

Flow In Games: Aural Conditioning

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Flow in Games: Aural Condition

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Thesis

Declaration

I hereby declare that this dissertation is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

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I hereby declare that the preparation and presentation of the dissertation were supervised in accordance with the guidelines on supervision of dissertation laid down by Ashesi University College.

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To the games yet to be made.

Abstract

This thesis discusses the potential the aural condition of games have with respect to creating and sustaining flow for all player types. It goes further to discuss the components of flow, existing methods of flow creation and sustenance with regards to game design and also suggests new flow creation and sustenance methods that leverage the properties of sound, music and the overall the aural condition of games.

TABLE OF CONTENTS

ACKNOWLEDGEMENT	IV
ABSTRACT	V
1. INTRODUCTION	1
1.1. BACKGROUND	2
1.2. APPROACH.....	3
2. LITERATURE REVIEW	6
2.1. THE CONCEPT OF FLOW	6
2.2. CREATING AND SUSTAINING FLOW.....	7
2.3. CRITICISMS OF THE CONCEPT OF FLOW.....	8
2.4. CREATING AND SUSTAINING FLOW IN GAMES	9
2.5. JUGGLING PARAMETERS: THE ART OF KEEPING PLAYERS ‘IN THE ZONE’	10
2.6. STRATEGIES FOR SUSTAINING AND CREATING FLOW	12
2.6.1. UTILIZING DYNAMIC DIFFICULTY ADJUSTMENT.....	14
2.7. CRITICISMS ON JENOVA CHEN’S APPLICATION OF FLOW.....	16
2.8. MUSIC: CONSTITUENTS AND CHARACTERISTICS.....	18
2.8.1. THE AMBIGUITY AND ‘ABOUTNESS’ OF MUSIC.....	18
2.9. THE POTENTIAL MUSIC HOLDS: AURAL CONDITIONING	21

2.10.	PLAYER TYPE ANALYSIS AND DEDUCTIONS	21
2.11.	UNIFYING PLAYER TYPE ATTRIBUTES	24
2.12.	GAMEPLAY DRIVEN GAMES, PLOT DRIVEN GAMES	25
3.	METHODOLOGY	28
3.1.	METHODOLOGY OF 'FLOW IN GAMES: AURAL CONDITIONING'	28
3.2.	PLAY-THROUGH SESSIONS: PRECURSOR TO METHODS DEVELOPMENT	29
3.2.1.	FINDINGS FROM THE UNCHARTERED 2 PLAY-THROUGH SESSIONS	30
3.2.2.	FINDINGS OF THE FIFA 11 PLAY-THROUGH SESSIONS	31
3.2.3.	FINDINGS: PLAY-THROUGH SESSIONS, SUMMARY	32
3.2.4.	INFERENCE FROM THE FINDINGS OF THE PLAY-THROUGH SESSIONS	32
4.	FLOW CREATION AND SUSTENANCE METHODS	34
4.1.	AURAL CONDITIONING METHODS	34
4.2.	AFFECTIVE EMPHASIS	35
4.3.	DYNAMIC PLAYER MIRRORING	37
4.4.	DYNAMIC ENEMY MIRRORING	38
4.5.	THE PSYCH SYSTEM (AURAL POWER-UP)	39
4.6.	TESTING THE METHOD OF AFFECTIVE EMPHASIS	40
4.6.1.	FIRST ROUND OF TESTING	41
4.6.2.	SECOND ROUND OF TESTING	43

5. CONCLUSION.....	46
5.1. FUTURE WORK.....	46
BIBLIOGRAPHY	48
LIST OF FIGURES.....	49
LIST OF TABLES	50
PLAY-THROUGH SESSIONS DATA	50

1. Introduction

Fun experiences are memorable and enjoyable because they are primarily unique in their interpretation for every person sharing that moment. Fun experiences create no stress, no anxiety and naturally keep us happily captivated in the experience for hours, making us temporarily unaware of the passage of time (Csikszentmihalyi, 1990). We experience these moments – just to name a few – when we have a fun night out with our friends; share laughs and interesting stories, have great sex and cheer our favourite teams on to a win. **Mikhail Csikszentmihalyi** describes this phenomenon that ultimately creates a fun and entertaining experience as ‘flow’ (Richter, 2008); and according to his research, flow can be achieved in almost all activities under the right circumstances and prerequisites. Understanding the concept of flow, its characteristics and how to create and sustain it in an experience makes all the difference in creating a boring activity or an incredibly fun and fulfilling one.

For my thesis, I will develop methods that leverage properties of music and sound to facilitate the process of flow creation sustenance in a gaming experience for all player types. This objective is shared with **Jenova Chen’s** thesis, ‘**Flow in Games**’, which sought transporting players to their personal flow zones and delivering genuine feelings of pleasure and happiness (Chen, 2007 a p. 1) in a gaming experience. ‘Flow in Games’, Jenovah Chen’s master thesis at the University of Southern California, Interactive Media Division; revolves around the application of Csikszentmihalyi’s concept of flow, described by Richter as ‘**living in fullness, without waste of time and potential, expressing one’s uniqueness, yet participating intimately in the complexity of the cosmos**’ (Richter, 2008 p. 1). The concept of flow with regards to games facilitates the process of sustaining a player’s state of being ‘**in the zone**’ for the entire gaming experience. Chen provides an outline of game design methods and principles that aid the process of achieving the state of flow in video games (Chen, 2007 b). He also highlights the challenges to be possibly met in designing for varied player types. This thesis seeks to use the concept of flow as it was used in ‘Flow in Games’: maximizing

player fulfillment and enjoyment in a gaming experience. This time however, focusing on the music and sound aspects of the game's design.

1.1. Background

Players are inherently different; they have different preferences, behave differently in identical situations and scenarios, and have different expectations of an experience given identical a-priori information about it. This fundamental dynamic of players complicates devising processes and methods for use in achieving flow in games (Chen, 2007 b) for all player types in a gaming experience. To achieve flow for all player types in a gaming experience requires finding the right balance of player type characteristics for which when satisfied guarantees immersion of all player types into the gaming experience.

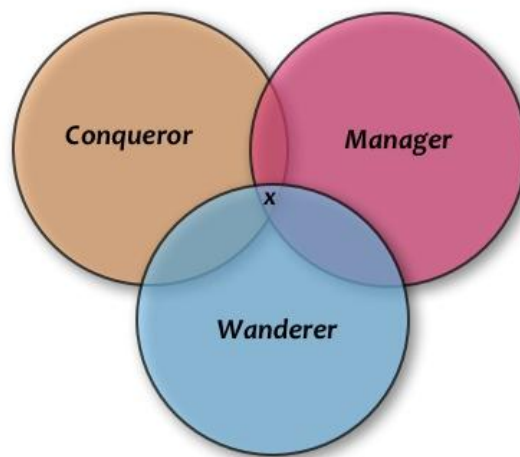


Figure 1: Player Type Disparities and Similarities

In Figure 1, the area of intersection between the three player types, marked by 'X', is the right balance of player type characteristics which when satisfied guarantees immersion of all player types into the gaming experience. The other regions depicted for each player type describe the characteristics unique to a subset of the player types shown. To leverage this balance is to:

- **Find** similarities among the different player types and use that as a basis for creating methods that support the creation of flow for the player types under consideration.
- **Design** a gaming experience that is highly versatile and can intelligently adapt to suit the player depending on the player type of the individual having the experience and his or her preferred level of in-game challenge (Chen, 2007 b).
- **Integrate** player choice into a game's design for the purpose of molding plot of the game based on the actions and decision of the player (Chen, 2007 b).

1.2. Approach

To create methods that facilitate flow in a gaming experience for all player types requires finding the right set of characteristics of all player types, then finding the relationship between these shared characteristics and the unique characteristics of all other player types. This relationship between shared characteristics allows for transitioning the gameplay experience, from that which focuses solely on satisfying the right set of player type characteristics to that which focuses on satisfying the characteristics of just one player type. Personalized gaming experiences for all player types become possible as a result of this relationship. This thesis will focus on the right set of player type characteristics with respect to sound and music, and develop flow creation and sustenance methods using this information. Improvements to the overall

gaming experience will be as a result of improving the storytelling or real-time interactivity through the use of music and sound.

These improvements will be made possible by a controlled aural gaming environment – the collection of music and sounds that describes the mood of the game, the scenes of the game and the events occurring in game for any given period of time –, which will accurately reflect the player’s actions, pace, state and other critical events occurring in-game.

*This level of reflected detail allows for the state or mood of the characters in the game and the overall game state to be mirrored by the aural gaming environment every step of the gaming experience. This allows for a rich and intricate storytelling throughout the entire gaming experience. The player’s understanding and appreciation of the gaming experience – in real-time, through actions of the player or through the exploits of a character in the game – becomes enhanced and improved by the level of reflected detail of the aural gaming environment. **This process of using structured, suggestive sounds and music to captivate a player in a gaming experience by leveraging the properties of music and sounds and the player’s natural associations with musical notes, tempo, genres and compositions is what I refer to as Aural Conditioning.***

The structure of this thesis has four main sections. Chapter 2 focuses on the literature review; here the concept of flow is discussed in detail as well as Jenovah Chen’s ‘Flow in Games’, which applies the concept of flow to game design. Chapter 3 focuses on methodology; the tests and discussions had with the thesis are outlined and explained. Their respective findings are also presented. Chapter 4 focuses on the flow creation and sustenance methods developed; here the flow creation and sustenance methods created are thoroughly explained. This is followed by the findings and analysis of the tests carried out to assert the efficiency of the flow creation and sustenance methods created. Chapter 5 infers from the results of the tests and discussions had, it provides a conclusion and also outlines the work to be done in the future.

