**Participant:** It wasn't a case of thinking about going left; it was just more of a natural thing.

**Interviewer:** Are you left-handed or right-handed?

**Participant:** No no, I'm right-handed.

**Interviewer:** Apart from at the beginning, was there anywhere else that particularly confused you?

**Participant:** I almost got stuck at the bit where you have to activate the bridge.

**Interviewer:** You found the button eventually, was it just a case of missing it, or was it that you thought there wouldn't be anything on the side of the stairs?

**Participant:** I think it's because it's on the side of the stairs in such a secluded space, people tend to think of stairs as just a one way sort of thing. I probably would have put a light on there or maybe on the wall nearby.

**Interviewer:** Do you think if it had been in a more illuminated area you might have been more inclined to investigate?

**Participant:** If it was slightly more illuminated maybe, but I think there needs to be stuff either side of the stairs to sort of draw you to actually explore it.

**Interviewer:** In an earlier version of the level there was an enemy guarding that button – do you think that may have helped draw you to it, or might it have pushed you away?

**Participant:** I tend to just see enemies as something to kill – I only think that they might be guarding something if they look particularly important.

**Interviewer:** You said you didn't really feel pushed in any direction particularly – in the corridors that you said were really dark, did you find yourself favouring the slightly lighter route because you could see more?

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- Participant:** I think so, yea.
- Interviewer:** The other way has a flickering light, was that more annoying to go down because it made it harder to see?
- Participant:** I think in games people tend to go towards what they can see, they see the dark as being sort of the unknown, and they might not want to venture that way.
- Interviewer:** So you didn't think there may be things hidden in darker areas?
- Participant:** When I play shooters I just tend to go from A to B, I don't really deviate unless I have to.
- Interviewer:** Would you say that was because shooters don't generally tend to have a lot of side areas?
- Participant:** Yea.
- Interviewer:** Would you say that that doesn't really fit in with that genre?
- Participant:** Exploration is all well and good in an FPS but people sort of have to know what they're looking for in the first place to want to look for stuff. I had Halo 3, and I read that you could activate terminals to read the back story, so I went and hunted them out because I wanted to read the back story. If it's a good enough story, you want to go and get involved as opposed to if it's a case of being dumped in and told to shoot things.
- Interviewer:** How would you describe the ambience?
- Participant:** I liked the ambience it reminded me a bit of F.E.A.R.
- Interviewer:** In F.E.A.R then, some of the powerups are quite well hidden – do you find yourself exploring more in that sort of environment?
- Participant:** I tended to see some of the tighter spaces as worthy of exploring because they're a bit out of the ordinary, and you know that it's quite unlikely that an enemy will be lurking there.
- I found the same sort of thing in Half-Life, the Lambda symbols meant there was a resistance faction nearby.
- Interviewer:** On the whole, do you think the illumination of the level added to the game

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play or detracted?

**Participant:** I thought it worked, if it was too brightly illuminated you might think it was just another Unreal level.

**Interviewer:** Having played other multiplayer maps in Unreal Tournament did you find it hard to play a single-player oriented level in the same engine?

**Participant:** I liked the game speed; that worked for me. I think the skill level required was quite low, the enemies weren't too challenging. The only bit that was, was where the bug enemies are attacking you.

**Interviewer:** So you didn't think the area they appeared in was too dark – you saw them as a challenge rather than an annoyance?

**Participant:** Yea, it's only an annoyance when you can't get them at all.

**Interviewer:** Overall then you enjoyed playing the level? If there were one or two things you could change to make it a more enjoyable or entertaining experience what would they be?

**Participant:** Maybe put some directional panels on the wall, to different base areas.

Maybe put some voices in so that if the player is stuck for a length of time, the avatar suggests a hint "maybe I should go and do..." etc.

The button that deactivates the generator shields was a bit confusing – I think people may think that because it only has a slight effect on them when you press it that they then must have to go and activate something else to turn them off, rather than thinking they have to shoot them.

The core was fairly self explanatory because of the hazard lines around the bits you had to shoot. It could have been because that sort of scenario appears a lot in games.

**Interviewer:** Sorry, I missed out a question; what were the areas that most stood out as being either central, or most important?

**Participant:** The beginning, just because it was big and open. The area leading up to the big lift and the core I thought was quite good too. [Pit Room/Split Corridor]

**Interviewer:** You avoided going down the big lift immediately, why was that?

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**Participant:** Again possibly from experience, a big thing like that tends to lead to something big, then I saw the smaller corridor and I thought I must have to do something else down there first.

**Interviewer:** Ok, I think that's about everything, thank you.

**Participant:** That's ok.

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### Appendix XVIII - Participant B-8-M

- Interviewer:** What were your general impressions of the level as a whole?
- Participant:** Well I take it it's just a map made in Unreal Editor?
- Interviewer:** Yea.
- Participant:** I've never really played those sort of games before that much, it's a bit new to me so I wouldn't have been able to recognise if you'd put anything new in there. I was a little bit annoyed because those panels were a little bit confusing.
- Interviewer:** Why were they confusing?
- Participant:** Just because they were all spread around the map, and they had two screens on them, so I went up to one and nothing happened. [This was because there were buttons next to a lot of computer panels and the player thought it was the panels that were being activated, not the buttons].
- Interviewer:** Ok, anything else at all?
- Participant:** The buttons by the lift [from Dark Corridor to Machine Room], I thought they were just decals on the wall. They didn't really look like buttons. If it was highlighted it would have been easier – you know like on Left 4 Dead it's got a blue silhouette around it, it just says "press me" a bit more.
- Interviewer:** How did you find yourself navigating your way through the level; was there anything that stood out as being useful?
- Participant:** Well, no, to be fair. I mean it's a really good map; I got lost a bit and it was a mission to find that last panel which I missed. So something like a guide arrow maybe would have been useful.
- Interviewer:** Something similar to the objective arrow in Bioshock?
- Participant:** Yea that would be good – or the one in Halo where it has multiple little objective arrows and it shows you the distance to each one.
- Interviewer:** Was it mainly the layout of the map that was the most confusing aspect or was it that there was nothing really pointing you to the objectives?



