VERIFYING AN INTEGRATED MODEL OF USABILTY IN GAMES

by

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ABSTRACT

This dissertation is about the Game Usability Model (GUM), which is a model of the interaction between a player and a game that helps to understand both game enjoyment and the function of game usability. The dissertation also explains the research conducted to verify GUM, and the results of that research. The GUM, seen in figure 3-1, says a game has characteristics that allow for different amounts of each of four Fun Keys: Hard Fun, Easy Fun, Serious Fun and People Fun. The player has corresponding needs for these four Fun Keys. This leads to a potential for enjoyment that is then modified by usability to lead to a total amount of actual enjoyment for each of the Fun Keys. Finally, the GUM says that Overall Enjoyment is comprised of a combination of all of these four Fun Keys.

I performed research in two phases to test the GUM. For the first phase of the research, I had thirteen experts rate eight exemplar games on Hard Fun, Easy Fun, Serious Fun, People Fun, and usability. This allowed me to verify the existence of the Fun Keys and usability by checking for consistent ratings. It also gave me ratings of the eight games for the Fun Keys and usability.

In the second phase of the study, 160 participants each played one of the eight games. This gave me known values for needs for the Fun Keys, for the players' actual experiences of the Fun Keys, and for the players' overall enjoyment of the games. From the previous phase, we also had the games' characteristics of the Fun Keys and the games' usability characteristics. So, using all of these characteristics, we were able to test the predictive power of the GUM.

The GUM was within the significant range in terms of predicting all four of the Fun Keys as well as overall enjoyment. It was also a better predictor than a direct effect from usability for all of the Fun Keys. So, the GUM is supported.

The GUM may act as a foundation for considerable future research.

1: INTRODUCTION

1.1 The Emerging Field of Game Usability

Games have held an extremely narrow target audience for a long time. The traditional target audience is considered to be young, antisocial males. However, games are now seeing much higher sales. U.S. computer and video game software sales amounted to $9.5 billion in 2007, which more than tripled industry software sales since 1996 (ESA, 2008). As a result, games are being targeted at increasingly wider demographics, including everyone from soccer moms to preschoolers to senior citizens (Kemp, 2007. Muskus, 2008. Bora, 2008). And these are not rare exceptions to the rule. The average game player is now 35 years old, and forty percent of gamers are female (ESA, 2008). Nintendo Wii consoles have even been installed in more than a dozen senior centers (Brown, 2007). As of 2008, 26 percent of Americans over the age of 50 play digital games, and this represents an ongoing rise in that demographic (ESA, 2008). Note that merely counting the people rather than the money they spend may exaggerate the impact of the widening demographics somewhat, as a casual gamer will tend to buy fewer and cheaper games. But among other results of the trend towards wider audiences is the need to make games accessible to people who are not accustomed to existing interface paradigms. Usability helps to fill this goal, because it evaluates if interfaces will work for target audiences. This helps to understand the emerging prominence of usability in games.

Usability has gradually been emerging in the game industry. The biggest pioneer has been Microsoft Game Studios (www.microsoft.com/games/). Not only does Microsoft Game Studios have an entire usability division (mgsuserresearch.com), but they even hold yearly workshops at the Game Developer Conference on performing usability evaluation on games (Nunes-Ueno et. al. 2006). In the meantime, some consultancies like Xeo (www.xeodesign.com/about.html) have started providing usability services for game companies. These examples are indicators of the appearance of usability in the field of game design.

Academic literature is also beginning to study game usability. There have been a number of articles on the topic, especially from Microsoft Game Studios. There have also been articles on heuristics for evaluation of usability of games (Federoff, 2002. Desurvire, et al. 2004. Korhonen & Koivisto, 2006. Schaffer, 2007) (see section II.4 for more information on these), which are particularly valuable because of game designers' incredibly tight budgets and deadlines. Not only have all of these journal articles been released, but I co-edited a book (Isbister & Schaffer 2008) which specifically addressed usability in games. So, usability in games is starting to emerge in academic literature.

1.2 Understanding Game Usability

For the sake of clarity in the rest of this document, I will set up a concept of game usability. A game has an intended player experience which has been designed by the game designers. Sometimes during play, the interface becomes something that must be consciously thought about, which interrupts the player experience. Good game usability is about eliminating obstructions in the game's interface that can get in the way of the player experience, so that the player can enjoy the player experience uninterrupted. Note that most game interfaces require some learning before they can get out of the way, so usability is often about making the game easier to learn. See section II.4 for a more detailed and in-depth explication of game usability.

1.3 The Need to Understand how Usability Contributes to Game Design

Currently, there is a context of usability as an increasingly important element of game design, which leads up to the role of my dissertation. What is *not* generally understood is the way that usability interacts with a game and a player to produce enjoyment. Understanding that dynamic is the goal of this dissertation.

I suggest that the goal of the interaction is to produce enjoyment for the player. There are alternate options, such as purchase intention or likelihood of recommendation. Ultimately, I suggest that those things are a direct result of enjoyment. However, enjoyment itself deserves some explication. What are the components of enjoyment?

Does it have different types? What are they? I will be looking to answer these questions and others with this dissertation.

The other big element of the GUM is the function of usability in relation to enjoyment. Does usability directly produce enjoyment, or does it interact with the player and the game's design in some other way? And just what is enjoyment in the context of game design? I also intend to answer this question about the role of usability with this dissertation.

Though these individual pieces are important, I am really looking to understand a set of relationships with a global model. So overall, I will be proposing a set of relationships with the GUM, and looking to see if this model is supported.

2: BACKGROUND

2.1 Previous Models of Enjoyment

There are three main areas of literature that relate to enjoyment: job satisfaction, needs and gratifications, and Human-Computer Interaction (HCI). In thinking about an experience someone has with an activity, job satisfaction is useful because it looks at someone's experience with actively interacting and doing tasks. Needs and gratifications literature is important for my purposes, because games are considered a media, though they are an interactive one. So, needs and gratifications literature helps us understand how people seek enjoyment in games as a media. Lastly, HCI literature has some things to say about game enjoyment, specifically with regards to games as a computer interface.

2.1.1 Job Satisfaction Literature

Job satisfaction literature offers a set of theories that focus on enjoyment and satisfaction. Though the initial purpose of these theories is centrally about productivity under the assumption that a happy worker is a productive worker, we can still look to these theories for insight into how games can satisfy players. I will discuss Affect Theory, Dispositional Theory, Two-Factor theory, and the Job Characteristics Model.

Affect Theory, the most famous job satisfaction theory, says that satisfaction is about meeting the desires of the worker (Locke, 1976). The idea is that if a worker has a particular need, then that worker will be satisfied with their job depending on how much of that need is satisfied. Therefore, a job that offers little praise will not satisfy the worker who needs lots of praise, but the worker who is indifferent to praise will be unaffected.

The next job satisfaction theory I will discuss is Dispositional Theory. Dispositional Theory is relatively abstract, and says that people's natural tendencies and traits have a greater impact on job satisfaction that the job itself (Judge & Locke, 1993). So, if a worker is dissatisfied, that may be because of the way the worker functions and thinks rather than because of a problem with the job.

One particular model of note within Dispositional Theory is the Core Self-

Evaluations Model. This model breaks down the elements of a worker's disposition into four pieces: self-esteem, general self-efficacy, locus of control, and neuroticism. The higher the worker is on all the traits (except neuroticism), the more satisfied the worker will be. And the lower the worker is on neuroticism, the more satisfied the worker will be (Judge, 1998).

Next I'll address Frederick Herzberg's Two Factor Model (Hackman & Oldham, 1976), which is sometimes called the Motivator-Hygiene Model. Herzberg says that job satisfaction has two different types of factors: motivators and hygiene factors. Motivator factors are things that encourage people's performance and satisfaction directly, such as recognition and promotion opportunities. In contrast, hygiene factors do not cause any special encouragement or satisfaction, but instead cause dissatisfaction when they are not met. Examples include things like pay, consistent company policies, and proper working conditions. This model has had some criticisms, but it relates to the theory in this dissertation strongly. I will discuss in more in chapter 2.5, but the central point I will make is that usability is a hygiene factor rather than a motivator.

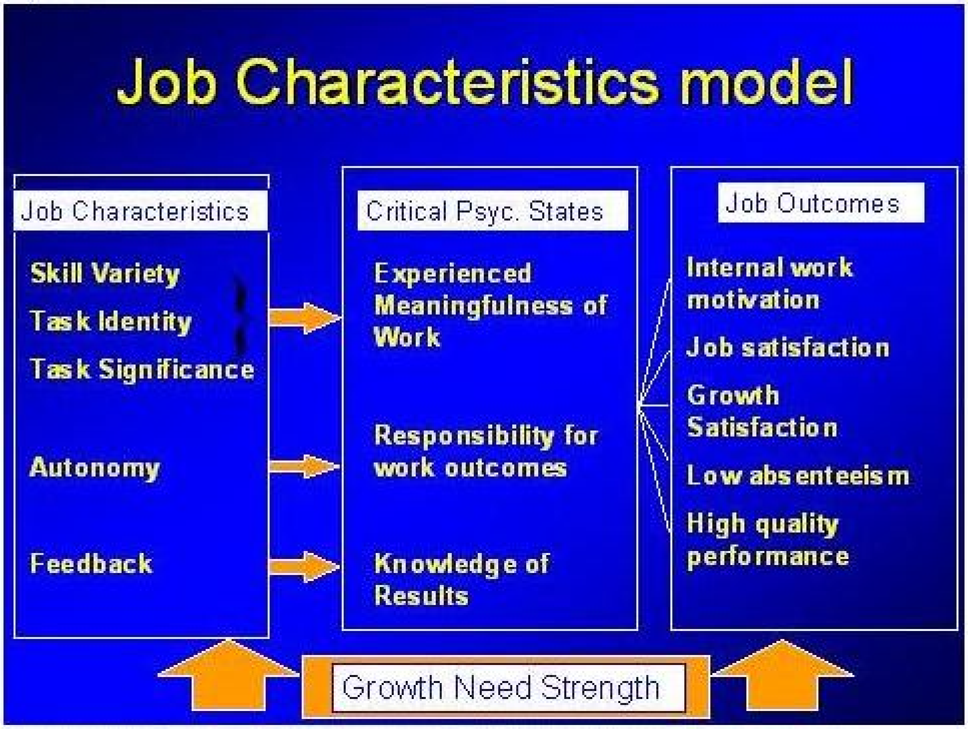

Figure 2-1: The Job Characteristics model

Note: From Drez, J. (1999). Chapter seven motivation through needs, job design, and satisfaction, slide 20. Retrieved from http://www.siu.edu/departments/cola/psych/psyc323/chat07/index.htm