To understand and discuss the concept of flow with respect to gaming experiences, the next chapter focuses on the breakdown and explanation of the concept of flow by Mihaly Csikszentmihalyi. It further discusses the application of the concept of flow by Jenova Chen to games and the criticisms leveled against the concept as well as Chen's game – 'flow'. The game Chen created using some of the methods he discussed and developed in his thesis for the creation and sustenance of flow in games. The later part of the chapter analyzes of the characteristics of music and its flow-inducing effects.

2. Literature Review

2.1. The Concept of Flow

To Mihaly Csikszentmihalyi, the former head of the psychology department at the University of Chicago and the renowned author of **'Flow: The Psychology of Optimal Experience'**, 'flow represents the feeling of complete and energized focus in an activity, with a high level of enjoyment and fulfillment' (Debold, 2002). Leigh Mactaggart Richter, in his review of flow describes it as living in fullness, expressing one's uniqueness without waste of time and potential (Ritcher, 2008). To Jenova Chen, the creative director and co-founder of ThatGameCompany¹, flow is equivalent to fun and is the 'balance of the relationship between challenge and ability' (Chen, 2007 b p. 1). From Csikszentmihalyi's description of flow, it can be deduced that every individual's flow experience manifests itself in a personalized form. However for all flow experiences there are common underlining traits.

These common traits exhibited in all flow experiences form **the indicators of flow**, the noticeable characteristics of any activity that assert the existence of flow. They are (Chen, 2007 a p.31):

- The experience creates no feelings of anxiety or stress.
- The individual having the experience gets fully engrossed in the task, the experience therefore captivates.
- The individual having the experience develops an altered perception of time, he or she becomes less conscious of the passage of time.
- The activity being performed has clear, specific goals and objectives.

¹ ThatGameCompany is a game development studio founded by Jenova Chen and Kellee Santiago. The studio specializes in small experimental game projects.
<http://thatgamecompany.com/about/>

- The individual having the experience feels adequately challenged and in tune with the activity being performed.

2.2. Creating and sustaining flow

According to Csikszentmihalyi's research on flow, also referred to as '**the state of optimal experience**', to create flow, there needs to be a direct relationship between the participant's skill level and the level of challenge offered by the activity being performed (Csikszentmihalyi, 1990). Figure 2 below describes this relationship in detail. This correlation of the difficulty of an activity and the participating individual's skill level is vital to the creation of flow. It creates the initial conditions necessary for the individual to enjoy the experience and get 'in the zone'. To sustain flow in an activity, these parameters have to be rightly matched for the entire duration of the experience. A mismatch of the individual's skill level and the challenge of the activity being performed either results in boredom – as a result of a higher participant skill level and a lower level of challenge in the activity being performed – or anxiety – as a result of a lower participant skill level and a higher level of challenge in the activity being performed (Csikszentmihalyi, 1990).

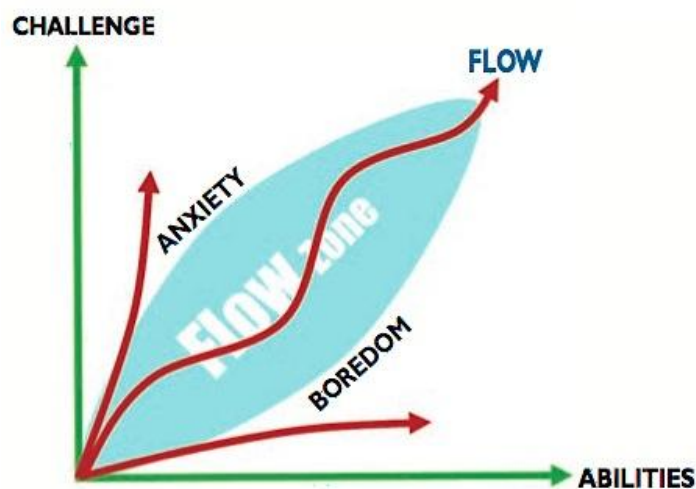


Figure 2: The Correlation Between The Level Of Challenge in an Activity and the Participating Individual's Skill Level (Chen, 2007 a)

2.3. Criticisms of the Concept of Flow

Critics of Csikszentmihalyi's work have varied stances on the concept of flow. Some argue that the concept of flow is mystical. This is because Csikszentmihalyi describes flow and provides indicators for identifying the experience when it happens, however he fails to provide methods for creating flow (Carl, 1999). Other critics argue that the concept is not a global phenomenon as Csikszentmihalyi describes it to be, but a western psychic phenomenon (Sun, 1987) and also the concept of flow is considered to be more applicable to men than women as stated in Carl's review of the concept. Csikszentmihalyi, in defense of his concept being described as a western psychic phenomenon emphasized that flow experiences vary from culture to culture – as a result of additional constraining variables introduced by the norms of the cultural setting the participant in the experience was nurtured with –. It is however the dynamics of the flow experience, the nature of the progression of the experience; that is universal (Csikszentmihalyi, 1990).

Perhaps the most significant criticism of the concept of flow is that the flow characteristic of continuously and accurately correlating an participant's skill level and the level of challenge of an activity is considered to be simplistic (Carl, 1999). There is the belief by most critics that other factors affect the creation and the sustenance of flow in an activity besides the challenge of the activity and the skill level of the participant of the activity. Walter John Carl III, an Assistant Professor at Northeastern University used the example of a tennis match with two players of similar skill levels to make an argument for this notion. In his analogy, the challenge for players of equivalent skill level is expected to be a direct match to their skill levels and resultantly create flow for both, according to the concept of flow. However, in practice, according Carl's observation and analysis, tennis matches of this caliber turn out to be boring for the

audience and frustrating for the players; showing evident lack of flow in the experience (Carl, 1999).

Carl, in his analysis of the concept of flow also identified a significant omission in the concept. This omission refers to the lack of explanation in Csikszentmihalyi's writing on flow with regards to the possibility or lack thereof of fatigue after flow. From Carl's research, in Csikszentmihalyi's writings prior to the concept of flow, he clearly establishes that any activity requires the use of psychic energy by the participant of the activity. This energy is revealed as the level of attention and focus that is mustered for a given activity over a period of time (Csikszentmihalyi, 1990). According to Csikszentmihalyi's research and writings, a participant's psychic energy is a limited resource. Knowing this, flow experiences should naturally create 'fatigue' after the experience ends. This is logical since flow comprises of participating in some activity, in this case, an entertaining one. Accord to Carl's observation, Csikszentmihalyi's concept of flow does not discuss how psychic energy is utilized in flow experiences nor does it assert or refute the notion of the creation of fatigue after a flow experience ends (Carl, 1999). This loophole in the concept of flow does indeed question the reliability of the concept since it fails to leverage or make provision for Csikszentmihalyi's prior research and writing on a similar topic.

Despite these criticisms, Flow's promise of engaging experiences for a varied audience makes it a viable concept to be used in entertainment media, both for describing user engagement and the attainment of flow. That is, if methods were developed to create and sustain it in entertainment media. 'Flow In Games', by Jenova Chen partly addresses this with respect to the video games industry (Chen, 2007 a).

[2.4. Creating and Sustaining Flow in Games](#)

Chen's thesis, 'Flow in Games' focuses on managing flow experiences in games (Chen, 2007 b) with focus on the design of games. This according to Chen is to create a gaming

experience engaging enough to guarantee the creation and sustenance of flow for a larger and varied user base – hardcore, regular and casual gamers alike (Chen, 2007 b). He describes a player's state when flow is attained as being '**in the zone**' – that is, in the player's flow zone. In his writing, Chen's description of the flow zone of a game agrees with Csikszentmihalyi's more generalized description of an activity's flow zone. Chen describes the flow zone of games, in general, as being defined by the skill level of players and the challenge or difficulty level offered by the game (Chen, 2007 b).

2.5. Juggling parameters: The Art of Keeping Players 'in the zone'

Due to these defining parameters – the challenge offered by the game and the skill level of the player – of a player's flow zone, designing a game intended for the masses is challenging; it requires balancing and controlling the gameplay experience in order to create flow for all player types, according to Chen (Chen, 2007 b). In Chen's thesis, he emphasizes that a user-oriented approach to designing games is paramount in the creation of a gaming experience that facilitates the attainment of flow by different player types. This is necessary because different player types have different perspectives on what a fun gaming experience constitutes, their perceptions and preferences therefore need to be sought to create an experience that best meets their preferences.

With regards to this notion of diversity among players, a user-oriented game design would seek to balance and moderate the various elements of the gameplay experience that makes it fun and entertaining, considering the innate preferences of all player types, for the same gaming experience. From the research of Bateman and Boon on Demographic Gameplay Design (DGD), a study that utilized the Myer-Briggs Type Indicator (MBTI) (Myer-Briggs, 1962) and the Keirsey temperament sorter (Kiersey, 1984) in identifying all possible player types; the player types to consider in this user-oriented gameplay design are (Cowley et al. 2008):

- **Conqueror:** the conqueror player type is competitive at heart, wants to win at all costs. Players of this type are goal-oriented and enjoy feeling dominant in gaming experience had and in social circles set around the game.
- **Manager:** the manager player type is logistical; he or she plays to develop mastery. Such players are process-oriented and will replay completed games if they can use their newfound mastery to unearth novelty at deeper levels of detail.
- **Wanderer:** the wanderer player type desires new fun experiences. He or she is less challenge-oriented than the player types above and primarily seeks enjoyment of new gaming experiences.
- **Participant:** the participant enjoys social play – couch cooperative or competitive play and online. He or she enjoys being involved in alternate game worlds.

It should be noted that the player types listed above are not mutually exclusive. A player can therefore have a combination of all of these player types. Figure 3 below depicts the flow zones for the Conqueror, Manager, Wanderer and Participant player types with their differences and similarities clearly shown by the overlaps of their flow zones.