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- Participant:** Probably more that there was nothing pointing me to the objectives.
- Interviewer:** So the fact that the level layout was essentially a loop, that wasn't too bad for you?
- Participant:** Yea it was fine, but then obviously with that corridor that takes you right back to the beginning I just thought "oh no".
- Interviewer:** When you first found the lift to the main core did you realise it was a lift? You obviously saw the button.
- Participant:** I realised it was a lift, but I thought I had to activate all the panels before I could activate it.
- Interviewer:** When you went into rooms for the first time, some of the rooms have got multiple paths – did you ever feel that there was anything pulling you in one particular direction in any of the rooms?
- Participant:** Not really no; I just tend to wait until I've explored the main area first before I start looking in different bits.
- Interviewer:** Which areas in particular stood out as being either most interesting or most key to the level? Was there anything that acted as a sort of central point?
- Participant:** Well the core room right at the end really.
- Interviewer:** Was there anything in the main level area at all?
- Participant:** I didn't think there were any areas that were particularly key, but at the end of the day you've just got to activate those panels. I mean, the lava bit that's a change of scenery and feels a bit different, it's not just repetitive endless corridors and similar room layouts.
- Interviewer:** Did you think that the rest of the map might have benefitted from some more variation in things like lighting?
- Participant:** I hate it when games get repetitive and it wasn't too repetitive but the rooms were more or less the same until I got into the lava area; and obviously the core area is different.
- Interviewer:** What sort of changes would have made it more visually appealing?
- Participant:** Well it sounds a bit weird, but maybe colour – like, a change in the lighting

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colour. You know how the lava room had a glow of red? Maybe different colours to show you're now in different areas like giving an area a blue glow with some blue lights on the ceiling, something like that.

Hmm, also, maybe a mini map – just something to say which areas you've already been to, with the areas you haven't been to uncovering as you find them. Obviously you could combine that with the objective markers I mentioned. I reckon people might get quite bored looking for that last panel.

**Interviewer:** A lot of people have missed the same panel you did [In the second room, behind the power storage pillars]. Was it in an area that particularly looked like somewhere you wanted to explore?

**Participant:** Well everywhere looks like it somewhere to explore that's the whole point of these games really.

**Interviewer:** What other sort of FPS games do you like?

**Participant:** Playing through Bioshock at the moment, erm, Half-Life 1 and 2, Left 4 Dead.

**Interviewer:** Is there a lot of need for exploring in Left 4 Dead?

**Participant:** Not really, you just have to get from A to B – if you get lost or separated you're in trouble. They have a lot of emphasis on key items and things you have to use though like I said.

**Interviewer:** How would you describe the ambience of the level?

**Participant:** It was the same soundtrack over and over again. That sort of level I would have recommended something much slower. Some sort of small ambience like a humming of machinery or something like that.

**Interviewer:** A few people have mentioned that the music's pace kept them motivated when they were backtracking looking for terminals – do you think you maybe would have got more frustrated had the music been slower?

**Participant:** If there was no music at all, or just ambient background noise, yea maybe. The music was perfect for the boss at the end. It was just that most of the time there wasn't much to shoot, so something slower would have sufficed and then had combat music kick in as needed.

**Interviewer:** So perhaps just a heavier use of triggered music?

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- Participant:** Yea that would be good.
- Interviewer:** What about the ambient lighting through the level?
- Participant:** Well just make it look a bit different like I said – it was the same textures in most of the rooms. Just mix it up a bit, make a few rooms different colours.
- Interviewer:** Would you have said any of the lighting was particularly [interrupted]
- Participant:** The overall lighting was absolutely spot on – the shadows, dark corridors all fine, brightly lit rooms wouldn't have looked right.
- Interviewer:** Would you have said that the objective points were in well illuminated areas in particularly?
- Participant:** They were quite dark, but that green monitor stands out well.
- Interviewer:** Would you say there were any points where there was lighting or architecture that was emphasising maybe doorways or other objective points?
- Participant:** Some of them were semi-hidden from distance but you could see them when you got closer to them.
- Interviewer:** Would it have been better if they had stood out from distance so you could see a clearer route?
- Participant:** Sort of yes, maybe if you put some lights like, literally above the doors.
- Interviewer:** In the [Split Corridor] you did a kind of double take when you noticed the flickering light? Was that conscious, did that interest you?
- Participant:** Yea it did because I thought it might be hiding something. Same as in the room with the Big Keg O' Health; that attracted me because there was a big empty space behind some crates.
- Interviewer:** You found the door to the armory, but didn't find the way in – was that just a case of not interested, or not knowing how to?
- Participant:** Well I didn't know how to – I assumed there must be a switch somewhere but I decided to just carry on with the main objective.
- Interviewer:** Overall did you enjoy the level?

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**Participant:** Yea, I mean it's getting there, definitely getting there. Just the music that was playing I was expecting there to be loads of things to kill. There was a lot of empty space. It would have been more fun with more combat. Also, the enemies that were there were quite easy. Perhaps making more groups of enemies rather than smaller numbers so that it makes you keep moving.

*[Short unrelated talk about various games, ending up on Doom 3]*

**Interviewer:** The lighting in Doom 3, how did you find that?

**Participant:** A lot of the time it was too dark, you had to alternate between guns and lights.

I didn't want to play it with mods, but it did get annoying.