The last job satisfactions model I will discuss here is Hackman and Oldham's Job Characteristics Model (1976). See figure 2-1 for illustration. This model seems to be more complete, as it includes the job characteristics (skill variety, task identity, task significance, autonomy, and feedback), the psychological states of the worker (experienced meaningfulness, experienced responsibility for outcomes, and knowledge of the actual results), and even the outcomes that companies can expect from their workers (job satisfaction, absenteeism, work motivation, etc.). The dynamic is that the characteristics of the job affect the worker's psychological state, which in turn affects the work outcomes.

All these models, mostly emerging in the 1970s, established a precedent for looking at satisfaction. Though these models were looking at jobs rather than games, and not looking specifically at usability, they gave some insight into the subject of enjoyment.

2.1.2 Uses and Gratifications

Uses and gratifications is a body of approaches which mostly address the interaction between media and audiences. The underlying theme is that people use media to satisfy certain needs, as opposed to the idea that media simply has a direct effect on people. One of the main themes of uses and gratifications is the idea that a media audience holds considerable power, rather than the media itself having absolute power. The part of this theory that is useful to us is how it focuses on the outcomes people are looking for, which often include enjoyment.

For instance, Jay Blumler and his colleagues (1974) focused on five types of gratifications audiences seek in media: Escape, Social Interaction, Identify, Inform/Educate, and Entertain. The Escape element is about getting away from a person's own daily life. The Social Interaction element is mostly about parasocial relationships people develop with characters in media, but also about how media creates a common ground for conversation. The Identify element is about how media has an impact on how people see themselves, such as when people borrow elements of characters they see, such as phrases or clothing styles. The Inform/Educate element is about how people gain information about the world around them from sources such as news broadcasts. And lastly, the Entertain element is about consuming media purely for the enjoyment it provides.

Like with Job Satisfaction, Uses and Gratifications literature is not really looking at games - it is mostly about passive media rather than interactive media - and it is not looking at usability. But just like with Job Satisfaction literature, Uses and Gratifications literature establishes important things about enjoyment. In this case, we gain insight into the way people seek out the type of experience that satisfies their needs. As we will see later on, this supports the idea that people will seek out games that have the type of fun they are looking for.

2.1.3 Donald Norman's *Emotional Design* Theory

In Donald Norman's *Emotional Design* (2004), he focused on how there is more to design than just efficiency and intuitiveness. He divided appealing design into Behavioral Design, Visceral Design, and Reflective Design. Behavioral Design is about the traditional usability aspects of a design, such as how intuitive and efficient a design is. Visceral design is about the gut-level emotional impact of a design, such as smooth curves or bright colors. Lastly, Reflective Design is about how a product relates to a person's sense of identity and memory. These three levels of design were supposed to map onto the three levels of the human brain: the reptilian, the mammalian, and the human.

This explication of enjoyment is powerful because it *does* take usability into account, at least somewhat. It certainly shows the potential to blur the lines between enjoyment and usability, because these types of enjoyment are all supposed to be tied in with usability. But while this theory does use both usability and enjoyment, it is not really dealing with games. It is a useful explication, but I find the explication in the next section even more complete.

2.1.4 Flow

Csikszentmihalyi's theory of Flow is a theory of enjoyment that focuses on the feeling of immersion that people experience while they perform a variety of activities (Csikszentmihalyi, 1990). The theory of Flow breaks down that feeling of immersion into both a set of prerequisites and a set of effects. The prerequisites include clear goals, space for concentration, direct and immediate feedback, a match between ability and challenge, and a sense of control. The effects include merging of action and awareness, a loss of self-consciousness, a distorted sense of time, intense concentration, and a sense that the activity is intrinsically rewarding. This theory began before video games were available, studying dancers, rock climbers, and surgeons. However, this well-respected theory is often cited in game literature due to the insight it offers on the subject of challenge.

2.1.5 Theories in Game Literature

Next is Bartle's Four Player Types Theory, which is specifically about games. Bartle proposed that players generally fit into one of four types. The Achiever is looking to get to the highest level or achieve the highest score. The Killer is looking to defeat other players. The Explorer wants to travel around and see all the different parts of a game world. And lastly, the Socializer wants to interact with other people, often just chatting. These four player types are an early explication of game fun, and they contribute powerfully to the Four Fun Keys Theory (Lazzaro, 2004, 2008) that I will use as the basis of the GUM. (Bartle, 1996. Bartle, 2003a. Bartle, 2003b.)

Another angle on game explication comes from Lisbeth Klastrup (2002), who analyzed the forms of interaction and agents in the game EverQuest. This theory breaks down the agents into players, NPCs, objects, and world rules. The agents have four types of interaction: navigating, manipulating, social interaction, and information retrieval. Klastrup also references Bartle's previously mentioned four player types. This theory is an explication of game entities and their relationships, not an explication of enjoyment.

Lastly, there is a prestudy paper out from the Hypermedia Laboratory at the University of Tampere (Jarvinen et al, 2002) that looks at both playability and game enjoyment. In this way, their paper speaks to the same issues as this dissertation. Their paper breaks down Playability into Functional Playability, Structural Playability, Audiovisual Playability, and Social Playability. Functional Playability is about the game input devices, such as controllers or DDR dance pads. Structural Playability is about the rules and interaction patterns. Audiovisual Playability is about the style and appearance of a game. And Social Playability is about the ability to develop a community of users. On one hand, this is certainly not an explication of types of usability problems. But in a way, it does serve as another explication of game enjoyment, as all the pieces of the model are areas where players can get enjoyment. So perhaps this can be seen as an alternative explication of enjoyment to the Four Fun Keys (Lazzaro, 2004 2008) used in this dissertation. However, where Lazzaro's Four Fun Keys shows four different types of enjoyment, Jarvinen's four playability components are more like the mechanical pieces that produce enjoyment.

2.2 The Four Fun Keys Model of Enjoyment

2.2.1 The Four Fun Keys Model, Explained

The Four Fun Keys Model of Enjoyment (Lazzaro, 2004, 2008) is an extremely comprehensive and elegant model of game enjoyment. For this reason, the Four Fun Keys model will be the basis of the GUM I am presenting in this dissertation. The Four Fun Keys Model breaks down game enjoyment into four very distinct Fun Keys, or types of fun: Hard Fun, Easy Fun, People Fun, and Serious Fun. I will explain each of these in turn. See figure 2-2 for a visual representation of this theory.

Figure 2-2: A visual representation of the Four Fun Keys

Hard Fun is basically the traditional challenge-based fun where the point is to meet incremental goals. Some examples of Hard Fun include trying for a high score at a puzzle game, trying to defeat difficult levels in a platform game, or trying to gain levels in a role playing game. The outcome of Hard Fun is generally a sense of achievement and accomplishment. (Lazzaro, 2004, 2008)

Easy Fun is generally less-goal-oriented play and exploration. Examples of Easy Fun include exploring a role playing game's game world and scenery, finding interesting ways to die in a first person shooter game, or checking out unlocked items in a racing game. Typically, the outcome of Easy Fun is a sense of awe and wonder. (Lazzaro, 2004, 2008)

Serious Fun is about having an impact on something outside the game, sometimes by learning, or sometimes by reducing stress. Some examples of Serious Fun are getting a workout from an exercise game, learning about political issues from a game that has such messages, or blowing off stress after work by shooting some aliens. The outcome of Serious Fun is somewhat more varied, but it can include improved fitness, decreased stress, or various kinds of learning. (Lazzaro, 2004, 2008)

Lastly, there is People Fun, which is about interactions with other people. Here, I differ with Lazzaro's claim because she suggests that People Fun includes interactions with non-player characters. I believe that People Fun only happens when people interact with other players. Examples of People Fun, as I see it, include competing against your friends in a racing game, working with your friends in a massively multiplayer online game to get a certain item, or even watching a friend play and cheering them on. The outcome of People Fun is some form of social bonding or interaction like schadenfreude, gratitude, or admiration. (Lazzaro, 2004, 2008)

I want to note a presumption that I will be making, which is that the Fun Keys exist not only as an outcome, but also in the player as a need, and in the game as a potential. This means that the player has a different quantifiable need for each of the Fun Keys, depending on the player and depending on the particular conditions when play occurs. So, Joe may love to be frustrated by Hard Fun but not care about messing around with Easy Fun. Jane may like the People Fun of playing with her friends but be bored by the learning involved in Serious Fun. Also, a game will afford different amounts of each of the Fun Keys. Just as with a player's needs, each of the Fun Keys will be available in varying quantities in the given game. For example, Tetris has a lot of Hard Fun but no People Fun. Yet a chat room with avatars like There.com has lots of People Fun and no Hard Fun. All this means that the production of each of the Fun Keys involves an interaction between a player with needs, a game which may or may not meet those needs, and an outcome of that Fun Key.