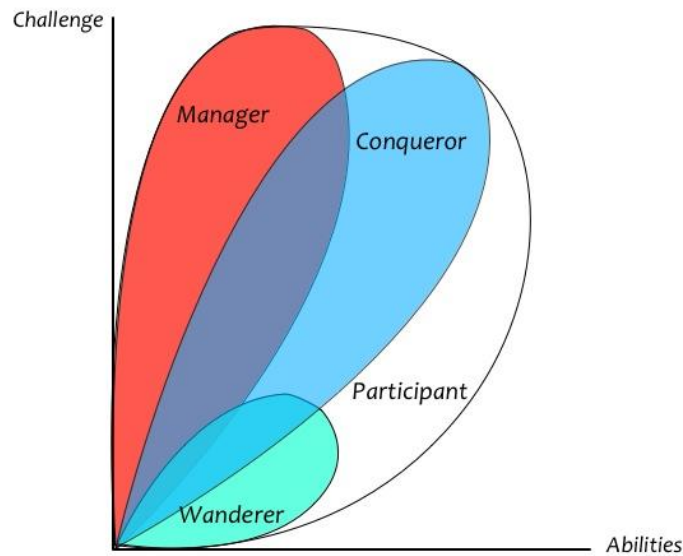


Figure 3: Differences in Player Type Flow Zones

One of the main insights from Chen's thesis applicable to my work is his realization about most games offering only a single, narrow and static gameplay experience that plays out almost the exact same with every single play-through. This limitation propagates to the game's flow creation capabilities with respect to a varied audience. Therefore games of this caliber only appeal to a particular subset of player types (Chen, 2007 b). Rehashing the primary objective, this thesis aspires to remedy this shortcoming by providing methods that will help create the conditions necessary for all player types to be captivated, enjoy and fully appreciate a gaming experience.

2.6. Strategies for Sustaining and Creating Flow

As possible options for the creation of flow in games, Chen suggests that video game designers incorporate the use of choice in games that extensively affects the progression of the underlining plot of the game, the options and resources available to the player. This is similar to emphasizing the use of morals as a pivot for making choices

and progressing the plot in games, as was done in games like 'Infamous 2'². However Chen's suggestion emphasizes that the choices made in-game permeate every aspect of the game's plot, not just the abilities of the character, the colour of his super powers or only the critical plot turns in the game – with respect to 'Infamous 2'.

Embedding player choice in a game's plot should effectively evolve it into a branching and multifaceted game plot. Chen is certain that doing this will in all provide players with the choice of creating their own personalized gaming experiences (Chen, 2007 b) and this will improve the chances of players getting 'in the zone' through the gaming experiences they progressively create for themselves as they play the game. This is based on the notion that players inherently know what they want from the games they play.

Chen however warns that this flow creation method hinges on the right balance of story branching and choices to be made in-game. He emphasizes that swarming a game with a lot of plot choices could end up breaking up the gameplay experience and eventually frustrate the player. Figure 4 depicts how player choice in games can be utilized to create a dynamic gameplay experience for different player types, allowing for different play styles, different story outcomes and different flow zones to suit the player type involved.

² Infamous 2 is an 2011 open world video game developed by Sucker Punch Productions and published by Sony Computer Entertainment. It is the sequel to the video game Infamous. <http://www.infamousthegame.com/>

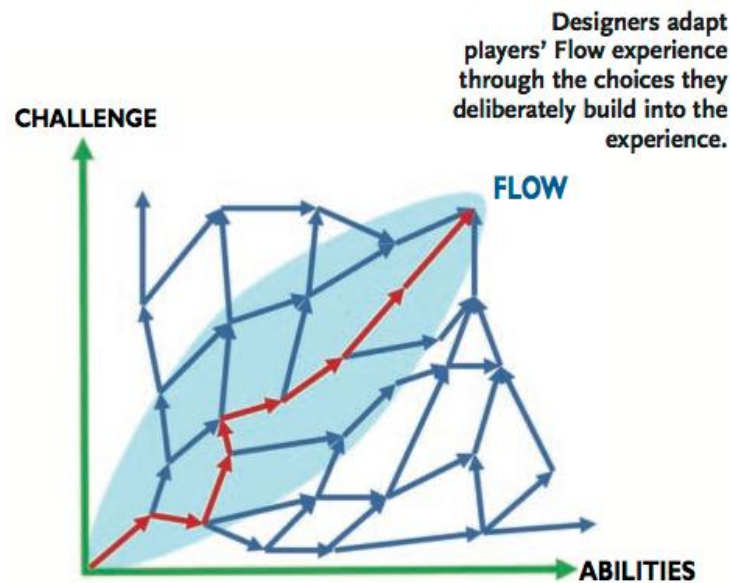


Figure 4: Using player choice in creating dynamic gameplay experiences (Chen, 2007 a)

2.6.1. Utilizing Dynamic Difficulty Adjustment

Dynamic Difficulty Adjustment (DDA), a technique used in modulating the level of challenge in a game over the course of a gaming experience (Hunicke, 2005) is also recommended by Chen to be used in games. Dynamic Difficulty Adjustment is for the purpose of keeping in check and accurately correlating a player's skill level with the difficulty or challenge offered by the game (Chen, 2007 b). Chen however disagrees with the use of data-centric DDA systems to categorize players on how well or how poorly they play a game (Miller, 2006). His argument with respect to this is that, besides competitive play, different player types have different notions of what playing 'well' or playing 'badly' is. This is due to the different levels of challenge or difficulty each player type can manage in a game. For example for the Conqueror player type, playing averagely for a moderately challenging gaming experience is considered to be playing 'badly'. On the other hand, playing averagely for a moderately challenging gaming experience is considered to be playing 'just fine' for the Wanderer player type. These

differences arise as a result of the maximum levels of challenge or difficulty each player type can manage, with respect to their skill level capacities as depicted by Figure 4.

Disregarding this factor hinders the process of facilitating the realization of flow in a game experience. This is because the likelihood of a mismatch between the player type and the metrics of performance used by the DDA system becomes high, due to the disregard of the player type's metric of performance (Miller, 2006) in favour of that imposed by the DDA system. To properly moderate and adjust the challenge offered by a gaming experience, Dynamic Difficulty Adjustment would require the player type's metric of performance in evaluating the game's state and making adjustments to the gameplay experience accordingly to suit the player.

As an alternative, Chen suggests an improved DDA system, the Embedded Difficulty Adjustment system (EDA). According to Chen, EDA systems form part of the game design as opposed to being a data collection and analysis module, the difficulty level of the game changes based on the player's preference of in-game activity (Miller, 2006). Based on the latent preferences of the player playing the game, the activities performed in the game will roughly correlate with the level of challenge or difficulty expected by the player from the game. Through this, the player subconsciously matches his or her skill level to the level of challenge expected from the game, through the activities performed in-game.

To support his argument, Jenova Chen used the example of playing 'Grand Theft Auto IV'³ – a game noted for its extensive list of in-game activities, side quests and the freedom it gives players with regards to deciding what to do in-game – in an interview with Joystiq, a game centric weblog (Miller, 2006). According to Chen, the design of the game allows players to choose the activities in the game that satisfy the level of challenge they prefer to experience during their play sessions, mostly through prior experience with the game or via trial-and-error. Players who enjoyed going on a killing

³ Grand Theft Auto IV is an open world action video game published by Rockstar Games in 2008. It is the fourth installment in the Grand Theft Auto Series. www.rockstargames.com/IV/

spree or standing off with the police in previous play sessions, for example, most often replay the same activity on subsequent play sessions. This is solely because it happens to be one of the in-game activities they enjoyed performing the most. Grand Theft Auto's design therefore allows players to perform activities in the game that were most fun and entertaining for them, from prior experience, according to Chen.

By doing this, the player is allowed to match his or her skill level to the level of challenge of the activities in-game and decide which of the activities he or she enjoys playing the most and wants to replay. The level of challenge expected and experience by the player becomes pivotal in molding the entire gaming experience with this game design. According to Chen, 'Grand Theft Auto' provides enough variation in the challenge of in-game activities, providing players choice and in turn satisfying the initial conditions necessary for the creation of flow. EDA systems utilize a similar design adaptable to different game designs and provide similar benefits (Miller, 2006).

2.7. Criticisms on Jenova Chen's Application of Flow

The criticisms of Jenova Chen's work on 'flow in games' have been mainly on his implementation of the concepts he developed in his thesis such as employing EDA methods to control and correlate the level of challenge in games with the skill level of the player and splicing the plot of the game with just enough choices to help mold the gaming experience most compatible with the player (Chen, 2007 b). To most reviewers and critics, 'flow', the game Chen built using the concepts he developed in his thesis is likened more to a serene experience that's coincidentally playable than a game (Navarro, 2007).

The main objective of Chen's game, 'flow', is to evolve an aquatic organism by feeding on other organisms in the gaming environment. Although critics acknowledge that flow is innovative, unique and minimalistic; they criticize its lack of challenge (Navarro, 2007) and overly simplistic gameplay mechanic (Roper, 2007). The whole game – which

according to reviewers takes less than three hours to complete – is spent performing the monotonous task of feeding on other organisms and watching the organism you control evolve. ‘Flow’ is said to have almost no appeal for replay once it is finished (Navarro, 2007) and this is worsened by the game’s lack of plot (Roper, 2007). However ‘flow’ is noted to have a relaxing feel to it, the in-game music and the beautiful visuals of the game create a relaxing atmosphere and this makes the game enjoyable to play. Also, to some extent the evolved forms that the organism being controlled in the game keeps players motivated to progress further and unlock new evolved forms and new attack styles of the organism.

Chen’s work on the creation of flow in gaming experiences focused more on the design of games and their gameplay. From the reviews and the reactions he garnered after releasing the game ‘flow’ it is safe to assert that the game and therefore the methods he developed and applied in creating the game, ‘flow’, worked in the creation and sustenance of flow. However these methods do very little with respect to storytelling and captivating players in events happening in real-time in a gaming experience.