**Interviewer:** Was it too dark when you were exploring or was it only too dark for combat?

**Participant:** I think it was ok really, compromising the atmosphere by changing the darkness might not have worked.

**Interviewer:** Ok, that's pretty much everything, thank you for your time.

**Participant:** That's ok.

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### Appendix XIX - Participant A-9-M

- Interviewer:** What were your general impressions of the level as a whole?
- Participant:** I enjoyed it, it was fun – there were a few bits where I kind of lost my way.
- Interviewer:** Why did you lose your way do you think?
- Participant:** I think it was one specific point, but I think it was just because I hadn't taken note of what I needed to do. I mean, the intro cutscene was clear I just don't think I paid it enough attention. I realised eventually what I had to do.
- Interviewer:** How did you find yourself navigating your way through the level? Was there anything that stood out as pointing you in the right direction?
- Participant:** I was just following my intuition I think. A lot of the time I was just looking for screens and red buttons. Generally I found there were two pathways; I'd explore both slightly and then decide which one to take.
- Interviewer:** When you were exploring each direction, was there anything that perhaps attracted you in one direction first?
- Participant:** Erm, I'm not sure really.
- Interviewer:** Let me think of an example. In the first room, was there anything in particular that made you go up on to the catwalk first?
- Participant:** Yea, the catwalk had a screen nearby, also it was brightly lit which indicated it was like, somewhere I had to go.
- Interviewer:** Where the big lift is, the set of dark corridors afterwards; there's one that's lit normally and one with a flickering light. Did you avoid the flickering light consciously or was it just easier to see the other way?
- Participant:** I think I figured it was two separate ways to go, and I just picked the one that looked safer first.
- Interviewer:** The room that you found eventually [containing the Big Keg O' Health], did you miss it initially because you didn't realise there was a lift there, or was it too dark to really see what was there?
- Participant:** I knew there was something there, but I thought I had to double-jump or

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press a button or something. It was only after I went along that other platform and there was another small elevator that I realised there were elevators that don't have switches to operate them.

**Interviewer:** What areas stood out as maybe being most important, or being a keypoint?

**Participant:** Definitely the main core. To be honest though most of it, most places had screens or something to activate. More text, some more information about what's happening would be cool. A number of times it switched to showing the doors by the main core, and I guessed each panel was slowly unlocking it until it opens fully, but more explanation would have been useful.

**Interviewer:** Was there anything in the first section of the level that you took as a reference point, anything that felt central to the level?

**Participant:** Possibly the section with two levels [Big Room].

**Interviewer:** Would you say you prefer games with a more explorative element rather than an arcade style game?

**Participant:** You could say that, I like games that have a good story. Story is important to me. Bioshock to me, the game play was horrible but the story drew me in.

**Interviewer:** Why was the game play bad?

**Participant:** It wasn't bad, I mean I've played some bad FPS games, but it was quite clunky and quite slow. But the story kept me playing; it was like System Shock 2.

**Interviewer:** How would you describe the ambience of the level, such as the sound and lighting?

**Participant:** Dark, moody. Definitely quite energetic though, I'm not sure how to describe it, it was quite pressing, and you knew you had to do something.

**Interviewer:** Was the music fitting all the way through, or was it a bit out of place when there were no enemies?

**Participant:** No it was good all the way through, it was constantly driving me.

**Interviewer:** The level as a whole was quite dark and moody – were there any areas that were maybe too dark?

**Participant:** No really no, it suited the level. The light that was there definitely drew me

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along because it stood out.

**Interviewer:** Would you say some of the areas were a bit repetitive? Would it have benefitted from more variation in the colour of lighting perhaps?

**Participant:** Yea I think that would help definitely. Possibly more coloured lighting to draw attention to items and things.

**Interviewer:** Did the lighting add to the experience or was it not really noticeable as being particularly important?

**Participant:** No it added to the experience definitely. Like sometimes walking down halls and places I'd notice the lighting change slightly.

**Interviewer:** How would you compare it something like Doom 3? Would you say that the high contrast between pitch black areas and light areas made the game less enjoyable? Was it fitting with game?

**Participant:** I think it was fitting yes, but some sections were just far too dark. The lighting levels in this map were much more enjoyable.

**Interviewer:** What was less fun about Doom 3?

**Participant:** The pace was quite slow. Doom did vary the areas up a lot though, lots of environment changes. I'd just consider the game play in this map more fun because I'm actually challenged rather than annoyed by not being able to see.

**Interviewer:** Would you say there is more that could be done with the FPS genre, moving away from the standard dark, dingy areas and setting games in brighter environments?

**Participant:** Yea definitely, there is only so much you can do with dark and dingy. I mean, I played Dead Space thinking "nobody lives on a ship like this". There were pipes everywhere and it seemed it was just entirely for game play purposes. Nobody would build a ship like this when such advanced technology is supposedly available.

**Interviewer:** Overall then, did you enjoy the level as a whole, was there anything you would specifically change?

**Participant:** Not really no, the layout, the design, the textures, everything worked well I think. Just one thing, the things you have to shoot to get the bridge to extend

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needed to be more obviously pointed out as needing to be shot. Perhaps make the shields a different colour to the electricity bolts. Perhaps even use the yellow and black warning stripes like you used on the main core.

**Interviewer:** Ok, thanks I think that's about it.

**Participant:** No problems.



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### Appendix XX - Participant B-10-M

- Interviewer:** What were your general impressions of the level as a whole?
- Participant:** Sort of, medium challenge, sort of half way through game.
- Interviewer:** Was there anything that particularly stood out as being something that you used to navigate your way through the level?
- Participant:** Not really – I kind of have quite high spacial awareness for game worlds. I was able to work out that there was the main upper level that goes around in a big loop, which was separate from the lower area that goes down to the core.
- Interviewer:** Was that level layout one that felt quite normal to you in the context of a game?
- Participant:** It felt more or less normal. There were a few little catches and bits that made it more interesting certainly.
- Interviewer:** Such as?
- Participant:** For instance hiding one of the panels in an area that you have to jump up to [First Room – player did not realise lift was there]. That was a little bit more interesting.
- Interviewer:** Was there an element of the design like the architecture or the lighting or anything else like that that stood out above everything else?
- Participant:** There was a section with some pipes with some Ammo behind them [Lava Room] that looked like you *should* have been able to get to, but I couldn't work out how.
- Interviewer:** Was there any section where you thought it either wasn't clear where you were supposed to be going or there were objectives that were not easily identifiable as such?
- Participant:** Not really, again years of gaming experience has given me kind of a sixth sense of what needs to be done, what needs to be activated, and things like that. The bit where you hid the button for the shields on the side of the steps; that was a nice touch.