2.2.2 The Four Fun Keys Model Compared to Past Models

Many of the previously established theories that relate to enjoyment elegantly fit into the Four Fun Keys theory. I will briefly compare the Four Fun Keys model to the theories which I discussed in 2.1. Many of these enjoyment theories are also addressed by Lazzaro (2008), including a few other enjoyment theories related to theater and other areas.

The Job Satisfaction literature fits in here in a few different ways. Affect Theory (Locke, 1976) meshes with the idea that there are needs a player will have and there will not be satisfaction if they are not met. The Four Fun Keys gives a specific break down of those needs. Dispositional Theory (Judge & Lock, 1993, 1998) suggests that a player will experience the Fun Keys in amounts independent of the characteristics of the games, rather than needing the game to have particular characteristics. Lastly, the Job Characteristics Model (Hackman & Oldham, 1976) has a set of critical psychological states that are all basically different types of Hard Fun.

The Uses and Gratifications model (Blumler & Katz, 1974) is a great example of how the Four Fun Keys maps to other theories well. Escape, Identify, and Inform/Educate are all forms of Serious Fun. Social Interaction is People Fun. And the Entertain element is a combination of Easy Fun and Hard Fun.

Csikszentmihalyi's theory of Flow (1990) is almost exclusively about Hard Fun. But he also talks about microflow activities, which often include Easy Fun.

Bartle's four player types (Bartle, 1996, 2003a, 2003b), Killer, Achiever, Socializer and Explorer fit into the Four Fun Keys. The Achiever is looking for Hard Fun, the Explorer is looking for Easy Fun, the Socializer is looking for People Fun, and the Killer is looking for both Hard Fun and People Fun. Note that Serious Fun is not taken into consideration by Bartle's model.

Another example where the Four Fun Keys elegantly includes other models is Donald Norman's *Emotional Design* model (2004). Behavioral Design is about Hard Fun, Visceral Design is about Easy Fun, and Reflective Design is about Serious Fun and also People Fun. Note that Norman's model does not account for Easy Fun.

2.3 Previous Models of Usability

What is the role of usability when a player interacts with a game? Most models of usability do not look at this kind of dynamic, even when the context is gaining efficiency in a business context. There are models that address how the properties of the system, team, and organization influence different usage activities (Winter et. al. 2007). There are methodological models that are about how and when to do usability (Granollers et. al. 2003. Schaffer, 2004.). There are models that try to include all the types of usability problems (Abran et. al. 2003. Van Welie et. al. 1999. Sauro & Kindlund, 2005). There are even models that focus purely on the role of games in a player's personal and social identity (Joyner & TerKeurst, 2005). But none of the models I have found about usability really looked at how usability interacts with the content and the user to produce an outcome. The closest thing is Frederick Herzberg's Two Factor Model (Hackman & Oldham, 1976) or Kano's customer satisfaction model (Kano et. al. 1984), which were both about job satisfaction and do not address usability.

2.4 Game Usability Explication

Usability has a lineage. It began in World War II with fighter jets, but really flourished and solidified in the 80s and 90s around business computing interfaces and websites. This field of study results in a narrow category of interfaces that typically involve a user sitting at a personal computer, focusing on a goal of efficient productivity. In games, the desired outcome is enjoyment rather than efficiency. And not only is the outcome different, but there are unique aspects of games that pose challenges. Games are extremely time pressured, require rapid real-time feedback, and have an entire emotional and often social component that must be considered.

This traditional focus on efficiency as the goal of usability leaves some people uncertain about how usability can help games. Ultimately, the most efficient game is one where you press one button and automatically win. However, since the goal of games is enjoyment, challenge is a central component. One argument against usability in games is that games are <u>supposed</u> to be hard. But the counter argument that has been posed (Chen, 2004) is that there is a type of challenge that is fun and intended by the game designer, and then there is a type of challenge that is frustrating and unintended by the game designer. So, challenge is a central sticking point in the issue of game usability.

In order to better understand the model of usability that relates to business applications, let us look at a previous model of usability. In *Usability Engineering* (1993), Nielsen defined usability as Learnability, Efficiency, Memorability, Error Handling, and Satisfaction. This definition is powerfully concise, but it is not well suited to games. The previous paragraph discussed challenge and efficiency, but again I will say that efficiency is unimportant in games. Error handling is generally the realm of quality assurance testing in games. This leaves Learnability, Memorability, and Satisfaction. Satisfaction is really just the central goal, which sets up a the-chicken-and-the-egg scenario. Does usability produce satisfaction, or does satisfaction produce usability? Learnability and Memorability are important pieces of usability in games, but they seem inadequate as the only components of usability. So this model needs substantial modification for games, but it gives us a starting point.

Another way to break down usability is to look at heuristics. Heuristics are really designed as guidelines for game evaluation. Since Donald Norman's usability heuristics

(1993), heuristics have been created by gathering together common usability issues and finding broad types of issues that arise. A list of game heuristics could function as an explication of games, but all the heuristics for game usability that were available at the time of this dissertation's study were too lengthy to act as concise explications. Melissa Federoff's game heuristics (2002), the first game heuristics publicly available, was a 40 item list. The HEP (Desurvire, et. al. 2004), which built on Federoff's heuristics, was 43 items long. And both the heuristics developed for games for phones at Nokia (Korhonen & Koivisto, 2006) and the heuristics in the white paper I released (Schaffer, 2007) included 29 items.

Since running the study described in this dissertation, a new set of 12 usability heuristics was published (Pinelle et al, 2008). I want to be sure to point these out, if only because of their inherent strength. These heuristics were compiled by evaluating noted problems in 108 game reviews, and the results are very comprehensive and useful. Unfortunately, these heuristics were released too late to be used in this study.

For this study, I put together my own explication of usability. I start with the definition and goal. I propose that, any game usability issue comes down to invisibility. This is a reference to Heidegger's (1962 trans.) Ready-To-Hand concept. The idea is that when you are using something you do not think about that thing. Instead, it becomes an extension of yourself and essentially disappears. So I would suggest that a game has an experience of some kind, a player, and an interface. The role of usability is to make the interface become an extension of the player and disappear, so that the player is directly in the game's experience. Usability also has the role of minimizing the time and difficulty of the learning curve as well, to the extent that a learning-curve is necessary. The one-sentence definition of usability this yields is: "Game Usability makes a game's interface as transparent as possible, as quickly as possible."

For an example, take Tetris on a Gameboy. The player is using the directional pad and the buttons to move the blocks around and make lines. Moving the blocks around and making lines is the game's experience. So the role of usability is to make the controls disappear, so that the player feels like they are directly moving the blocks around. Usability should also make all the displays about score and what blocks are next and such disappear from the player's awareness. Even the start menu and options menus in Tetris should not interfere with the player’s experience. And with all three of these things – the controls, the heads-up display (HUD), and the start/options menu – any learning that is necessary should be both fast and easy. So all these are roles for usability in Tetris, and they are all about making the interface disappear.

Now, for two other areas, consider Mario Bros. Like in Tetris, the HUD, controls, and start/options menus must become invisible. But now consider level design. Meeting the goals in a level can be difficult, but if the difficulty is in understanding what those goals are in the first place then you have a usability problem. Once again, this is a matter of the explicit level design disappearing and putting the player directly in the experience of the game. And there is a second element we can look at in regard to Mario Bros. If a player sees a goomba and tries to run into it like a magic mushroom, their character will generally die. So if players cannot identify an enemy, a power-up, or even their avatar, then again there is a usability problem. And like with the other areas, this usability problem is about the interface intruding in the player’s ability to experience the game directly.

So we have a description of usability in games that says that game usability is about keeping the interface of the game from intruding in the player’s ability to experience the game. And we can see that these usability problems can be in the HUD interface, the controls, the start/options menus, the level design, and the visual appearance of game elements like avatars, enemies, and power-ups. But what are the types of problems that can cause this interference between the player and the game experience?

Let us start with Nielsen’s Memorability and Learnability, as taken from his usability definition. Players will need to learn the interface in most games before it can become invisible, so we want to make that learning happen as quickly as possible. We also want that learning to not have to be repeated, so Memorability makes sense. One of Nielsen’s (1993) heuristics was feedback, and in games this is especially critical both for fast learning and also because without feedback the interaction between the player and the game will not seem present. I want to add Intuitiveness, because almost all games must be playable without any training or instructions. Even in games where training is expected, training can be lessened and focused on difficult areas the more that the game is intuitive. And lastly, Consistency is necessary because unexpected events will break the invisibility which we seek. Consider what happens if pressing left on the D-pad suddenly makes your character go down instead of left, as it did for the entire past hour of game play. This is an experience where the interface has definitely just intruded on the game experience. Note that some potential elements like challenge and freedom are not being included, because they are not really the area of usability. While it is possible for a usability test to tack on checks for these things, they are really in the area of the game experience itself.

So this leaves Learnability, Feedback, Consistancy, and Intuitiveness. And these four elements must be evaluated in the areas of the HUD interface, controls, start/options menus, level design, and the visual appearance of game elements. See Figure 2-3 for a visual representation.