Critics and reviewers of Jenova Chen’s game, ‘flow’ did point out the lack of depth in the game with respect to gameplay, plot and replayability. Regardless most still enjoyed playing the game, they attributed this to the serene gameplay experience they encountered while playing the game. This serene experience constituted of beautiful visuals and in-game music. The music in the game to some extent affected the overall gameplay experience therefore. Due to its compatibility with the setting of the game, it aided in creating a relaxing and fun experience (Roper, 2007).

Chen’s ‘flow’ therefore did leverage, to some extent, the characteristics of music to create an overall relaxing and fun gaming experience. The use of music in everyday activities particularly with regards to entertainment has been observed to create flow-like experiences and also support the creation of flow. With respect to video games, in-game music is one of primary channels of expression, mood suggesting and intuitive in-

game feedback. Understanding its makeup is key to leveraging its maximum potential in the creation of flow in games.

2.8. Music: Constituents and Characteristics

Music has always been axiomatically believed to share some form of relationship with human emotion and feeling. However due to the lack of methodologies to measure the extent of these relationships, music itself and what it is about has been difficult to define (Scherer, 2004). Most scholars regard music as a communicatory medium since it fits the ‘information theory’ model developed by Shannon and Weaver (Shannon and Weaver, 1949). The message being communicated between the sender and the receiver is most of the time ambiguous with respect to music however. This ambiguity of the message communicated through music makes some scholars doubtful of music being truly a communicatory medium. Most are left to wonder if music is just “a human faculty that pretends to communicate but that is more or less parasitic on many of the abilities that underlie language and that has no real function other than to tickle the senses” (Miell et al. 2004, p. 3).

2.8.1. The Ambiguity and ‘Aboutness’ of Music

From the perspectives of musicologists and ethnomusicologists, music consists of sonic patterns, action and interaction. These discourses also concur that the underlining message conveyed in music is ambiguous. Music therefore is aptly described as being inherently ambiguous. Due to this characteristic, **‘one and the same piece of music can bear quite different meanings for performer and listener, or for two different listeners; it might even bear multiple disparate meanings for a single listener or participant at a particular time’** (Miell et al. 2004, p. 4).

To answer the question of what music is about and what it communicates, some scholars resorted to suggesting that music is about itself (Miell et al. 2004). However

this was heavily scrutinized and ultimately rejected by scholars because music had been identified with diverse cultures throughout history. If indeed music was about itself, it could not have been used to describe the values and makeup of so many varied cultures. Music, from this analysis certainly possessed traits to describe more than just itself. The 'aboutness' of music according many scholars had to be human emotion. Juslin and Sloboda conducted research with regards to the notion of music's 'aboutness' being human emotion and concluded that 'the unfolding of music's evident structure modulates the affective states of both listeners and performers, probably in part by mirroring the temporal forms of emotional brain-mind-body processes and those of correlates of these such as gesture or linguistic utterance' (Miell et al. 2004, p. 7).

The suggested emotion elicitation properties of music was further supported by Lavy's research, which asserted that the sonic patterns in music can elicit human emotion. Also from the research of Koelsch, Kasper and others; musical meaning resorted from either (Koelsch et al. 2004, p. 1):

1. A connection across different frames of reference suggested by common patterns or forms (e.g., sound patterns in terms of pitch, dynamics, tempo, timbre, etc. that resemble features of objects).
2. The suggestion of a particular mood or feeling.
3. Extra-musical associations (e.g. any national anthem).
4. The interplay of formal structures in creating patterns of tension and resolution. (e.g. A scenario of power struggle and conflict resolution)

With respect to the research findings above, (2) explains why music can evoke empathy for another person's suffering, in film and theatre and also (1) create nostalgia through the recollection of memories and moments in a person's life by listening to a familiar song (Scherer, 2004).

Contrasting the established notion of the inherent ambiguity of music, sounds and music exhibit very little or no ambiguity in special case scenarios. In these scenarios, different receivers of the message conveyed by music are able to accurately read and comprehend the message with respect to scenarios depicted. This property is due to our inherent capability as humans to accurately identify the message being conveyed via musical associations and references. This notion was asserted by the findings of research conducted by Lipscomb and Tolchinsky. Currently this phenomenon is particularly leveraged and evident in film and theatre (Miell et. al, 2004).

The reason for this special case is because there are certain sounds and musical patterns that humans, irrespective of cultural backgrounds, naturally associate with certain ideas and concepts. This has been used in a wide array of films to ensure that the conceptual state of the scenes in the film is almost identically received regardless of the cultural background of the audience. An example of this is the horn call sound in the movie 'Jaws'; which naturally denotes fear, danger and fear of the unknown (Miell et al, 2004).

This property of music is currently being leveraged in game design, however the scope of its utilization is very minimal. It's currently reserved for only big budget first and third person shooter games such as Call of Duty⁴ and Battlefield⁵. The current application and utilization of this phenomenon, with respect to games, is underutilized in my opinion. This phenomenon can to evoke specific moods in different player types and help create an appropriate aural condition to express the underlining ideas of the plot of a game or mirror the player's gameplay experience in real-time, possibly with a cinematic feel to it.

⁴ Call of duty is a critically acclaimed and award winning first person shooter franchise developed by Activision, the current installment of the franchise is Call of Duty: Modern Warfare 3.

⁵ Battlefield is an award winning first person shooter franchise developed by DICE SE under EA Games; the current installment of the franchise is Battlefield 3.

2.9. The Potential Music Holds: Aural Conditioning

Music's inherent ambiguity of meaning and its special case where it expresses a specific or equivalent meaning universally makes it a versatile tool in the creation of flow in games for a larger audience, taking into consideration the varied player types available. Csikszentmihalyi asserts to the potential of music as a flow-inducing tool in his writing, he clearly states that **'listening to music wards off boredom and anxiety, and when seriously attended to, can induce flow experiences'** (Csikszentmihalyi, 1990 p. 109). Coupling this with music's ability to evoke emotion and feeling, it becomes an effective tool for intricate storytelling in entertainment media. Especially in film, theatre and games.

With respect to games, music can be used to support the progression of the plot of a game, describe the progression of the player's gaming experience, alter the overall mood or state of the gaming experience or set a specific mood for the gaming experience. The particular style of application of music and sound to games to create an optimum aural condition that complements the gameplay experience of the game depends on the inherent nature of the game, be it gameplay driven or plot driven.

2.10. Player Type Analysis and deductions

From my analysis of the player types in section 2.4 and their mutual non-exclusivity I have come to realization that:

1. The Conqueror player type is capable of managing the highest of challenges in a gaming experience and thus can experience flow even when the challenge offered by the gaming experience is high. This is due to the inherent goal-oriented nature of the Conqueror player type and the thirst for dominance. Players of this nature are likely to be highly skilled with above average reflexes.

The flow zone of the Conqueror player type therefore has a steep incline in comparison with the other player types.

- 2. The Manager player type follows the Conqueror type in terms of managing the highest level of challenge in a gaming experience. The characteristic of being process-oriented and seeking mastery of the gaming experience improves the skill set of the Manager player type over time allowing for the experience of flow even at high difficulties in game. For this reason, the flow zone of the Conqueror player type is moderately inclined, compared to the other player types.*
- 3. The Wanderer player type can least manage a high level of difficulty in a gaming experience, this is because the Wanderer is not goal-oriented – therefore likely to get distracted by non-scoring aspects of the game – lacks the thirst for game mastery and also the thirst for dominance that characterizes the Manager and Conqueror player types respectively. The Wanderer prefers to explore the gaming environment and gameplay mechanic. This player type becomes content with just interacting with the elements of a new gaming experience. Due to this, the flow zone of the Wanderer player type is the least inclined, comparing it to the other player types.*
- 4. The Participant player type exists as a subset of all the other player types discussed above and cannot be distinguished on the grounds of the level of challenge or difficulty of the gaming experience due to the dynamic nature of cooperative and competitive play. It is logical to perceive the Participant player type as the cooperative and competitive seeking traits of the Conqueror, Manager and Wanderer player types. The flow zone of the Participant player type therefore depends on the average level of skill of all participants of the gaming experience taking place; it could be as steep as that of the Conqueror player type or as leveled as that of the Wanderer player type.*

Figure 5 depicts my observations and analysis of these player types with regards to their competitive nature, goal oriented nature and indirectly their skill level capacities.

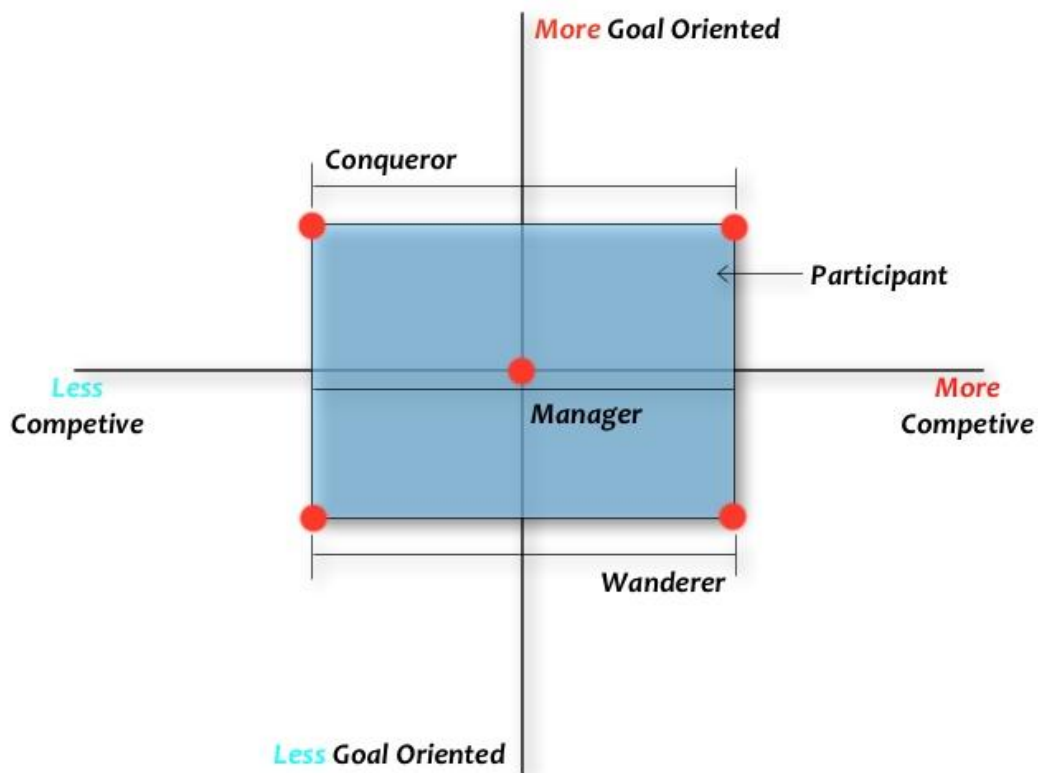


Figure 5: Player Type differences with respect to Competitiveness and Goal Orientation

Satisfying the shared preferences of all these player types in a gaming experience through user-oriented design principles according to Chen would create a gaming experience enjoyable by all player types.