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- Interviewer:** Obviously you found that just by poking around – would you normally have considered there being something on the side of stairs?
- Participant:** Possibly not stairs. I was kind of looking around for a button somewhere. But I've played games with buttons stuck in boxes, so that's not too obscure really. Most games that I've played, if something is button activated but isn't like, a main objective then it won't be placed more than maybe three rooms away.
- Interviewer:** When you walked into the room with the generators [Lava Room 2] did you immediately see those [the generators] as being key points of the room?
- Participant:** The first thing I thought was that they were two obviously marked things that you need to shoot.
- [Unrelated discussion about various games]
- Interviewer:** As you went through the rooms, did you feel that there was any factor that might have been drawing you towards one specific direction or one specific point in rooms or was it a case of just exploring as you went?
- Participant:** Again, from experience of gaming, I kind of have a pattern of searching rooms. I'll clear a room of enemies first; I'll clear from left to right, top to bottom. That's just kind of how I do it. If I find something to push, I'll push it, and if it leads me on to the next section I'll usually go straight on. I might have a quick look around for ammo and health too.
- Interviewer:** Which areas in any part of the level stood out either as being focal points of the level or points of reference that you might have used as a navigational tool?
- Participant:** Where I was heading back to the big elevator, there were two 'figure of 8' layouts in rooms either side of it [Machine Room and Split Corridor], so it allowed me to know where I was heading. [An interesting feature that had not been intentionally designed]. That layout didn't really pop up anywhere else in the level, so I knew that that was important.
- Interviewer:** From your previous FPS experience, the areas with flickering lights – what sort of connotations do you give that sort of effect? Is it a draw or repellent?
- Participant:** If I link it back to the sound, I think "hmm, ok, bit of electricity noise here", linking it back to Half Life where that noise is a bad thing, usually a warning not to continue in a direction because you'll die.

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- Interviewer:** Is that something you find in most shooters, is that quite a common connotation? Can you think of any events in a game that might have flipped something like that around?
- Participant:** Yea fairly common – only thing that really flips it is if there is a power up past the point where the effect is used to reward exploration.
- Interviewer:** How would you describe the ambience, the atmosphere of the level?
- Participant:** Dark. Classic FPS.
- Interviewer:** Were there any areas that were too dark?
- Participant:** I have played Doom 3. So no. I have never come across a game darker than that.
- Interviewer:** With regard to Doom 3 then, if the Duct Tape Mod had been built-in to the game, would that have made it better?
- Participant:** Nah, I liked it as it was, it made it more interesting because all you saw was a set of red eyes coming at you and you didn't know if it was going to be something big or just one of the mindless drones that come after you. The only way you'd know is to start shooting, get the muzzle flare off the end of the barrel and think "Ah. Going to need something a little bigger."
- Interviewer:** Would you say Doom 3 was one of your more favourite games?
- Participant:** Erm, I'm not sure. It was different, just because it was dark that was its thing. Mass Effect for example is different because its characters are that bit more developed. Modern Warfare was just a very good shooter. Half Life, brilliant story, brilliant mystery.
- Interviewer:** Being a heavy PC gamer, have you played F.E.A.R.?
- Participant:** I've played F.E.A.R 2, Project Origin.
- Interviewer:** Ok, and how would you describe the environments in that game?
- Participant:** Very dark again, lots of destroyed buildings to run through. Lots of armour coming after you a lot, which is very creepy. It uses a lot of areas where the environment will change as you're walking through it.

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- Interviewer:** Overall then, the lighting in the level did it add or detract from the game play at any point?
- Participant:** It was pretty standard. Again, lots of gaming experience, the only games I've ever played and stopped to look at the architecture specifically are Mass Effect and Resistance: Fall of Man.
- Interviewer:** Is there anything you would have changed to make the lighting a little less generic?
- Participant:** Erm, I might have added a bit more visual disruption to it. For example if you get hit by missiles you get a red tinge round the edge of the screen. Or one of the other creatures, if you get hit by it you go blind for two seconds; that always freaks people out! Another game, erm, S.T.A.L.K.E.R, as you progress through the game and go deeper into the Zone things go monochrome, you get snow across your vision, your enemies show up in bright white. It's interesting because it's a different way of looking at what you're shooting at.
- Interviewer:** Ok so maybe less change to the environment, more change to the feedback?
- Participant:** Yea.
- Interviewer:** Overall then, did you enjoy playing the level?
- Participant:** Yea, always love playing shooters.
- Interviewer:** Apart from the lighting, is there anything else you would change to make it either more challenging, more entertaining?
- Participant:** Enemies. More enemies – I had a ton of ammo and not enough guys to shoot it at.
- Interviewer:** More of the weaker enemies, or just more overall?
- Participant:** A mixture – those little bug enemies were horrible! [In a positive rather than detrimental way].
- Interviewer:** Ok I think that's about everything.
- Participant:** Ok.

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### Appendix XXI - Participant A-11-M

#### Participant Notes:

Participant did not speak English as their first language. This interview contains some parts that the researcher has interpreted as accurately as possible.

- Interviewer:** What were your general impressions of the level as a whole?
- Participant:** It had a good pace, there were some good weapons and I found a couple of them I was most comfortable with. There were some parts where you could get the weapons [from pickups] but they seemed to be either very few, or quite hard to find.
- Interviewer:** How did you navigate your way through the level? Were there any aspects that were helping to signpost the way forward or did you find it quite confusing?
- Participant:** It was confusing at some points, but in other ways it was good. There were multiple doors at points which was good because it wasn't so linear.
- Interviewer:** So you liked the more free-roaming aspect?
- Participant:** Yes, that was good.
- Interviewer:** Did it ever get annoying that there wasn't one specific way to go?
- Participant:** No, it was different – but not annoying.
- Interviewer:** Where there was more than one route for you to take, did you ever feel like there was one path that was being emphasised more than another, or did it feel like quite a balanced choice?
- Participant:** I missed the door on the side in the room with the lava [Lava Room 1] because it was on the side.
- Interviewer:** Was that because it wasn't the dominant feature of the room?
- Participant:** Possibly yes, because it was just another door on the wall. Maybe if there were some crates or barrels in the corridor to obscure the view to the end of

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the room you might be more inclined to see the door on the side.