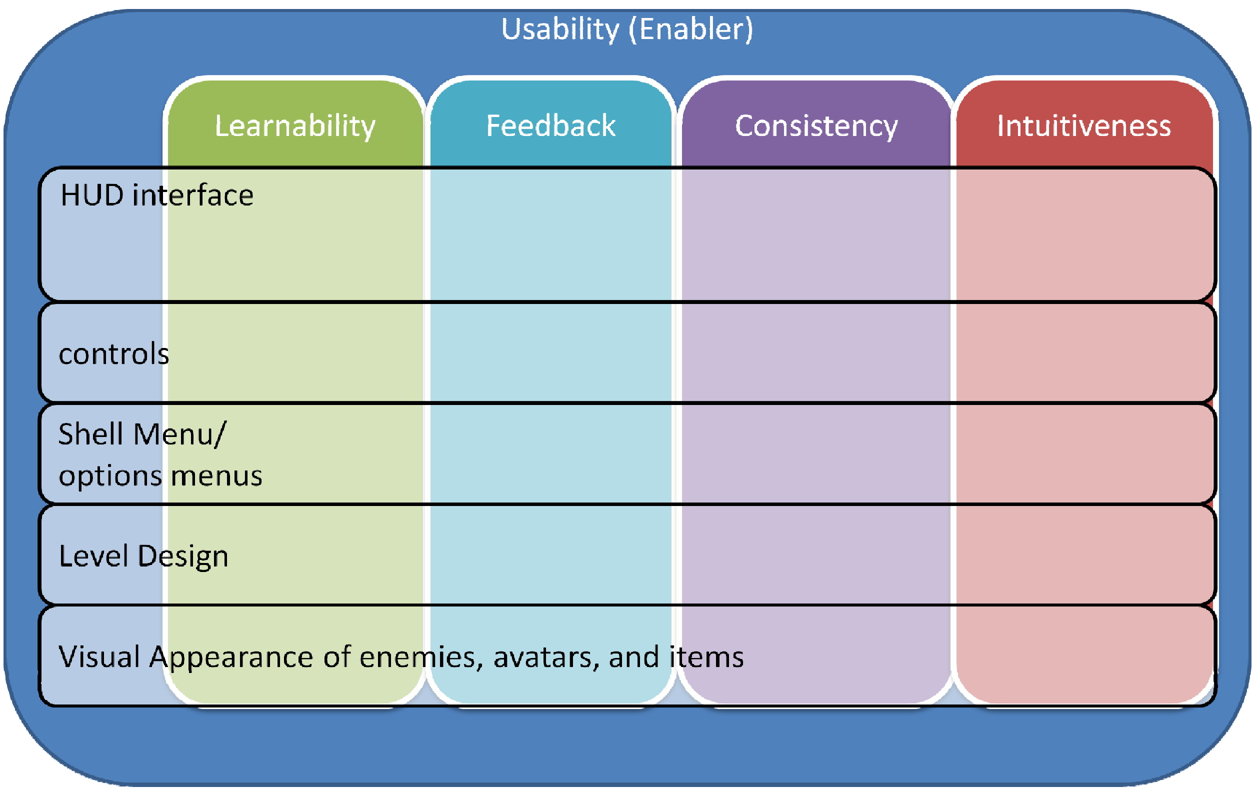

Figure 2-3: Explication of Usability

2.5 Usability as a Modifier

Often usability is seen as something that has a direct influence. Usability is seen to cause a direct increase in efficiency with business applications, or in enjoyment with usability applications. However, there are times when no amount of usability improvement will make a business application do its job, or make a game enjoyable. Usability is not the core experience. I would argue that, instead, usability is a modifier that can hurt the experience when it is bad. Think of it like a valve that we have to ensure is open so the game experience gets through. See Figure 4 for a visual representation

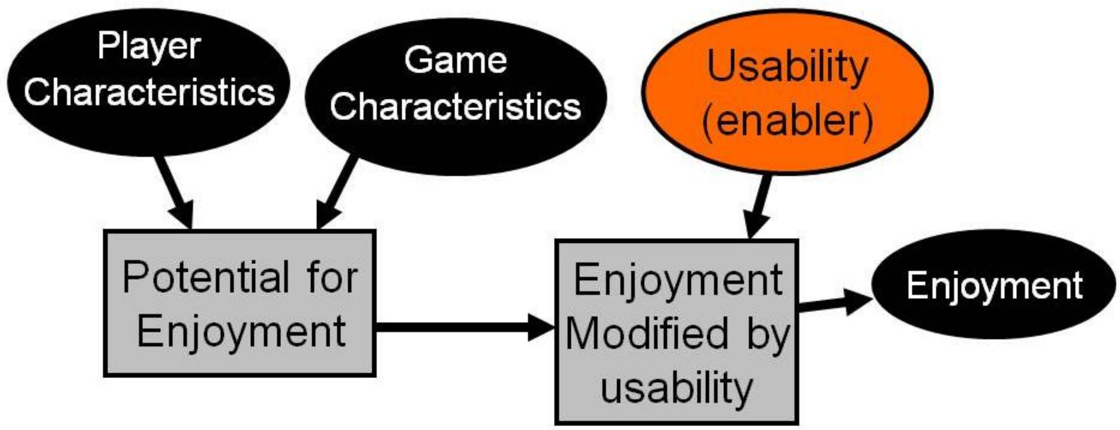

Figure 2-4: A visual representation of usability acting as a modifier.

I first heard this idea that usability was mostly about keeping things from getting in the way at the usability seminar from Microsoft Games Studios at the Game Developer Conference in 2006 (Nunes-Ueno et. al. 2006). They used demonstrated that bad usability would keep people from enjoying the game experience that game designers had created.

Another relevant model is the customer satisfaction model created by Kano in 1984 (Kano et. al. 1984). In this model, there are Basic factors which are must haves, Excitement factors that are attractive satisfiers, and there are performance factors that are about being satisfied with being as efficient as possible. Though usability is sometimes a performance factor with business applications (Jokela, 2004), in games usability is almost strictly a basic factor. This is an echo of my previous statement. Usability is a problem when it is bad but once usability is good then it is basically invisible and not the actual source of enjoyment. (Jokela, 2004)

Recall Frederick Herzberg’s Two Factor Model (Hackman & Oldham, 1976). The

Two Factor Model is useful in the same way that Kano's (1984) is. Both models are looking at satisfaction, which is perhaps a near enough cousin of enjoyment. And both models have the concept of something that causes a problem when it is not up to par, but does not provide any satisfaction in itself – this is called a basic factor by Kano and a hygiene factor by Herzberg. But like Kano's model, the Two Factor model is not fundamentally about usability. So we can only suppose that usability could be retroactively shoehorned into these theories as another hygiene factor or basic factor.

Interestingly, Nicole Lazzaro (Lazzaro, 2008) pointed to this same idea of usability as a modifier in her chapter in our Game Usability book. She uses different terminology. What I call game design she calls player experience or PX, and what I call usability she calls user experience or UX. But she has basically the same system, using a bicycle as an analogy. The front wheel, which steers, is the game design or PX. The back wheel, which gives the vehicle momentum, is the usability or PX. The effect is the same, in that you have to have both to go anywhere interesting.

3: RESEARCH PROBLEM & QUESTIONS

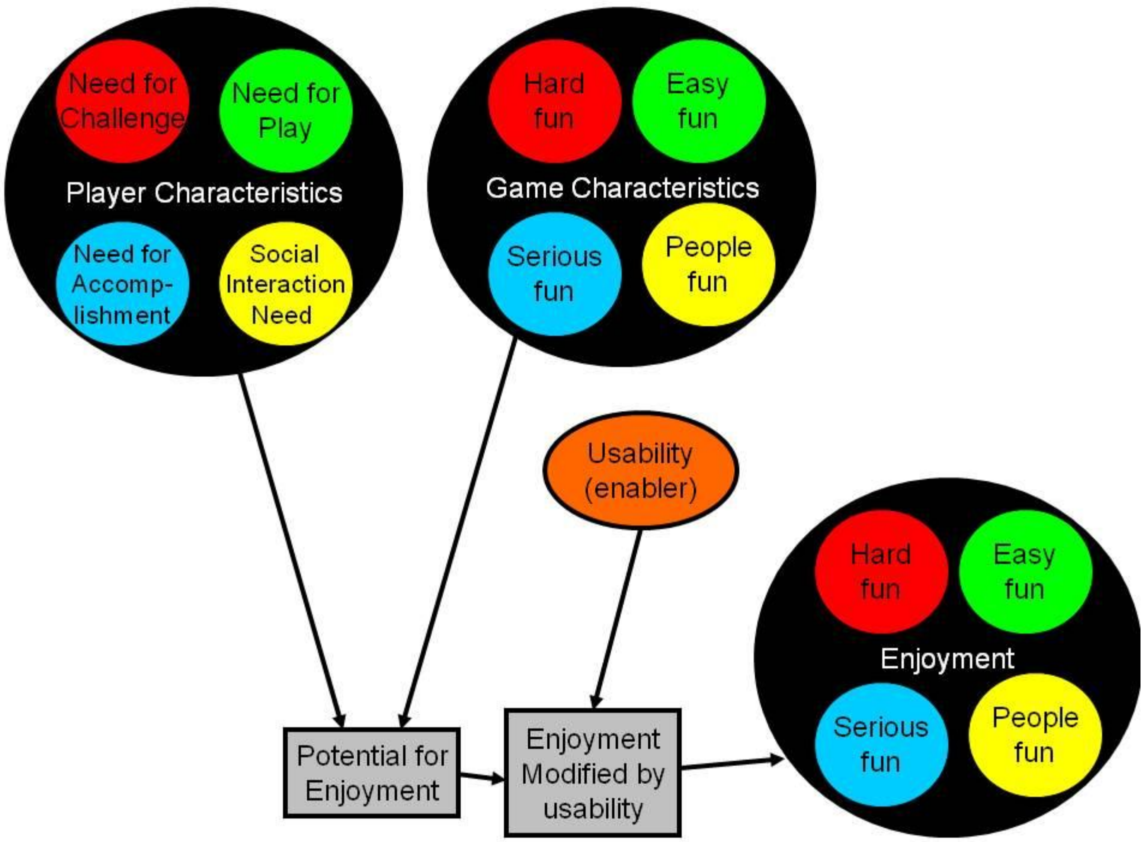

Figure 3-1: Visual representation of the Game Usability Model (GUM)

This dissertation research is looking to verify the Game Usability Model (GUM), which is an integrated model of usability in games. Please see a visual representation of the model in Figure 3-1. The idea in the GUM is that enjoyment is divided into four elements: Hard Fun, Easy Fun, Serious Fun, and People Fun (Lazzaro, 2004, 2008). Needs and Gratifications literature (Blumler et al. 1974) suggest that players will have different needs and some games will be better or worse at meeting those needs. So the GUM has player characteristics that include differing needs for each of the four types of fun, as well as game characteristics that include differing potentials for each of the four types of fun.