2.11. Unifying Player Type Attributes

From the research and observations discussed above, the unifying attributes – considering music and sound – of the player types discussed with respect to gaming experiences involve:

1. The special case of specificity of music and sounds, this allows for crafting scenarios and situations in gaming experiences that are perceived very similarly by all player types. Plainly, **all player types are capable of comprehending the underlining ideas being expressed in a game if the property of specificity of music is leveraged.**
2. The inherent ambiguity of music and sounds, this allows for designing gaming experiences that facilitate differences in perception by varied player types in solving and completing the tasks in the game. The ambiguity of the aural condition of the game allows for diverse perceptions of the events occurring in game, which also triggers novel solutions to the problems to be solved in the game. **Plainly, all player types are capable of forming different opinions of the ideas being expressed in a game if the property of ambiguity of music is leveraged.**
3. The mood and emotion evoking capabilities of music and sound, this attribute of music and sounds allows for intricate storytelling through the solicitation of empathy from the player with reference to the events occurring in the gaming experience or the characters in the game. Getting players – regardless of type – emotionally interested in the events and characters in game serves up the needed focus or attention to create and sustain flow throughout the entire gaming experience. Plainly, **all player types can be coaxed to be emotionally interested in the nature and progression of the game if the properties of mood and emotional elicitation of music are leveraged.**

4. The suggestive nature of music, this characteristic of music serves an intuitive mechanism for notifying players of changes in the difficulty of the gaming experience or possible upcoming events which gives them the needed time to adjust their playing styles in anticipation of the estimated difficulty or the event suggested by the aural condition. Plainly, **all player types can be provided information on the elements in the game without the use of words by using suggestive sounds and music.**

2.12. Gameplay Driven Games, Plot Driven Games

From my analysis and readings about the categorization of games, games can be grouped based on their defining gameplay components. According to this categorization, games can be labeled as either Gameplay Driven Games (GDG) or Plot Driven Games (PDG). Gameplay Driven Games and Plot Driven Games both possess what I consider to be the key components games – **gameplay mechanics, interaction** and **plot** –; it is however the **priority** and the **precedence** these components have that distinguishes the two.

Table 1: A Game's Composition	
1	Gameplay Mechanics: This refers to the mode of interactivity between the player in-game and the elements that constitute the game.
2	Gameplay Interaction: This refers to the depth of interactivity amongst the various elements of the game and the player in-game.
3	Plot: This refers to the cause of the game, the reason behind the game's existence, its characters, the dynamics and relationships amongst the elements and character of the game

Gameplay Driven Games have the gameplay mechanics and interactivity as the pivot of the gaming experience, while a Plot Driven Game has the underlining story of the game being the pivot of the gaming experience.

Table 2: Gameplay Driven Games, Plot Driven Games	
Gameplay Driven Games	Plot Driven Games
Examples. Tetris, Mario, Pong	Examples: Uncharted, Battlefield, Final Fantasy
Either lacks a plot or has a static plot.	Has an intricate, unfolding plot.
The primary motivator of play is the gameplay and the objective of the game.	The primary motivator of play is a mix of the gameplay, the plot of the game and the objective of the game.
Characters, if they exist are solely designed around introducing new gameplay mechanics. They contribute very little to the plot of the game.	Has intricately designed characters that are important pieces to the overall plot of the game.
Game levels revolve around beating a high score, time limit or a boss.	Game levels revolve around completing plot requisites to further unfold the plot of the game.

To elaborate further, a shallow or non-existent plot and an intricate and polished gameplay mechanic characterize Gameplay Driven Games. The resulting gaming experience becomes centered on the player's ability to play through the game, to successfully finish a level, progress to the next one and beat the highest score of the game. This as a result detaches the player from the characters in the game – if there are any – in favour of being engrossed in the detailed levels of interactivity the game provides. For Gameplay Driven Games that have a plot, it is most of the time present to help the player make sense of the gaming environment and also comprehend the nature of the gameplay mechanics present as well as present the reward of completing the overall objective of the game. Tetris, a game developed by Alexey Pajitnov (Sheffield, 2006) is an example of a Gameplay Driven Game. Devoid of a plot, the game is purely based on progressing as far possible through the levels to beat the high score of the game.

In contrast, intricate plots characterize Plot Driven Games, mostly involving multiple characters. The game is experienced by playing the role of a character, or a set of characters in the game. Events that occur in the game are therefore witnessed through the perspective of the character being controlled in the game. Plot Driven Games do

indeed have their plots to be the most polished component of the game. They however always have a gameplay mechanic, sometimes just as polished as the plot of the game itself. This allows Plot Driven Games to tell intricate stories and also provide thrilling gameplay experiences in unraveling the story.

The gameplay experience with respect to Plot Driven Games however is tailored to the progression of the plot of the game; the gameplay experience is therefore coupled to the plot of the game serving the fundamental purpose of progressing it. Due to this, the gameplay experience of Plot Driven Games in comparison to that of Gameplay Driven Games is more about the character being controlled in the game and the turn of events affecting the actions of that character, not about the player playing the game. *Uncharted 2* is an example of a Plot Driven Game. Focused on telling the adventurous tales of treasure hunter Nathan Drake and his comrades. It also provides good gameplay mechanics to progress the plot.

3. Methodology

The methodology I adopted for this thesis comprised of semi-structured discussions, play-testing and questionnaires. This preferred methodology structure was for the purpose of data collection utilizing a user-oriented approach. The data gathered from these activities were analyzed using statistics and simple trend and correlation analysis, deductions from the analysis were then used to assert or refute the initial hypothesis of the methods tested. The discussions performed were in the form of play-through sessions; the testing of the methods developed on the other hand involved play testing, and questionnaires.

3.1. Methodology of ‘Flow in games: Aural Conditioning’

To achieve the objective of this thesis, that is developing flow creation and sustenance methods that will facilitate the creation of a personalized, dynamic and captivating gaming experience for all player types; I first will describe extensively the methods that I have created which cater for flow generation and sustenance with regards to Gameplay and Plot Driven Games. The description of these flow creation and sustenance methods will encompass the details of:

- How they work.
- The properties and variables that to make them work.
- The best possible scenarios to employ these methods in games.
- How these methods can be implemented in games, in practice.

The evaluation of the methods to be discussed will be practical. This will be made possible by creating prototypes for a collection of the methods described. The prototypes will be showcased for the purpose of demonstrating how the methods, in practice, work in creating and sustaining flow for different player types in a single gaming experience. To assert or dismiss the effectiveness of the methods to be described, I hosted user-testing labs to garner feedback on the effectiveness and most importantly the flow inducing capabilities of the methods showcased via prototypes.

The data collected from the user testing sessions will be analyzed and used to assert or refute the effectiveness of the methods developed. Based on the analysis of the data garnered, revisions to the methods might also be made. In summary, for this thesis, I will:

1. Create a prototype for Affective Emphasis.
2. Assess the effectiveness of the flow creation and sustenance methods by collecting user feedback and through user testing sessions.
3. Discuss the flow creation and sustenance methods I have developed.

3.2. Play-through Sessions: Precursor to Methods Development

In order to develop flow creation and sustenance methods applicable to Gameplay Driven Games and Plot Driven Games, I needed a discussion group to garner information and discuss the types of games the participants preferred to play, the types of games they enjoyed the most, the things current games are excelling at the most and also what could be done to better the overall gaming experience delivered by these games. These discussions were necessary because I believed a user-oriented approach was better developing flow creation and sustenance methods. A user-oriented approach provided additional information and possible scenarios likely to be overlooked in developing these methods if they were developed singlehandedly. The participants of the play-through-sessions were all male, avid gamers with over ten years of gaming experience. Participant's classification of player type was done through discussion between the participant and myself.