**Interviewer:** Which areas, if any, in particular stand out as being either a central point or somewhere that you could use as reference to know where you were in the level?

**Participant:** Maybe the Big Room with all the doors, after the dark corridors, because it felt like everything sort of led into that room. There were some doors that were leading to new places but also some leading to bits of the level I had already been to before.

**Interviewer:** With regard to lighting, would you say any of the areas were too dark, or not lit in an appropriate way to support the gameplay?

**Participant:** There were some dark areas, but they didn't have a major impact on the gameplay.

**Interviewer:** With the insect enemies for example, did the area of the level they appeared in make them more of an annoyance than a challenge?

**Participant:** I think it was more of a challenge.

**Interviewer:** Overall, the ambience of the level – did you feel it was quite fitting for the level or did you think some elements of it were a bit out of place?

**Participant:** No no, I thought it was good, very convincing.

**Interviewer:** Did you think it might have benefitted from a change of pace for example, when there are more enemies or fewer enemies on screen?

**Participant:** Yea that might have been good.

**Interviewer:** When you got down to [Lava Room 2] was there any specific reason that you think you didn't notice the generators sooner? Were they not the focal point of the room for you, or did you think there was another button that you had to push?

**Participant:** I thought there was another button. Where you were wanting players to shoot them, while it was kind of logical you hadn't had to do anything like that in the level previously. Maybe if it had been a mechanism introduced in an earlier level in a full game then the puzzle would have made more sense, set into context.

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- Interviewer:** So it was more just not realising than it was you making a conscious decision not to shoot them?
- Participant:** Yea.
- Interviewer:** Overall then, did you enjoy the level?
- Participant:** Yea.
- Interviewer:** Was there anything else you would change to make it better, make it a better experience? Anything you thought particularly detracted from the game?
- Participant:** The enemies don't respond particularly well, that could use some tweaking.
- Interviewer:** Was it not realistic enough or not challenging enough?
- Participant:** A bit of both really. Some enemies you shoot them with one type of weapon and they just stand there and don't really react at all.
- Interviewer:** Ok I think that's about everything [interrupted]
- Participant:** Oh, and I liked the boss.
- Interviewer:** Oh ok, that's interesting why did you like the boss?
- Participant:** He was much more challenging – I managed to kill him eventually but he was tough. It was a good challenge.
- Interviewer:** A few people have said he is too difficult?
- Participant:** I don't think so; it was just a good challenge at the end of the level.
- Interviewer:** After you killed the boss, how long did it take you to realise what you needed to do to destroy the core itself?
- Participant:** Not too long, a few moments.
- Interviewer:** Was it not obvious enough what you had to shoot?
- Participant:** No I think it was clear enough.
- Interviewer:** Ok, that's about everything. Thank you for coming along.

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### Appendix XXII - Participant B-12-M

- Interviewer:** What were your general impressions of the level overall?
- Participant:** There were two things I specifically remember – obviously, getting stuck near the end [Lava Room 2] where I didn't realise I had to shoot those two things. That was because when I shot them the first time there was no immediate reaction I thought maybe that wasn't what I had to do.
- Secondly, when I got past the first terminal to [Lava Room 1] and I was jumping in the lava, I totally missed the door on the side wall because it was masked by gas. I did eventually find it.
- I thought the level was pretty good, I thought it was quite fun. I don't play a lot of FPS games and when I do, I have to admit I'm not paying a lot of attention to the scenery.
- I thought at points it was a bit light on enemies, which isn't necessarily a bad thing. It might have been more because I kept going back over the same areas. Some respawning enemies would have helped just keep me on my toes a bit better.
- Interviewer:** Was there anything in particular you used to navigate your way through the level, any signposting you noticed?
- Participant:** I was moving towards green lights to start with, because green lights are something that attract you. I'm not sure why, maybe it was because it was a contrasting colour [to the rest of the level], or maybe there is some sort of psychological attraction to green when you're looking for a way forwards.
- Interviewer:** I did notice you were shooting red things quite a lot too, I'm not sure if that was a conscious choice?
- Participant:** I certainly wasn't doing that intentionally no. Perhaps I was just shooting out of frustration.
- Interviewer:** Was there any element of the design, like the lighting, sound, architecture, that particularly stood out?
- Participant:** I'm going to have to say no again – I'll hold my hands up and say I'm terrible for noticing things like that. There were a few maybe, it's the little things when you're moving through an FPS, you do sort of pay attention to the



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structure of the room.

For example if you see things that might be difficult to get past, you're going to go and try anyway because you're looking for the goodies that might be hidden behind, a.k.a Rocket Launcher.

There were bits, two specifically, where I was looking for a cheap and cheeky way past. There was that huge bridge that led over the magma river [Lava Room 2] and I thought I might be able to jump over at the sides [of the room].

**Interviewer:** Were there any other points where you felt lost or confused at all?

**Participant:** No no no no no, the flow of the level was pretty good, apart from the door I mentioned before. Even that was mainly just because I missed it. As is usual with the FPS genre, when you come round to something for a second time it is usually more obvious, as was the case when I went back to the door.

There were a couple of occasions where I thought the doors were well camouflaged but I thought it was for design reasons rather than to be annoying.

Also, the final console, when you come right back round the level to [Second Room], I swear that that console was not there when I went through that room the first time.

**Interviewer:** I think that must be, because a lot of people are missing it the first time through, it must be because it's the first one in the level and people are not actively looking for them, so aren't as observant.

**Participant:** That could be right, I mean, the first one I used which was obviously the second one in the level [Lava Room 1] was right there in front of me.

**Interviewer:** In that room with the walkway [Second Room] there is a lift that you can take up to the walkway. Obviously you jumped up there the first time – did you not see the lift?

**Participant:** I did, but only once I got up to the walkway by jumping, and I saw something sparkling in the corner to collect and then saw the lift. It was the FPS instinct I guess, I thought there wasn't going to be a lift up there, because that would be too easy. It just seemed more instinctive to find a way up by jumping.