In the GUM, the player needs interact with the game characteristics and produce a potential for each of the four Fun Keys. This potential, however, is modified by usability. The outcome of that modification is some quantity of actual predicted enjoyment, which again corresponds with the four Fun Keys. So this dissertation research will seek to show support for the GUM.

3.1 Definitions

I will begin by defining the measurable constructs, and then I will talk about the constructs that result from the combination of those constructs. The player needs have been operationalized with 7 point Likert scales for each of Fun Keys, as measured in questionnaires immediately before game play in the second phase of the study. The game characteristics were operationalized with ratings on 7 point Likert scales and rated by experts in the first phase of the study. Usability, was also rated on a 7 point scale in the first phase of the study. All scores were then centered to handle colinearity.

The “Potential for Enjoyment” construct is a combination of Player Needs and Game Characteristics. This potential was predicted by multiplying the game characteristic score for each of the Fun Keys by its corresponding player need score. The “Enjoyment as Modified by Usability” score results from the Potential for Enjoyment score multiplied by the Usability score. This Enjoyment as Modified by Usability score represents the total predicted enjoyment of each of the four Fun Keys. An “Overall Enjoyment” score is comprised of a combination of each of the four Enjoyment as Modified by Usability scores.

Specifically then, Hard Fun in the game is multiplied by player need for Hard Fun to produce Potential for Hard Fun Enjoyment. Potential for Hard Fun Enjoyment is multiplied by game usability to produce Hard Fun Enjoyment as Modified by Usability, which is the predicted amount of Hard Fun which I expect players to experience. Likewise, Easy Fun Enjoyment as Modified by Usability is Easy Fun in the game multiplied by player need for Easy Fun, multiplied by the game’s usability. Serious Fun Enjoyment as Modified by Usability is Serious Fun in the game multiplied by player need for Serious Fun, multiplied by the game's usability. And People Fun Enjoyment as Modified by Usability is People Fun in the game multiplied by player need for People Fun, multiplied by the game's usability. Finally, an Overall Enjoyment score is the sum of these four Enjoyment as Modified by Usability scores.

3.2 Questions I am Answering

Q1: Are the constructs in the GUM valid?

Q2: Does the GUM accurately predict the enjoyment players experience?

3.3 Hypotheses I am Testing

H1.1: The GUM predicts the amount of Hard Fun which players experience. A regression will be performed comparing Hard Fun Enjoyment as Modified by Usability to players' actual experienced Hard Fun. I hypothesize $P < .05$.

H1.2: Usability directly influences Hard Fun experienced. A regression will be performed comparing Usability to players' actual experienced Hard Fun. This hypothesis will be supported if $P < .05$.

H2.1: The GUM predicts the amount of Easy Fun which players experience. A regression will be performed comparing Easy Fun Enjoyment as Modified by Usability to players' actual experienced Easy Fun. I hypothesize $P < .05$.

H2.2: Usability directly influences Easy Fun experienced. A regression will be performed comparing Usability to players' actual experienced Easy Fun. This hypothesis will be supported if $P < .05$.

H3.1: The GUM predicts the amount of Serious Fun which players experience. A regression will be performed comparing Serious Fun Enjoyment as Modified by Usability to players' actual experienced

Serious Fun. I hypothesize P < .05.

H3.2: Usability directly influences Serious Fun experienced. A regression will be performed comparing Usability to players' actual experienced Serious Fun. This hypothesis will be supported if P < .05.

H4.1: The GUM predicts the amount of People Fun which players experience. A regression will be performed comparing People Fun Enjoyment as Modified by Usability to players' actual experienced People Fun. I hypothesize P < .05.

H4.2: Usability directly influences People Fun experienced. A regression will be performed comparing Usability to players' actual experienced People Fun. This hypothesis will be supported if P < .05.

H5.1: The GUM predicts the amount of Overall Enjoyment which players experience. A regression will be performed comparing predicted Overall Enjoyment with players' actual experienced Overall Enjoyment. I hypothesize P < .05.

H5.2: Usability directly influences Overall Enjoyment. A regression will be performed comparing the usability scores with the Overall Enjoyment experienced by each player. This hypothesis will be supported if P < .05.

4: EXPERIMENTAL DESIGN

There were two phases in the research. The first phase verified the constructs of Hard Fun, Easy Fun, Serious Fun, People Fun, and Usability. That first phase also identified the levels of those constructs in a set of exemplar games. The second phase had participants play the exemplar games to verify the relationship between the constructs. This second phase intended to verify the GUM itself.

4.1 Phase 1 – Verifying Constructs and Rating Exemplars

4.1.1 Participants

Thirteen game experts were trained in the four Fun Keys and usability, enough that they could identify and rate the constructs. I call them experts because they attended the training sessions and by the end they clearly demonstrated an understanding of the Fun Keys and of usability. Also, the experts were recruited from game classes at RPI, which suggests that they began with some expertise in games. These experts were not, strictly speaking, participants.

4.1.2 Measurement instruments

Training was performed classroom style, and lasted approximately 4 hours distributed between two sessions. Training included a thorough description of each of the four fun keys and game usability, a set of examples, and also some practice rating.

A set of questions was used to guide analysis of the games. The four fun keys and usability each had 3 questions for guidance plus an overall rating.

4.1.3 Apparatus

Eight exemplar games were selected for testing purposes. I selected these games with the help of several experts in the respective types of games. There were two games selected for each of the Fun Keys, one of which had good usability and one of which had bad usability. For example, one game was primarily Hard Fun and had bad usability, and another game also had primarily Hard Fun but good usability.

4.1.4 Procedure

I recruited experts from game classes at RPI. Because the participants were recruited from game classes, they had at least some minimal expertise in games. I held two classroom sessions to train the experts in the Four Fun Keys as well as Usability.

The experts independently played and rated each of the 8 exemplar games. All play and ratings were performed independent of other experts. Each game required approximately 45 minutes to play and 15 minutes to rate. The experts reviewed two games per session, so they came in for a total of four rating sessions. This means that each expert spent approximately 12 total hours between training and evaluation, not including preparation and travel time. I gave each expert a $150 gift certificate to compensate them for their time.

At the end of the ratings, I performed tests for Chronback's alpha on the ratings of the participants for each game. This checked variance for ratings in order to check for reliability in the constructs of each of the Four Fun Keys and Usability. If Chronback's alpha was > .7 for a given construct, then I would accept it as reliable. I also did Factor Analysis tests on each set of scores to analyze the relevance of each rating of each type of Fun and the rating of each piece of Usability. I also used the Factor Analysis to create weighted scores of each of the games for use in the second phase of the study.

4.2 Phase 2 – Verifying the Game Usability Model

4.2.1 Participants

160 undergraduate college students were recruited from RPI's psychology classes.

4.2.2 Measurement instruments

A questionnaire to evaluate how much each participant had needs for each of the four Fun Keys. This questionnaire had ratings for how much each participant would enjoy each type of fun. This questionnaire also collected some demographics information.

A second questionnaire was used to evaluate how much enjoyment each participant experienced while playing one of the eight exemplar games. This questionnaire also includes an overall measure of enjoyment.

4.2.3 Apparatus

The apparatus for Phase II was the same eight games that were used in Phase 1 of this dissertation.

4.2.4 Procedure

Participants were recruited from a general psychology class at RPI. Participants arrived, were greeted, and then were given an informed consent form. Then they took a demographics questionnaire that included questions to determine their need for each of the different types of fun. Next, they played one of the eight games for approximately 45 minutes. Finally, participants took another questionnaire, this time to determine how much of each of the four types of fun they had experienced. Participants were then thanked for their time and dismissed. Identification information was collected for the sole purpose of allowing the participants' class instructor to give extra credit as per his or her policy, and it was kept separate from participant questionnaires.

Knowing players' need for enjoyment, amount of enjoyment and usability in each game, and the amount of resulting enjoyment each player experienced, I was able to test the validity of the GUM. Regressions were performed for each of the four Fun Keys, comparing the predicted enjoyment experienced with the actual enjoyment experienced. I also performed a set of regressions to measure if usability has a direct impact on amount of the four Fun Keys that participants experienced. Additionally, I performed regressions to test the accuracy of the GUM in predicting Overall Enjoyment, as compared to the prediction of a direct effect hypothesis.