Table 3: Detail on the Participants of the Play-through Sessions		
Participants	Dominant Player Type	Level of Gaming Experience in Years
Participant 1	Manager	15+ years
Participant 2	Conqueror	13 years
Participant 3	Conqueror	13 years
Participant 4	Manager	10 years
Participant 5	Manager	15 years

Our discussions took the form of late night meet-ups in the hall of the apartment we shared, we played games and discussed the features that stood out about the games we played and the features we felt were discouraging or contributed very little to getting us ‘in the zone’ of the gaming experience. We also did discuss the effects that the aural condition of the games had on our overall performance and how it influenced our perception and understanding of the plot. I documented – in writing – all of the sessions we had, there were four sessions in all. The games we played during these discussions were Uncharted 2 and FIFA 12

3.2.1. Findings from the Uncharted 2 play-through sessions

From the Uncharted 2 discussions, the feedback I garnered hinted that players were very particular about the seamlessness in the changes of the aural condition. For example, some players did find the death sound snippet to be out of place with the setting of the game level and the aural condition projected – the game level in question was ‘Trainwrecked’ – it soon became irritating to the player and the third parties spectating as the sound snippet played over and over as the player kept dying in-game. It was also noticed that the aural condition of the game was static, and at some point did not correspond to the turn of events in the level played. This was realized on the ‘Trainwrecked’ level of Uncharted 2. This level had Nathan Drake shot, bleeding to death and had to fight against Lezarovic’s men – the boss of Uncharted 2 – all by himself. The level started off with an aural condition the player and the spectating third parties asserted to suggesting ideas like being against all odds, being sneaky, being near death-no escape scenario. This captured the initial moments of the level well, however due to

the skillset of the player and the resultant change in the gaming experience the game state and mood suggested by aural condition mismatched with the gaming experience witnessed. The player was being very aggressive despite his state, he was running and gunning down the armed men after him and was having a lot of success doing this. The aural condition did not adjust to reflect the change in the gaming experience; it still reflected ideas of being sneaky and cornered which were contradictory to the gaming experience witnessed. The player did have the upper hand, was being aggressive and not sneaky. Besides this anomaly, players and third-party spectators did realize and respond to the aural condition especially when it leveraged the property of specificity of music with respect to the communicated message. Most of the time, the specificity of the music and sound making up the aural condition suggested incoming danger which got the player alert and ready to react, there were a couple of times however where the aural conditioning suggested emptiness of the gaming environment. This happened on the level 'Mountaineering' of which the player inferred from the suggestiveness of the aural condition and the visuals of the game level, the lack of danger and therefore resorted to an exploratory style of play.

3.2.2. Findings of the FIFA 11 Play-through sessions

With regards to the play-through sessions we had with FIFA 11, participants of the discussion engaged in one-versus-one competitive play. The discussions had with regards to the FIFA 11 play-through sessions centered on flow and competition. Most of the participants asserted to being most immersed in playing FIFA when they played opponents of the same skill level or of slightly higher skill level. The challenge experienced by playing equally skilled or slightly higher skilled player stimulated and captivated enough to keep the participants in their flow zones for the length of the experience. Most participants when asked if they would play against other players who were highly skilled and better by a wide margin in every respect said no for the reason that the experience would require too much of them of which they would not be able to give since they were not at a skill level required to deliver such a performance. This would end up frustrating them, make them anxious, overly competitive and bitter

about the whole experience and would in turn defeat the purpose of engaging in the experience in the first place: to get 'in the zone' and have fun while at it. The participants were overall satisfied with the aural condition of the game, especially the chants of the spectators and the commentary. It made the game more lifelike and more fun for them.

3.2.3. Findings: Play-through Sessions, summary

Summarizing the findings of the play-through sessions had with both games:

- Participants were very much aware of the aural condition of the games they played. Transitions in the aural condition that were not seamless did attract their attention, disrupt their focus and evoked their displeasure.
- Participants did not feel captivated by the gaming experience when the aural condition of the game did not correlate with the events, setting and mood of the game. This was as a result of the static nature of the aural gaming experience.
- In competitive play, participants to some extent protected their chances of getting 'in the zone' by choosing to play opponents of roughly equivalent skill levels.
- The suggestiveness of the aural condition of games was more eminent when they were more lifelike for the participants. Example, the spectator chants at stadiums in FIFA 11.

3.2.4. Inference from the findings of the Play-through Sessions

Based on the findings of the play-through sessions conducted and the properties of music and sound – its ambiguity and specificity, to be precise. I arrived at these conclusions for the flow creation and sustenance methods I was going to create:

- Due to the emotional elicitation properties of music and sound, it was possible to structure the aural condition of a game to reflect a particular mood or state thereby evoking the same or similar moods or states in the player. (Refer to the method of Affective Emphasis)

- The property of specificity of music and sound allowed for conveying ideas and through suggestions via the aural condition of a game. This property enabled the use of the aural condition of a game to provide a-priori information to events in the game before they happen. This property also allowed for an intuitive feedback system that only utilized sound in conveying ideas. (Refer to the methods of Dynamic Player Mirroring and Dynamic Enemy Mirroring)
- The effectiveness of the aural condition of a game in captivating the player in the gaming experience requires as a requisite that the events depicted visually correlated with the aural condition. For this reason, the aural condition of a game, to truly reflect the events and happenings in a game needs to be dynamic. Correlating and reflecting the visual depictions in the game throughout the entire gaming experience.
- Due to the capacity of the aural condition of games to motivate players, it is possible to create a system that allowed players to trigger the aural conditions that motivated them the most. (Refer to the Psych System)

4. Flow Creation and Sustenance Methods

From the inferences made, I created four methods, which I believe are capable of creating and sustaining flow in games for the entire gaming experience. Most of the methods created do apply for both Gameplay Driven Games and Plot Driven Games.

4.1. Aural Conditioning Methods

Gameplay Driven Games and Plot Driven Games, both described in section 2.12, are structured differently due to the differences in apportionment of their equivalent compositions. These differences in structure form the fundamental distinguishing features of the two game types, and their corresponding gaming experiences. With respect to leveraging aural conditioning to create a more immersive and engaging gameplay experience, Gameplay Driven Games and Plot Driven Games are very similar since the fundamental objective for both game types is to create a gaming experience capable of creating and sustaining the player in his or her personalized flow zone for the entire gaming experience. Most of the methods I have created are multipurpose, that is, they can be applied to deliver similar results regardless of the game type – be it gameplay driven or plot driven. These methods are Affective Emphasis, Dynamic Player Mirroring, Dynamic Enemy Mirroring and The Psych System. Table 5 below provides additional information these methods

Table 5: Summary on Flow Creation and Sustenance Methods		
Method	Target & Description	Application
Affective Emphasis	Reflects a particular state or mood in the game to the player.	Multipurpose
Dynamic Player Mirroring	Reflects the pace, performance and state of the player in the game, to the player.	Multipurpose
Dynamic Enemy Mirroring	Reflects pace, state and mood of the enemies or opponents in-game, to the player.	Applicable to only Gameplay Driven Games.
The Psych System	Facilitate a power-up system using the aural condition of the game, for the player.	Multipurpose

4.2. Affective Emphasis

Affective emphasis focuses on making apparent to the player a state, mood or a set of states or moods in a gameplay experience through its aural condition. The purpose of this state or mood emphasis in the gaming experience is to suggest to the player the state or mood compatible with the gaming experience. This is for the purpose of synchronizing the state or mood being evoked by the gaming experience and the player's reception, aiding the player's appreciation of the gaming experience; this in turn sustains or improves the player's state of flow. The method of affective emphasis requires that the sounds and music that make up the game's aural environment either directly or indirectly suggest to the player the mood or state required to fully appreciate and engage the current state of the gaming experience. Due to the primary objective of affective emphasis, this method is most effective being static.

Affective Emphasis needs to effectively project a set of similar moods or states to diverse player types bearing in mind that the scope of specificity with respect to the message communicated by sound and music is minimal. Due to this minimal scope of specificity, maximizing the method of affective emphasis in games requires it be static in order to fully utilize the property of specificity of music and sound. Affective emphasis being static implies that the sounds or musical snippets that make up the aural condition will be picked from a limited collection of sounds and music snippets that suggest the mood or state being sought after. Making the method of affective emphasis a static one further defines its scope of effective utility. From my research and observation, affective emphasis works best when used in set piece moments – scripted, action packed scenes – of gameplay experiences, for a short period of time. The short timespan within which affective emphasis is used counteracts the static nature of the aural condition created. This ensures that it does not get repetitive and monotonous.

The Call Of Duty⁶, Battlefield⁷ and Uncharted⁸ franchises have used affective emphasis targeted at replicating Hollywood blockbuster movie moments in games tailored to first-person shooter and third-person shooter gaming experiences respectively.

Affective emphasis does however have utility that exceeds its current restricted scope of first-person and third-person shooter games, in my perspective. For example, affective emphasis could be used to show the turning points in boss battles – battles involving the characters that mold the plot of the gaming experience or the major enemies of the game – as well as near death moments of despair in games. Affective emphasis has the added benefit of turning a gaming experience into a captivating cinematic if done properly, this is due to the descriptive and suggestive properties of the aural condition created. For Gameplay driven Games, affective emphasis can be applied to specific turning points in the dynamics of the player's gaming experience, this effectively avoids the problem of having a static experience. That is, affective emphasis being overly repeated in a dynamic experience of which Gameplay Driven Games are. The static nature - of affective emphasis makes it very suitable for Plot Driven Games, especially with the critical plot turns of the game.

The second flow creation and sustenance method focused on the aural gaming condition is Dynamic Player Mirroring. This method is simply a motivating mechanic that uses the pace and performance of the player in a gaming experience to gauge and reflect an accurate level of encouragement and motivation, through the aural condition of the game.

⁶ Call of duty is a critically acclaimed and award winning first person shooter franchise developed by Activision, the current installment of the franchise is Call of Duty: Modern Warfare 3.

⁷ Battlefield is an award winning first person shooter franchise developed by DICE SE under EA Games; the current installment of the franchise is Battlefield 3.

⁸ Uncharted is a critically acclaimed and award winning third person shooter/ adventure franchise developed by Naughty Dog under Sony. The current installment of the franchise is Uncharted: Golden Abyss.

4.3. Dynamic Player Mirroring

Dynamic Player Mirroring focuses on measuring the performance and pace of the player – using performance metrics of each of the player types – throughout the gaming experience and adjusting the aural condition of the gaming experience to mirror the measured performance accordingly as well as facilitate its betterment. **The underlining premise of this method is that players are susceptible to in-game motivation and will respond accordingly.** This is primarily to serve as intuitive in-game feedback with respect to the pace and performance of the player. Dynamic Player Mirroring rewards players for playing well through its reflective nature. Play sessions of high pace and outstanding performances by players automatically trigger an aural condition with upbeat, up-tempo sounds and music tailored to the natural preferences of the player according to his or her player type.