**Interviewer:** When you were up there, was there anything in particular that made you

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jump back down and go through the lower door, rather than keep on the walkway and go through the upper entrance?

**Participant:** I just didn't notice the doorway on the walkway.

**Interviewer:** Any of the other rooms where there was more than one direction to take initially such as [Mini Core] where you can go to either side, was there anything that made you go one way first, or do you have a method you use when you're playing games like that?

**Participant:** I went the direction that the enemy had attacked me from first.

**Interviewer:** Any other points in the level where you felt one direction was pulling you that way more than another?

**Participant:** There was the [Big Room] with the mezzanine level, and the armory which I couldn't get in to.

**Interviewer:** The room that you just mentioned, was that a point that you felt was a central area or key point in the level?

**Participant:** When I went into that room, I have to admit I thought, "hmm, console, console", there were two, perhaps three I can't remember – and I had a small thought of "oh, it was late at night, needed to finish the level up". I just wouldn't have expected two consoles in the same location, and I would see that whole room as being one location.

Saying that, if I'd gone in to that room, activated one console and the other one was hidden, then I would have started sweeping and gone back to that room last, because I would have thought that room had been done. Just because it was obvious it felt rushed.

**Interviewer:** When you got to the armoury door and tried the keypad, obviously you thought that there must be another way in; did you just give up looking for it?

**Participant:** I might have, I suppose – I sort of went up, tried the keypad, and it didn't work so I sort of just added it to my mental 'To Do' list and carried on going forwards really. I might have spent more time if I had less ammo.

**Interviewer:** How would you describe the overall ambience and atmosphere?

**Participant:** It was cool, it was alright. The music I thought at points was either tailored to

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go with the speed of the game or with the feel of the room. The sound and the music was all perfect.

**Interviewer:** Anything else, specifically lighting-wise?

**Participant:** The only thing I noticed was the extra light in the [Main Core] [Spotlight that is designed to draw players anticlockwise or clockwise around the room] and I thought because it stood out as being asymmetrical in the room that it must have something to do with the solution. I thought it was pointing at something important on the other wall.

**Interviewer:** Do you think if that hadn't been there as a distraction you would have found the actual solution quicker?

**Participant:** No I don't think so, by that point I would usually have tabbed out and gone on to the internet to find the answer.

**Interviewer:** Was it literally that you didn't get any instant feedback the first time you shot things?

**Participant:** Yea, if there had been a set of sparks or something that would have helped focus my attention.

**Interviewer:** The lighting again, was there any points where you felt it detracted from the game play or made it less enjoyable?

**Participant:** I don't think so; I'm not very good at noticing lighting. Sometimes it's just an annoyance for me; if it's too dark I'll end up fiddling with the screen settings. There wasn't any points in there that I thought were too dark though, it was all good, all largely visible. There were places that were hidden, but they were obviously intended to be hidden. I don't think I'm particularly influenced by lighting and things like that. I tend to be really impatient when I'm playing FPS games too.

**Interviewer:** In [Lava Room 2] the button on the side of the stairs, you obviously missed that a few times before pressing it.

**Participant:** Yea, I think that was because I went in there, shot some rockets, nothing really happened. Then I tried getting over using ingenuity again, and then I noticed the button.

It would have made more sense to shoot the generators [the larger objects next to the power conduits that are supposed to be the target] to cut the

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power, rather than shooting at electricity. Not that the generators were particularly standing out more, it just seemed a bit more logical because the pipe was running from the beam to the generator.

Likewise in the very first room, there are wires running from the door. So when I got the message about it being remotely activated, I instinctively followed the wires to find the activation switch.

**Interviewer:** So you enjoyed the level overall? Is there anything in particular that you would have added or taken away?

**Participant:** Yea I enjoyed it. Having enemies respawning more I think is about all I would change. I was feeling myself getting a bit bored when I was backtracking. Oh and the extra feedback in the core.

I enjoyed it, until the penultimate room there wasn't anything that frustrated me or anything.

**Interviewer:** Ok then, I think that's all, thank you very much.

**Participant:** That's no problem.

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### Appendix XXIII - Participant A-13-M

**Interviewer:** What were your general impressions of the level overall?

**Participant:** Yea I think it was good – I have a tendency to go for anything that's lit up. A lot of the computers and things were quite good because it drew me in and there were flashing lights down corridors that made me stop a lot. Yea it was good, a good layout. Every time I saw a flashing light it made me stop to see if I could pick it up or I could push it.

**Interviewer:** How did you navigate your way through the level; was there anything you used as visual reference?

**Participant:** After a while you became familiar with the rooms and diving through the doors really. Any time I saw a lift or something new then that was the direction I went in.

**Interviewer:** Was there any particular element of the design, like the lighting or the sound or the architecture that stood out above the others?

**Participant:** Not the lighting – sometimes the lighting was confusing I think. It was a bit, no, not confusing... suitable I suppose. It was suitable for the game, it was dark enough, and there was a lot of stuff hidden. I suppose you have to approach it in a more explorative manner. There were piles of boxes and things in the dark which you don't know if you can get over. That's not a problem though, that just draws me in more and I'm trying to jump over it for a while before I realise.

**Interviewer:** So you wouldn't say it was too dark?

**Participant:** No no, at first I thought so, maybe but no I think it was suitable, it was how it should have been to create the right atmosphere for the game.

I liked the architecture, it was interesting, and it kept me entertained. The only thing was the door [that is in the cutscene after activating terminals] at the end; I didn't know where that was because I hadn't actually seen it in the environment yet. But again, that's not a problem, it's the end of the level, it's supposed to be getting a bit harder and making you think about the whole game level.

I'm not sure how long it would have taken me to realise I needed to blow up those things [participant needed a hint in Lava Room 2]. I probably would

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have got there eventually, because I would have had to think back to the cutscene and think that there was a reason that had shown me what it did. Not being massively experienced with games maybe I didn't pay enough attention to those sorts of things.

**Interviewer:** I am finding that those people putting themselves down as less experienced are struggling with that puzzle more.

**Participant:** I think you don't expect there to be puzzles you expect it to be all put out in front of you.

Those little bug enemies also – not my friends!