4: RESULTS

4.1 Reliability

I used Chronback's Alpha to test the consistency of the ratings of the games that were performed in the first phase of the study. This test measured agreement on each individual questionnaire between the subset of items for the four Fun Keys and usability. The Chronback's Alpha for Hard Fun was .785. And for Usability it was .899. So for these two constructs Chronbach's alpha was within acceptable range.

	Chronbach's Alpha Level
Hard Fun	.785
Easy Fun	.426
Serious Fun	.610
People Fun	.615
Usability	.899

Figure 4-1: Chronbach's Alpha Levels for the four Fun Keys and usability. Note that I did not use the construct to rate Easy Fun or People Fun

Easy Fun had a Chronback's Alpha of only .426, but it could be raised to .504 by removing the "sound and vision" variable. However, this variable was the type of Easy Fun with the most face validity among the Easy Fun variables. In the games that were selected to show Easy Fun, most of the fun was in the form of playing with the construction of sounds and visual effects. So rather than remove the "sound and vision" variable, I choose instead to remove the other two variables.

People Fun also had a low Chronback's Alpha at .615. This value is approaching the acceptable range, but I found that there was a way to improve it. Like with Easy Fun, this number could be raised substantially to .870 by the removal of one variable. This time that variable was the "communication" variable. Just like with Easy Fun, the variable that was statistically correct for deletion was the one with the most face validity. This time, both the People Fun games were basically chat rooms with avatars, so they had lots of communication and very little competition or cooperation. And again, like with Easy Fun, I chose to keep the one variable with face validity and throw out the two others.

Like Easy Fun and People Fun, Serious Fun had a somewhat low Chronbach's Alpha Level. With Serious Fun it was .610. However, unlike with Easy Fun and People Fun, with Serious Fun the removal of the separate components would not increase the rating. So this time I decided to accept the ratings even though the reliability was not extremely strong.

Easy Fun total Chronback's Alpha	.426
Easy Fun Chronback's Alpha with "Exploring a game world" removed	.202
Easy Fun Chronback's Alpha with "Exploring a storyline" removed	.311
Easy Fun Chronback's Alpha with "Producing or playing with sounds and colors" removed	.504
People Fun Chronback's Alpha	.615
People Fun Chronback's Alpha with "Competing against other players" removed	.323
People Fun Chronback's Alpha with "Playing against the computer with other players" removed	.437
People Fun Chronback's Alpha with "Communicating with other players" removed	.870
Serious Fun Chronback's Alpha	.610
Serious Fun Chronback's Alpha with "Getting smarter" removed	.494
Serious Fun Chronback's Alpha with "Learning specific subject matter like social issues" removed	.503
Serious Fun Chronback's Alpha with "Getting exercise" removed	.525

Figure 4-2: Chronback's Alpha levels when elements are removed.

4.2 Scoring the Games

Using the Phase I ratings, I scored all the games on the Fun Keys and on usability. For Hard Fun, Serious Fun, and Usability, I did a factor analysis of the component pieces of each construct. I had SPSS create weighted scores for each of these. For Easy Fun and People Fun, I planned to use the single component pieces that had the most face validity. However, I also performed a factor analysis on Easy Fun and People Fun with a weighted score output, discluding the component that had reduced the Chronback's Alpha scores. This was to compare the accuracy of the two ratings. So for Easy Fun, I planned to just use the "sound and vision" score, but also made a weighted score with the other two component scores for comparison. And similarly for People Fun, I planned to use the "communication" score, but made a weighted score with the other two scores. The scores are shown in the following figures.

Type of Fun	Game Name	Hard Fun	Easy Fun	Serious Fun	People Fun	Usability
Hard	Mario Kart	6.784	2	2.5646	1.4615	5.7267
	ATV Quad Frenzy	5.9488	1.5385	2.6359	1.2308	2.213
Easy	Electroplankton	2.3311	6.8461	3.1685	1.6923	5.8713
	Gary's mod	2.5171	5	3.1145	1.4615	3.6249
Serious	Big Brain Academy	4.1649	2.2308	5.7753	1.3077	5.9523
	Fatworld	3.5723	1.8461	6.6322	2	1.8013
People	IMVU	2.5252	3	3.06	6.6154	3.8539
	Second Life	2.7896	3.6923	4.0279	6.4615	2.9417