This reassures the player of how well the play session is going and this in turn fuels the cycle of the mirroring process: the player feeds off the up-tempo, energetic aural condition to put up an even better performance which in turn is mirrored by the aural condition. The breaking point or threshold of this phenomenon is when the player becomes overly confident and so self-assured in his streak of great gameplay experiences such that he or she starts to take too many risks and fails in executing them resulting in a temporarily broken and inconsistent gameplay performance. This phenomenon creates a system where players even when playing very well and being complimented for it in-game must control their natural levels of susceptibility at such high levels of flow and performance for the purpose of maintaining the state. Through mirroring, this would switch the aural condition of the gameplay experience to motivational and a relatively low tempo aural condition, suggesting to the player that he or she is not playing as well as he or she was or could be.

The third flow creation and sustenance method focused on the aural gaming condition is Dynamic Enemy Mirroring. This method serves as an added layer of feedback for the player in-game about the state of enemy being played against. Devoid of a graphical

user interface, this method provides intuitive and suggestive feedback using the aural gaming condition on the enemies in-game.

4.4. [Dynamic enemy mirroring](#)

The method of Dynamic Enemy Mirroring shares a lot of similarities with Dynamic Player Mirroring with one fundamental difference however: the trigger of the aural condition of the gaming experience. For Dynamic Player Mirroring, this trigger is the player, more precisely the performance and pace of the player in the gaming experience. For Dynamic Enemy Mirroring, this trigger is the enemy being played against in the gaming experience. Dynamic enemy mirroring works by reflecting the state of the enemy being played against in the gaming experience. This mirroring effect provides the player with another layer of information about the enemy being played against – that is, the state or mood of the enemy being played against. The changes in the aural condition via Dynamic Enemy Mirroring intuitively notifies the player of the needed play-style required to be successful in battling the enemy being mirrored since the level of rage, anger and sneakiness suggested by the aural condition can be used by the player to predict or guess the nature of attacks or moves to be made by the enemy. Dynamic Enemy Mirroring from my observation and research is best suited for one-on-one boss battles as this allows for complete focus of the player's attention on the enemy being battled.

The methods Dynamic Player Mirroring, Dynamic Enemy Mirroring and Affective Emphasis rely on absolute seamlessness of transitions from one aural condition to the other. The seamlessness of aural condition transitions is vital, this is because broken aural condition transitions diverts the attention of the player from the gaming experience to the broken unsatisfactory nature of the transition, this ultimately breaks the players state of flow or hinders its improvement. This challenge of seamlessness of aural conditions with respect to games is very much identical to maintaining the seamlessness of music in disk jockeying. The implementation of these methods will

therefore utilize techniques of disk jockeying to ensure that the aural conditions transitioned through are all seamless and follow naturally to the ears of the player immersed the gaming experience.

4.5. The Psych System (Aural Power-Up)

The Psych System can be described simply as a power-up mechanism focused on the player of the gaming experience rather than the character being played as in the game. Traditionally, power-up systems in games improve the abilities or the overall health status of the character being played as, in a gaming experience. The effects of this are direct and measurable. For example, in Super Mario Land, when Mario acquires a 1-up mushroom he gains an extra life. Applying this concept of power-ups with respect to the player of the gaming experience gets more complicated taking into consideration the effects the aural condition of the game has on the players perception, play-style and mood while playing the game. This complication creates an avenue for a new type of power-up system targeted at the player, where aural conditions that improve the player's pace, performance and overall enjoyment of the gaming experience become the power-ups. **Music and sounds have indeed been identified to be capable of evoking moods and emotion thus the aural condition of a gameplay experience has the capacity to encourage a player to play better than he or she normally would, that is if the aural condition of the gameplay experience meets the expectations of the player playing the game according to player type categorizations.** The psych system has this as its premise. The Psych System is a dynamic power-up system, it analyzes preferred player aural conditions and their respective pace and performance statistics over a period of time to create a purchasing system where music and sounds found to correlate to the highest pace and performance of the player in the gaming experience are the most expensive. This power-up system is put together through trail-and-error, by sampling various aural conditions in the early levels of the game, the data collected is

then used to price and categorize the possible aural conditions available for the power-up system.

The player, to trigger these aural conditions for an optimum gaming experience would have to earn enough power-up points to make the purchase and trigger the right aural condition. This in turn would create the needed gaming atmosphere to facilitate the improvement of his or her pace and performance in the gaming experience. The nature of the psych system allows the player to trigger the preferred aural conditioning at any point in the game provided he or she has the needed power-up points for the aural conditioning. This mechanism is regulated from being repetitive by having a maximum number of consecutive triggers for each aural condition in place. This way some level of dynamism is still preserved. The psych system holds the promise of facilitating the development of an optimum gaming experience for the player through changes in the aural condition of the gaming experience.

To test the effectiveness of the methods I developed, I created demos that applied the methods I developed and had testing sessions with randomly selected participants to garner results on the implementation of these methods. The first of the methods that I tested was Affective Emphasis.

4.6. Testing the Method of Affective Emphasis

For testing the method of affective emphasis, I created a music playback system that plays commercial house music songs seamlessly by leveraging disk jockeying techniques such as track-to-track transitioning. The genre house music was selected with my subjective observation of its innate mellow, relaxing and mildly energetic properties. With this knowledge I crafted an aural experience that first sought to relax but also

mildly energize the gaming experience. This aural experience fitted well with the gaming experience that was Osmos⁹.

4.6.1. First round of testing

The test comprised of playing the game, Osmos, with its original aural condition (the original gaming experience); then playing the same game with the aural condition from the music playback system I developed (the customized gaming experience). Questionnaires garnering feedback followed immediately after each gaming experience as well as a short discussion on the effectiveness of the method and possible improvements to the method. In all twenty-five people participated in the test. Out of the twenty-five, eleven were female and the remaining fourteen were male. In all fourteen casual gamers, eight regular gamers, two hardcore gamers and only one non-gamer participated in the method test.

⁹ Osmos is an award winning casual game developed by Hemisphere games. This game has you playing as an aquatic organism with the objective of becoming the biggest in the gaming environment. This is done by engulfing other organisms in the gaming environment

Table 5. Summary of Affective Emphasis Method Testing [First Test]	
Number of Females	11
Number of Males	14
Total Number	25
Number of Casual Gamers	14
Number of Regular Gamers	8
Number of Hardcore Gamers	2
Number of Non Gamers	1
Averages	
Original Experience Rating	7.04
Modified Experience Rating	8.34
Original Experience Rating [Female]	8.1
Original Experience Rating [Male]	7.36
Modified Experience Rating [Female]	8.59
Modified Experience Rating [Male]	8.14
Original Experience Rating [Casual]	7.5
Original Experience Rating [Regular]	7.125
Original Experience Rating [Hardcore]	7
Original Experience Rating [Non Gamer]	—
Modified Experience Rating [Casual]	8.43
Modified Experience Rating [Regular]	8.19
Modified Experience Rating [Hardcore]	8
Modified Experience Rating [Non Gamer]	8
Note: all averages are out of a total of 10	

In summary, the pattern exhibited by the participants of the tests carried out showed preference for the customized gaming experience over the original gaming experience. Casual gamers showed the highest level of preference for the experience. The collective

rating of the customized gaming experience was 8.43/10 as compared to that of the original gaming experience, which was 7.5/10. The differences in rating for the customized gaming by casual, regular and hardcore gamers were close. They were 8.59, 8.19 and 8 respectively. The differences in the gaming experience with the original gaming experience were also close; they were 7.5, 7.125 and 7 respectively. In all, females rated the experience higher than males for both experiences. For the original gaming experience, the overall rating by females was 8.1, that for males was 7.36. For the customized gaming experience, the overall rating for females was 8.59, that for males was 8.14.

4.6.2. Second round of testing

To assert the validity of results of the first test conducted, I organized a second test for affective emphasis, this time showcasing the customized gaming experience first then the original gaming experience. This was to assert without a doubt that the results for the customized experience garnered from the previous test were not affected by the structure of the tests performed since the customized gaming experience followed the original gaming experience in the first test. Due to this order, there was the possibility that participants carried their experience from the first test to the second one which in turn affected how they rated and responded to the questions on the test.

The second test followed the same sequence of activities as the first but with the customized gaming experience being run first then the original gaming experience. In all, 15 people participated in the test and all participants did not have prior notice of the tests not had they participated in the first one.

In summary, the pattern exhibited by the participants of the second test carried out again showed preference for the customized gaming experience over the original gaming experience. Casual gamers again showed the highest level of preference for the customized gaming experience. The collective rating of the customized gaming experience was 8.13/10 as compared to that of the original gaming experience, which

was 6.83/10. The differences in rating for the customized gaming experience by casual, regular, hardcore and non-gamers were close. They were 8.29, 8.00, 8.00 and 8.00 respectively. The differences in the gaming experience with the original gaming experience were irregular; they were 7.57, 5, 7.5 and 3 respectively. In all, females rated the customized experience higher than males. For the original gaming experience, the overall rating by females was 6.57, that for males was 7.06. For the customized gaming experience, the overall rating for females was 8.57, that for males was 7.75. Over 90 percent of the participants in the discussion question that followed the test clearly stated the added benefits the aural condition created by the method of affective emphasis. They stated that it did make the game more enjoyable, interactive and lively. For this reason they preferred the customized gaming experience to the original one. Below is a summary of the results of the second test.