**Interviewer:** Good enemy or an annoying enemy?

**Participant:** Good *because* they annoyed me! Not in a bad way, in a sort of "I need to get out of here quickly" kind of way. No they were necessary, really good enemies because they were really difficult to get rid of.

**Interviewer:** Did you ever feel lost or confused, apart from not knowing where the door was that was shown in the cutscene?

**Participant:** No. I didn't ever necessarily feel lost I knew I was looking for something that would be around somewhere, so I just hunted round until I found it, same way I play most other games really. So no never lost, just confused once at the bridge [in Lava Room 2].

**Interviewer:** In the rooms that had more than one way to go in and out or more than one thing in them, did you ever feel like there was anything suggesting one route over another or one aspect of the room over another?

**Participant:** Nothing other than if I realised I'd been through it already. Usually I'd look through a doorway and if it looked new I would go that way.

**Interviewer:** So the main thing that drew you along was things looking new?

**Participant:** Yea, pretty much.

**Interviewer:** What areas of the level if any stood out as being a central point or focal point that you could use as reference for finding your way around the rest of the level?

**Participant:** There was the [Big Room] that I kept going back to, I think it had the most

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doors coming off of it. I ended up back in there a lot.

I think my favourite room was the [Mini Core] room. Once I'd killed the guy stopping me coming in, running around there trying to find what to do and what was going on was quite fun. It didn't feel central though.

**Interviewer:** Why was that such a good room?

**Participant:** All the features in there, the architecture was good, the colouring was good it just had a different feel to that room, it was very red. It felt quite pivotal; it was a change of scenery that felt like things were getting a bit more urgent.

**Interviewer:** How would you describe the overall ambience, the feel of the level? Was it suitable, or was it detrimental to the gameplay at any point?

**Participant:** No I think it was really spot on actually, the ambience was good. I think that there wasn't an overload of enemies which was good, there was only a maximum of I think three in any one room. The enemies weren't perfect of course but it was good overall. The enemies were few enough that you could sneak into rooms and try and get close to enemies before shooting them.

**Interviewer:** The lighting specifically – you said it was suitable?

**Participant:** Yea at first I thought it was a bit dark, and I wasn't sure if I was going to be able to see things or if I was going to get lost, but it created a lot of the ambience, along with the soundtrack, the music is very important obviously and that was quite good too.

**Interviewer:** Did you find the lights emphasising any key items or points at any time?

**Participant:** Yes, possibly towards doors and things, they seemed to be a little more lit up, while the corners where there was hidden stuff were maybe a bit darker. Even the lack of light makes you think that there might be something hiding in the corners in the dark.

Once I realised that there were health and ammo pickups and things like that I started actually exploring a lot more of the level.

**Interviewer:** Overall then you enjoyed playing the level?

**Participant:** Yes, yes.

**Interviewer:** Is there anything in particular that you would add or take away to make it a

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better experience?

**Participant:** There were quite a few guns, probably too many for one level – although in the context of a full game it would make more sense to have that many. It wasn't necessarily a bad feature, but I would have maybe preferred to have more bullets for a few guns, rather than more guns.

**Interviewer:** Ok I think that's everything.

**Participant:** Ok.



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### Appendix XXIV - Participant B-14-F

- Interviewer:** What were your general impressions of the level as a whole?
- Participant:** I thought it looked quite nice, all the visual aspects.
- The layout was pretty good too. Usually if I'm playing an FPS and the level isn't linear I get quite lost, but I didn't in this one. Some bits of the level were a bit dull; it made it quite hard to see some things, such as the lift at the beginning in the first room. I only realised it was a lift when I stood on it and it went up. The atmosphere was quite good too.
- Interviewer:** How did you navigate your way through the level; was there anything that acted as a guide?
- Participant:** No not really. I just explored really, and kept moving towards areas that I hadn't explored.
- Interviewer:** In the rooms that had more than one entrance or exit or various things to do, did you feel that there was anything pushing you in one direction particularly initially or did you just explore at your own pace?
- Participant:** A bit of both really – like if there is a pane of glass and you can see some health through it then you'll go there first. Generally, if there are no enemies about you can just take your time though really.
- Interviewer:** Were there any elements of the design, like the sound or the architecture or the lighting that specifically stood out over anything else?
- Participant:** Music was quite good, although there were some random sound effects occasionally that sounded like monsters, so I was getting quite paranoid that there were things behind me. Sound effects were quite complimentary to the atmosphere.
- Interviewer:** Obviously I had to give you a hint just at the end there [in Lava Room 2, participant could not work out how to extend the bridge], why did you have trouble with that?
- Participant:** Because in the rest of the level, it had been a case of pressing buttons to activate things rather than shooting things. I was looking for a button to push to get the bridge to come across. I thought it would be on the other side of the stairs but it wasn't.

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- Interviewer:** Was the cutscene that plays when you press the first button not clear enough, or did the cutscenes not really have an impact on you?
- Participant:** They did just wash over me slightly, I didn't really pay much attention to them.
- Interviewer:** You said you had trouble remembering which rooms you had been to already – was that down to the design, was there not enough variation as you went through the level?
- Participant:** I think most of it was alright, it was just when you go along that catwalk back into the first room, that bit threw me off a bit because I thought I had to be doing something else back in that room as I had been led back to it.
- Interviewer:** How would you describe the overall ambience and atmosphere of the level?
- Participant:** Yea it was pretty good, it all worked well together, but the monster designs looked a bit out of place because they're from an old game.
- Interviewer:** The lighting in the level, did you feel that it was detrimental at any point or did it complement the game play quite well?
- Participant:** No it was good, it built the atmosphere well. The mixture of dark areas and light areas was good – it might have been a bit more intense if you'd had some enemies attack you in corridors, but overall it was fine.
- Interviewer:** Did the flickering lights or anything similar directly influence anything that you did?
- Participant:** The screens that you had to activate were well emphasised so you could see them from a distance. The blue screens confused me a bit, I expected them to activate as well initially. I didn't notice any lights pointing me in any direction specifically though.
- Interviewer:** I noticed you were playing quite cautiously, is that how you usually play FPS games?
- Participant:** Only until I've got used to the controls, but I was being cautious after those bug enemies appeared, because they drop from the ceilings and that really scares me! I don't think I usually play cautiously though in general.
- Interviewer:** Overall, did you enjoy the level?