Figure 4-3: Ratings of all the games for the Four Fun Keys and for Usability

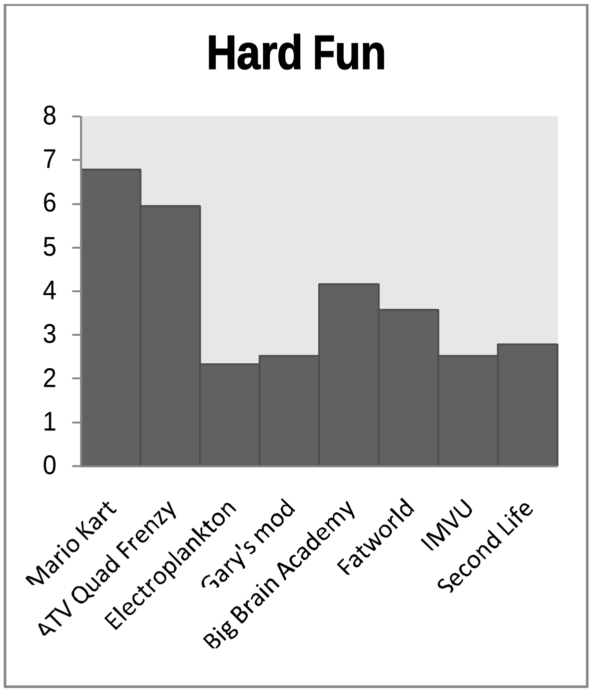

Figure 4-4: Hard Fun ratings

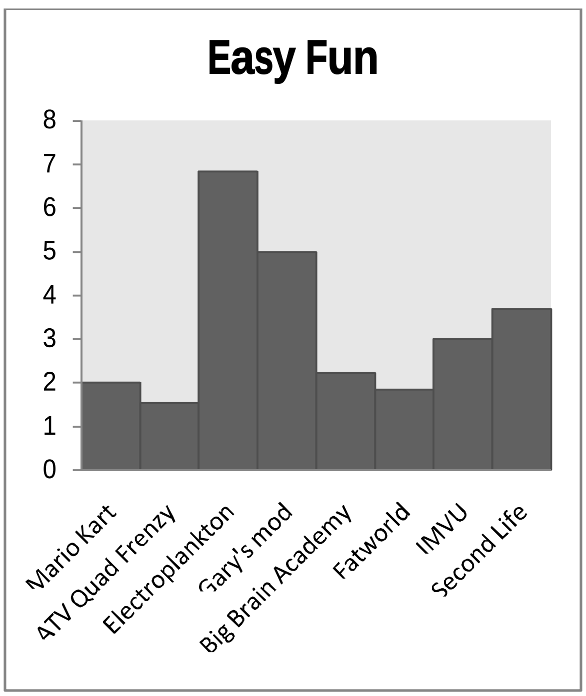

Figure 4-5: Easy Fun ratings

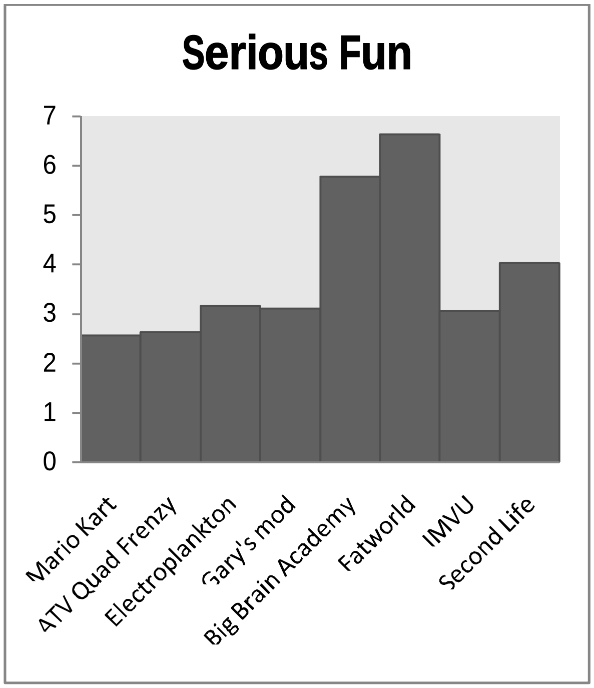

Figure 4-6: Serious Fun ratings

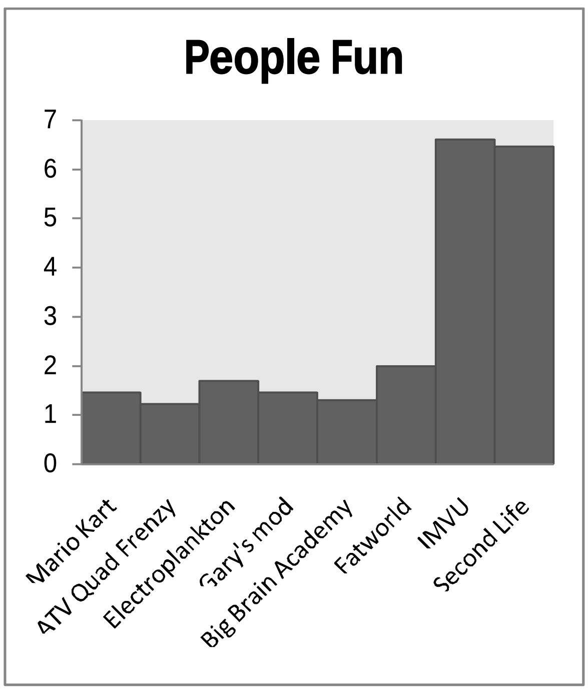

Figure 4-7: People Fun ratings

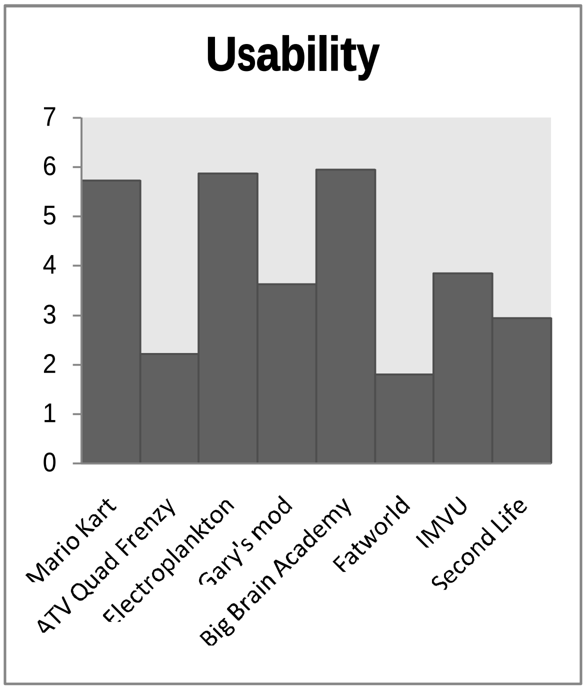

Figure 4-8: Usability ratings. These should alternate.

Although the above figures show the difference between the games visually, I also ran univariate ANOVAs for verification. See the Appendix I for the relevant SPSS output. For all the four Fun Keys and for usability, there were overall significant differences ($P < .001$) between the games. Schaffe Post Hoc Multiple Comparisons tests and Homogeneous Subsets were also performed. These tests showed ATV Quad Frenzy and Mario Kart to be significantly higher on Hard Fun than the other 6 games. The Scheffe testes showed Electroplankton and Gary's Mod to be significantly higher than the other 6 games, with the exception of Mario Kart which was significantly different from Electroplankton but not from Gary's Mod. For Serious Fun, the Scheffe tests showed Big Brain Academy and Fatworld to be significantly higher than the other 6, with the exception of Second Life which was significantly lower than Fatworld but not significantly lower than Big Brain Academy. With People Fun, IMVU and Second Life were significantly higher than the other 6 games. The ratings for usability were a little more varied, so less of the games were significantly different from each other. As seen in figure 4-8, IMVU, Second Life, and Gary's Mod were all rated towards the middle of the scale. However, the differences between all the games were still significant and the good usability games were all rated higher than the bad usability games. Also, of the four homogeneous groupings in usability ratings, one was solely comprised of the good usability games and another was solely comprised of the bad usability games. The other two homogenous groupings for usability ratings included some of the higher rated bad games and lower rated good games, so they're a product of having less of a distinct split between the games.

4.3 Validating the Constructs

Next I tested the weighted scores for validity. The next step I took was to do a simple correlation between the factor scores for each variable and their respective overall score. The Pearson Correlation Coefficient for these tests came out: Hard Fun = .824, Easy Fun = .713, Serious Fun = .803, People Fun = .948, and Usability = .947. These are all within the desired range. Note that I also tried correlations for the alternate weighted scores for Easy Fun and People Fun. These came out at .473 and .451 respectively, which indicates that the choice to use the single construct was correct in both cases.

4.4 Demographics of Participants in Phase II

Because participants were taken from undergraduate psychology classes, their ages were uniformly in the range of 18 to 19 years old. Of the 160 participants, 125 were male and 35 were female. As a measure of overall computer expertise, I asked participants how many programming languages they knew. 77 participants knew no programming languages, but 83 knew at least one. See the figure below.

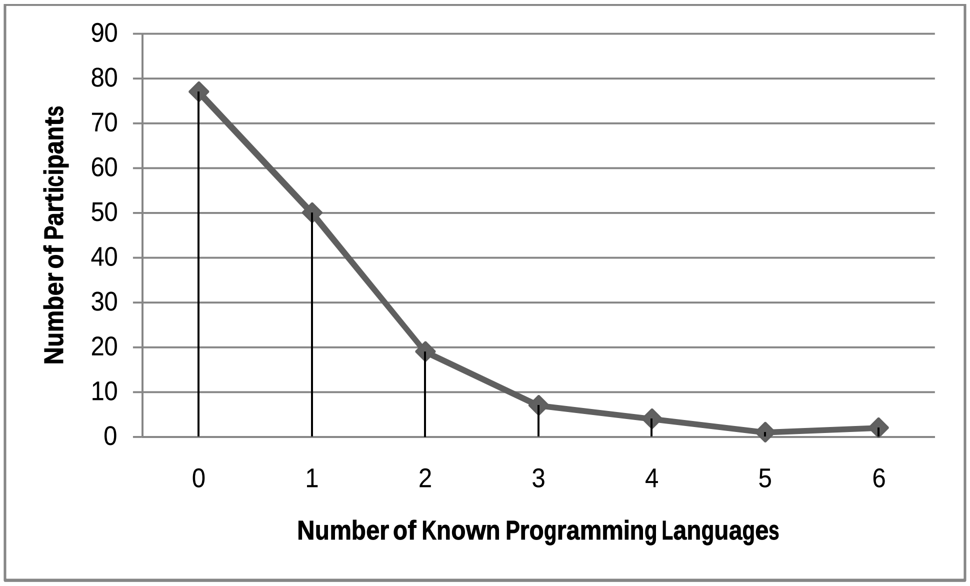

Figure 4-9: Number of participants who know different numbers of programming languages. This is to test the computer expertise of participants.

I also tested the game expertise of participants by asking how often they played games. 69 of the 160 participants played games at least once a day. 123 of the 160 participants played once a week or more. See the figure below for an illustration.

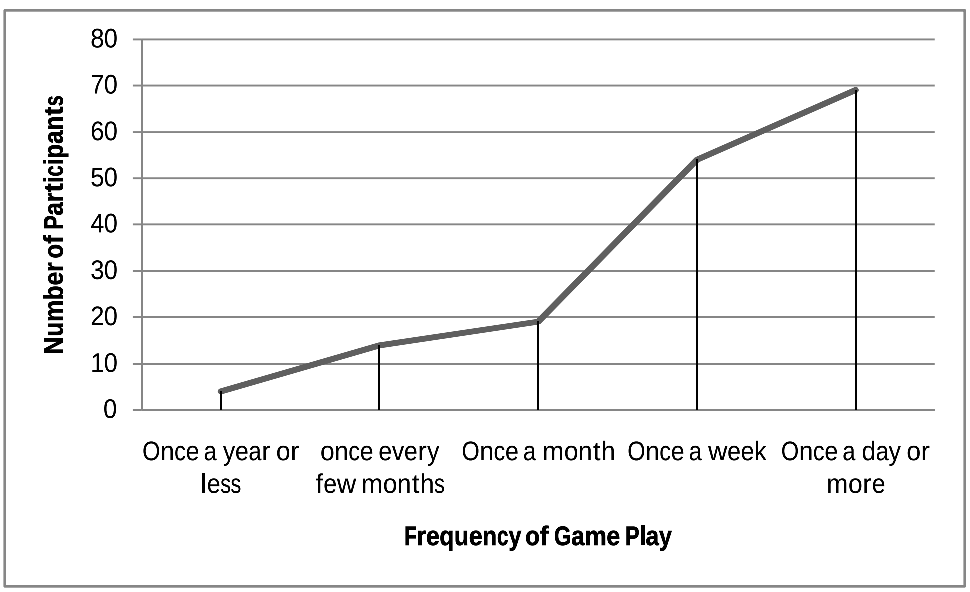

Figure 4-10: Frequency of game play. This is to test game expertise.

I asked questions in the demographics section to determine how much need each participant had for each of the Four Fun Keys. I used these numbers in the next section (chapter VI) to help calculate predictions, but it is worth noting the distributions of these needs for fun. Easy Fun and Serious Fun both had fairly even bell-curve type distributions. But both Hard Fun and People Fun had distributions that were skewed heavily towards high needs for fun. The charts follow in figures 4.11, 4.12, 4.13, and 4.14.