Comparing the results from both tests, I came to the conclusion that the order in which the gaming experiences were showcased contributed very little to the feedback provided by the participant and therefore the data from both tests did truly reflect the sentiments of the participants about the gaming experiences they had. The similarities on the data collected in both tests further asserted to this. The conclusion deducted from the analysis of the data collected is that **the method of affective emphasis when applied correctly managed to captivate players in the gaming experience being had, participants also did enjoy the gaming experience more when affective emphasis was used and therefore were more susceptible to getting 'in the zone', that being in the state of flow.**

Table 6. Summary of Affective Emphasis Method Test [Second Test]	
Number of Females	7
Number of Males	8
Total Number	15
Number of Casual Gamers	7
Number of Regular Gamers	4
Number of Hardcore Gamers	3
Number of Non Gamers	1
Original Experience Rating	6.83
Modified Experience Rating	8.13
Averages	
Original Experience Rating [Female]	6.57
Original Experience Rating [Male]	7.06
Modified Experience Rating [Female]	8.57
Modified Experience Rating [Male]	7.75
Original Experience Rating [Casual]	7.57
Original Experience Rating [Regular]	5
Original Experience Rating [Hardcore]	7.5
Original Experience Rating [Non Gamer]	3
Modified Experience Rating [Casual]	8.29
Modified Experience Rating [Regular]	8.00
Modified Experience Rating [Hardcore]	8.00
Modified Experience Rating [Non Gamer]	8.00
Note: all averages are out of a total of 10	

5. Conclusion

In summary, the aural condition of games is critical in delivering a gaming experience that captivates and guarantees the creation and sustenance of flow for all player types. It makes all the difference in delivering a satisfactory gaming experience and highly entertaining and fulfilling one. Game designers therefore need to incorporate the design of the aural condition of the games they develop into their processes of game design. This is to ensure that the aural condition of the games developed do indeed reflect the moods and states intended to be expressed in the gaming experience. To further ensure that all player types appreciate the gaming experience as it was designed to be, the aural condition of the gaming experience need to be designed to intelligently detect the nature of the player having the gaming experience and adjust itself accordingly to meet the needs and expectations of the player. To aid this process, this thesis describes four methods that not only facilitate meeting the diverse needs and expectations of player types through the aural condition of the game, but also captivate the player in the gaming experience and transports the player into his or her flow zone for optimum fulfillment and enjoyment in the gaming experience.

5.1. Future Work

I was not able to craft and run tests for the other methods I created, namely Dynamic Player Mirroring, Dynamic Enemy Mirroring and the Psych System. This will be done later. These methods will be discussed in detail here or elsewhere, with a focus on how they will be implemented in a game engine. They will then be tested and analyzed to measure their effectiveness. After this is done, the methods proven to be effective will be incorporated into the design of games. The final test of how effective the methods developed are at facilitating flow creation and sustenance for all player types will be when these games are released to the general public for play and review.

An archive of music and sounds identified to be suggestive of a particular state or mood will also be created. Through collaborations with sound engineers, composers and musicians and gamers; this archive will have an assorted range of sounds and music all of which are capable of evoking human emotion. The sole purpose of the archive is to serve as a repository for game designers for inspiration and possibly licensing the music and sounds made available to be used the games they design. This archive will also serve as a platform for collaborations between game designers and music composers and engineers. The archive will also provide contact-licensing details of the composers and music in the archive respectively.

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List of figures

Figure 1: Player Type Disparities and Similarities

Figure 2: The Correlation Between The Level Of Challenge in an Activity and the Participating Individual's Skill Level

Figure 3: Differences in Player Type Flow Zones

Figure 4: Using player choice in creating dynamic gameplay experiences

Figure 5: Player Type differences with respect to Competitiveness and Goal Orientation

[List of tables](#)

Table 1: A Game's Composition

Table 2: Gameplay Driven Games, Plot Driven Games

Table 3: Detail on the Participants of the Play-through Sessions

Table 4: Summary on Flow Creation and Sustenance Methods

Table 5. Summary of Affective Emphasis Method Test [First Test]

Table 6. Summary of Affective Emphasis Method Test [Second Test]

[Play-through Sessions Data](#)

Uncharted 2 Play-through Labs

Level: Train Wrecked, & Mountaineering.

Difficulty level: hard

Session One

- Loading screen made him nervous, made him anticipate.
- In game music for the level is apt, but death scene sound track is a bit random, doesn't flow nicely with the whole experience.
- Gameplay experience connotes adventure but the realism in the game – with respect to people dying could have been improved.
- The soundtrack for the level was ok but not perfect however. He preferred a more upbeat soundtrack to motivate him to play, possibly intimidate him a bit – keep him on edge.

- The gunplay effects are also not that great.
- The soundtrack of the level denotes a sneaky attack approach to the level 'Train Wrecked'. However the player's aggressive play style invalidated the choice of in-game music for the level.
- The death scene and music gets irritating over time, however the gameplay dynamics and continuity of the game even after dying keeps the experience interesting and not irritating.
- The player believed the level of difficulty was just right (hard).
- Given ample time, and no distractions, he was able to complete the stage.
- He appreciates the cut-scenes, it allows him to sit back and appreciate the story more. He thinks cut-scenes makes the storyline easier to grasp and relate to.

Level: Who Am I?

Difficulty level: hard

Session Two

- Less intense level of the game – he was just walking about in the game environment – is great, allows for appreciating the scenery as well as take a breather and adapt to the controls. However too much of this gets boring pretty quickly.
- Playing level 'Mountaineering'
- The aural feedback reflected the emptiness of the level and the chilly atmosphere of the level.
- The player could tell that the cut-scenes are not of the same quality as movies; he would not watch the cut-scenes if these cut scenes were a full movie. It is not life-like enough for him.
- The best experience for him with the cut-scenes would be to actually make the choices in the cut-scenes and speak for the characters.
- He would like more options/choice in determining how the game progresses.

- He would appreciate a game that is story centric, however the story has to be that good. The in-game music did not reflect fully the state of the player (eg. killstreaks, aggression, near-death). For example the later stage played out aurally in a sneak attack plan while he played in a pretty aggressive manner.
- He thinks being conditioned to play a game according to the storyline is not bad and might be even be better than reflecting the player's state in the game because it can get monotonous for the player if he/she plays it in a particular way all the time. However for story-driven experiences, it would be critical for the game not to repeat experiences in the game. That would defeat the purpose of immersing a player in the plot of the game.
- The aural feedback was calming, it also promoted investigating.
- Mismatched aural feedback, sound connoted danger but there was no immediate danger.

Uncharted 2 play-through labs

Level: A Rock and a Hard Place

Difficulty level: Normal

Session Three

- He does not prefer passive gameplay, feels like a waste of time, fast paced levels are his thing. However he realizes that they are important for introducing controls and such.
- The cut-scenes in the game are necessary for introducing and unraveling the story. There is no other way he could think of which could do the job better.
- Playing A Rock and a Hard Place – The soundtrack or lack thereof is assuring because you inherently know there are no bad guys coming for you, it is sort of relaxing to know that.
- Movie cut-scenes for games would not work so well because connecting the characters in the movie cut-scene and the game would take some work, it would be a bit too unclear.
- Soundtrack suggests urgency, the intensity of the soundtrack is nerve-racking, and chances of getting attacked are high.
- Player was pretty comfortable playing at normal difficulty.

- The continuous dialog with the gameplay provides a great way of noticing the relationships between the characters in the game as well as progressing the story while you play the game.
- The introductory levels in of the game are just that, they lack the aural complexity of latter levels. However this is because of how the story starts out. In the beginning stage you're a lone survivor in a sense still trying to make it through, in the next stage you're robbing a museum. These storyline scenarios do not allow for an intense aural condition thus the game does introduce itself pretty well.
- The mission that required stealth had to be redone a couple of times, the player did not adhere to the play style suggested for the level by the aural feedback.
- In game sound is quickening, the alarm and proximity of bad guy voices makes it worse. That fits pretty well with the level and the turn of events in the level.
- He thinks the slow, passive bits of the game are necessary. And they can be even more beneficial if properly placed. For example, spliced between intense action scenes, these passive scenes relax you for the next intense scene and also allow to you take in the visuals and surrounds in the game.

Fifa 11 Play-through lab

Friendly – Game: Manchester City vs Barca

Session Four

- The fun aspect of Fifa is the competitive nature of the game. Facing-off with someone and trying to beat the person. Another fun factor is the tactical nature of Fifa 11.
- Fifa 11 is somewhat a character driven game because all the players have unique attributes.
- The most fun to be had when playing Fifa 11 is when you are being challenged; the experience should be challenging to be ultimately fun. To beat someone who is on the same standing as you are would be more of an achievement than beating someone who is of a lower skill level. Playing lower skilled players end up as practice matches, a chance to try out new techniques.

- Participant 1 prefers to play people who are higher in skill level than himself but only for a couple of games. For the sake of improving. Participant 2 would not play a person of a higher skill level because his competitive nature will emerge and disrupt the experience. He also agrees frustration could set in when playing a person of a higher skill level. Participant 1 would also end up frustrated if he kept losing to a player of higher.
- Playing another person is more fun than playing the AI, the AI on Legendary difficulty is designed to outwit us at all times and that is unfair. Couch play adds more interactivity to the game, from the outside. Plus the experience becomes dynamic because humans are dynamic, that makes the whole experience more fun. In their perspective, couch competitive play is essential for Fifa 11, it is more interactive and makes the game even more fun.
- Fifa 11 is a bit too ideal. It does not mirror real world football as much as it could. They do get some things right: audio, player interactions etc. “there’s a lot of factors that you basically can not code”, example player emotion, and pitch atmosphere. The finer details are not done, for example offsides are a bit too accurate in Fifa 11. In the real world, referees make mistakes. Also freekicks are a bit too unrealistic: you can control the curvature of the ball. The referee decisions are also bit too accurate; it does not reflect the imperfection of real football.
- If Fifa was to be more realistic, as a simulation for real life football, majority of people would like it even more. “it is basically a fantasy, making the fantasy more realistic would in turn appeal more”.
- The music in the game is great. Fifa 11 allows everyone to play, up to about eight players. And that is a lot of fun; it is more challenging and creates a more football-y atmosphere.