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**Participant:** Yea it was good.

**Interviewer:** If there was anything in particular you could take out or add, what do you think it would be?

**Participant:** Probably update the monsters definitely. I think everything else was pretty good though.

**Interviewer:** Ok, I think that's about everything then, thank you.

**Participant:** Ok, no problem.

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### Appendix XXV - Participant A-15-M

#### Participant Notes:

Participant was knowledgeable on level design and level editing, and so was looking around the level in UnrealEd during this interview to allow him to give more accurate, contextual feedback.

- Interviewer:** What were your general impressions of the level as a whole?
- Participant:** It looks nice, but I was finding many, many places where I was getting lost.
- Interviewer:** Why do you think that was?
- Participant:** When you come to a junction, I found there were too many options, some of which lead off and then loop back again, and you end up thinking "oh, I've just come from here". You can't quite work out which path is which.
- Interviewer:** Any examples?
- Participant:** The starting area. The door on the right leads back round to a choice of going either left or right, left taking you back to the start, which seemed a bit odd.
- Interviewer:** Was there anything suggesting one way over another to you, or was it just trial and error?
- Participant:** Mainly trial and error I think.
- Interviewer:** How did you navigate your way through other bits of the level; was there anything that acted as guidance?
- Participant:** There was one bit where there was some ammo hidden behind a pipe [Lava Room 1] which I noticed because it was lit up. When I went to look at it closer I saw the corner of the ammo box. There was a similar bit in the room with the Big Keg O' Health – because I could see a gap behind the boxes I went to investigate.
- Interviewer:** Were there any other points in the level where you felt pushed in one particular direction?

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- Participant:** Hard to say. There's a lot of branching, and some points you'll take a route and then get lost and end up backtracking. The bit with the rotary bridge was a bit confusing; once it's been activated you have to backtrack to find the door to go across it. I would have moved the door closer to where the button to activate the bridge was, or vice versa. You're kind of getting stuck at the end of a branch. Also, some of the branches that lead off of the main route seem to link together again occasionally which doesn't quite feel right.
- Interviewer:** Was there any element of the design, such as the sound or the lighting or the architecture that stood out?
- Participant:** The [Lava Room 1], [Lava Room 2] and the [Main Core] were particularly nice. In [Lava Room 2] I think you've really made the bridge and the route important because of the room layout. Everything in the room is emphasising the way to go. The colour composition is quite nice too, with the positioning of the lights and contrast between black and orange. The ceiling lights are the only thing I'm not too keen on, with them being yellow – I think I would change them to a light yellow.
- The electricity conduits were good too; they were blue which to me emphasised them as being objectives. They weren't immediately the first thing I paid attention to, but the cutscene when you push the button emphasised them as being an important aspect of the room.
- I felt like the barrels that glowed red should explode too, I don't know why. Possibly just because that's the connotation I get from playing other games.
- Interviewer:** Were there any other areas of the level that stood out as being either important or central in any way?
- Participant:** Nothing in particular. The boss was quite irritating, because he's not overly intelligent.
- Interviewer:** How would you describe the overall ambience, the atmosphere of the level?
- Participant:** The look and feel, it makes me feel like I'm in some Skaarj facility. It needs a bit more colour and lighting in certain areas.
- Interviewer:** Why in particular?
- Participant:** You get lost.
- Interviewer:** Because there's not much colour variation?

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**Participant:** Not so much colour variation, it's just that some parts of the map look the same as others, just because of the colour scheme. You've got normal lights, the base floor and the walls and lots of pipes everywhere – it looks good but it needs more variation.

There was a bit that used colour well – where you have to activate two buttons to open a door [Mini Core]. You press one button and the light that side of the door goes green, while the other side is still red, which emphasises what needs doing.

The only problem here is that you can't see the main objective of the room when you walk in, because the core is in the middle. When I play games, I tend to follow a light source, and the big glowing red core is a bit off-putting.

The room does function how I would expect it to in a full game though, because it guides you subtly to the objectives. It would be better if you could see the big door as you first come in though, to emphasise what you have to do in the room.

**Interviewer:** The lighting in particular, did you find it added to the game play or detracted?

**Participant:** It added to it yea. There was that room that had a strobe light in the hallway [Split Corridor] and I went round it because it was dark. I didn't really notice other dark areas much, but I noticed this one because it was strobing.

In the [Lava Room 1] the lighting was very important, it counts for so much. The room would be very flat otherwise.

**Interviewer:** Overall do you think lighting is a more aesthetic thing or a game play thing?

**Participant:** It is a powerful tool but it is more aesthetics than game play. The game play is more how you manoeuvre around the level.

**Interviewer:** Overall then did you enjoy playing the level?

**Participant:** Yea.

**Interviewer:** If there was anything you could change to make it better what it would it be?

**Participant:** In the [Main Core] if you wanted to make it more interesting, when you blow up one of the vents you could have it take a chunk out of the floor.

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I'd also have some lasers firing out as it gets damaged, just to make it more dangerous, because at the moment the only threat in the room is the boss.

In the [Lava Room 2] you could make it more obvious that you have to shoot the energy conduits by having them literally holding the bridge up, in a medieval drawbridge kind of style, with them as the chains.

It might have been nice also, in the [Pit Room] if you could drop down the pit to get a shield powerup or something. You'd have to have a lot of gold light down the bottom to draw the player down.

The lighting is nice, but I would change the floor lighting compared to the ceiling lighting, just to add a bit more colour into the environment. It does feel very UT2K4 [Unreal Tournament 2004].

When you come into the [Lava Room 2], again, you can't see the button you have to push straight away, which is a bit confusing. This room definitely works best though, because it's big, open, and overall, the main objective is very clear.

**Interviewer:** Ok I think that's about everything then.

**Participant:** Ok.