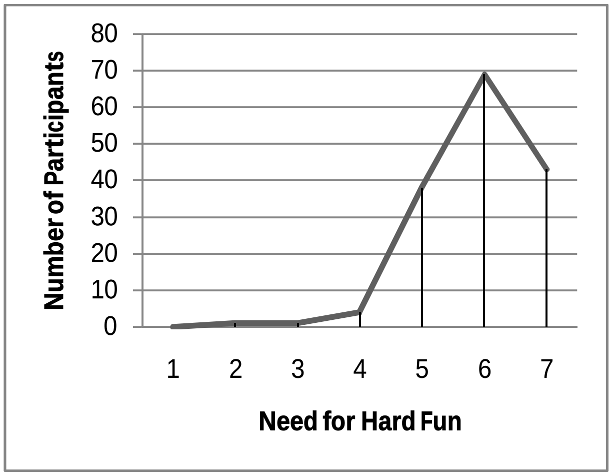

Figure 4.11: Rates of Need for Hard Fun

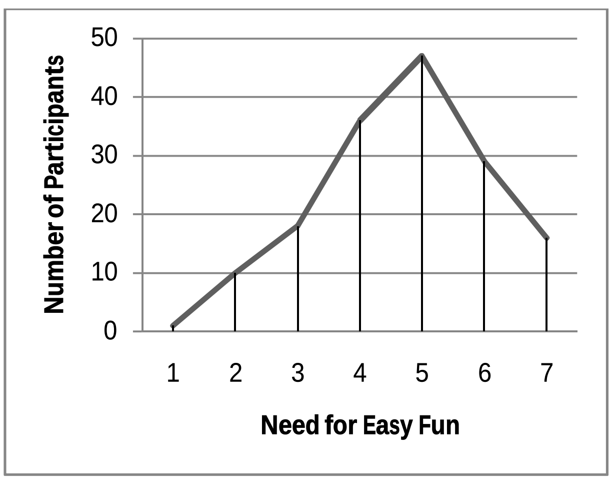

Figure 4.12: Rates of Need for Easy Fun

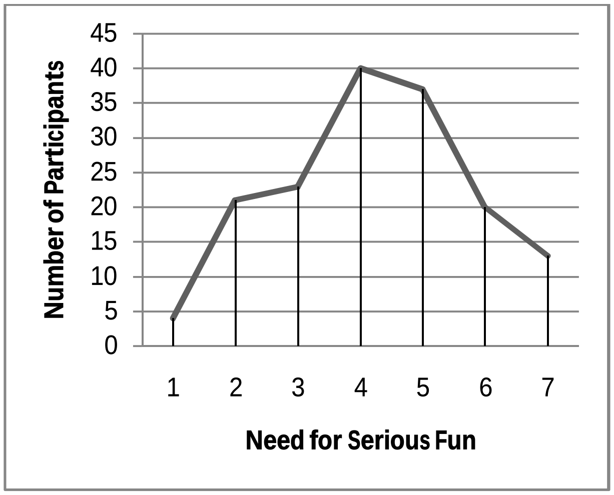

Figure 4.13: Rates of Need for Serious Fun

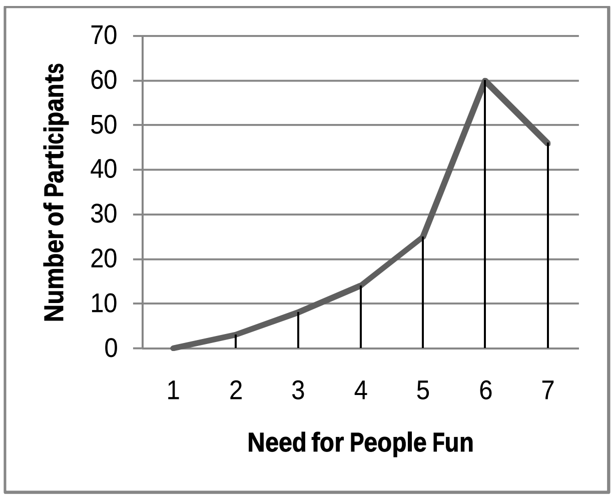

Figure 4.14: Rates of Need for People Fun

I took data about participants' favorite thing to do that causes each type of Fun. So in order to better understand the high need for People Fun in this sample, it may help to look at the sample's favorite things to do that cause People Fun. 96 of the 160 participants chose "Compete against other players" as their favorite type of People Fun, and 53 of them chose "Playing with other players against the computer." Only 9 participants chose "chatting with other players." This data is reflected in Figure 4.15 below.

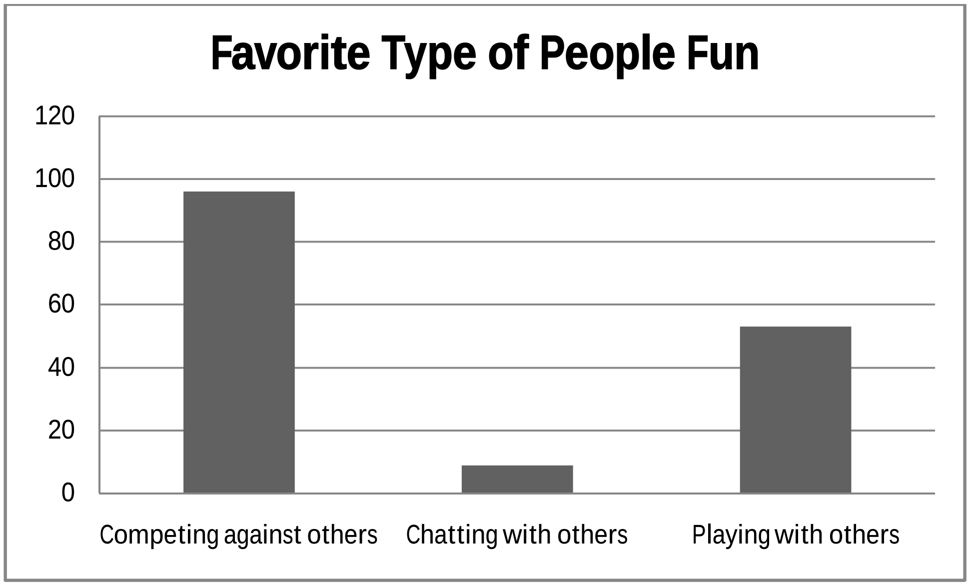

Figure 4.15: Favorite type of People Fun, as chosen after indicating need for People Fun

5: HYPOTHESIS TEST ANALYSIS

The data I got from Phase II testing let me test our hypotheses. For each of the types of Fun, I calculated predicted scores according to the definitions that I had determined. I performed regressions comparing the actual amount of each type of Fun the participants experienced against the predicted scores. These regressions included controls for gender, computer expertise, and gaming expertise. I also did regressions to test for direct effects from usability in order to test the alternative hypothesis. See Appendix J for the relevant output. Also see the figure below for comparative predictive power of the different hypotheses.

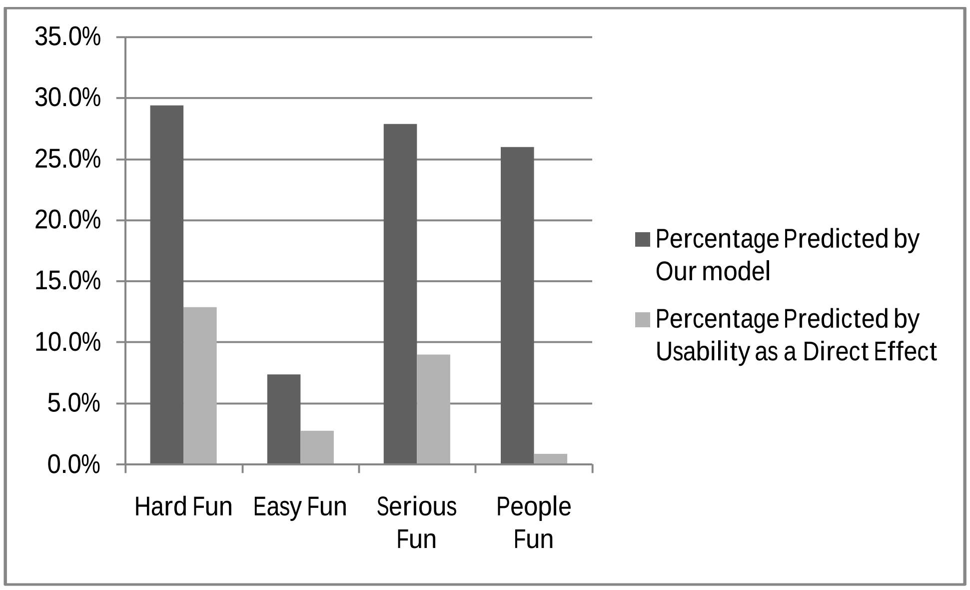

Figure 5.1: Percentages of variance predicted by the GUM or predicted by a direct effect from usability. Note that these are predictions of the actual amount of the respective type of Fun.

5.1 Hard Fun Prediction

H1.1: ***The GUM predicts the amount of Hard Fun which players experience. A regression will be performed comparing Hard Fun Enjoyment as Modified by***

Usability to players' actual experienced Hard Fun. I hypothesize P < .05.

The regression performed comparing the Hard Fun that I predicted against the Hard Fun that participants experienced came out $P < .001$ with a $R^2 = .294$. *Hypothesis 1.1 was supported.*

H1.2: Usability directly influences Hard Fun experienced. A regression will be performed comparing Usability to players' actual experienced Hard Fun. This hypothesis will be supported if P < .05.

The regression testing for a direct effect of usability on Hard Fun came out $P < .001$ with a $R^2 = .129$. *Hypothesis 1.2 was supported.*

In order to test for the difference between our prediction and a direct effect from usability, I performed a stepwise regression. This regression had two steps. The first step had the model with usability as a direct effect, using the same controls as in the original regression. The second step had that same model plus our prediction figure. With Hard Fun, the sig F Change was < .001 so the GUM was significantly more predictive than usability as a direct effect.

5.2 Easy Fun Prediction

H2.1: The GUM predicts the amount of Easy Fun which players experience. A regression will be performed comparing Easy Fun Enjoyment as Modified by Usability to players' actual experienced Easy Fun. I hypothesize P < .05.

The regression performed comparing the Easy Fun that I predicted against the Easy Fun that participants experienced came out $P < .005$ with a $R^2 = .074$. *Hypothesis 2.1 was supported.*

H2.2: Usability directly influences Easy Fun experienced. A regression will be performed comparing Usability to players' actual experienced Easy Fun. This hypothesis will be supported if P < .05.

The regression testing for a direct effect of usability on Easy Fun came out P = .312 with a $R^2 = .028$. *Hypothesis 2.2 was not supported.*

In order to test for the difference between our prediction and a direct effect from usability, I performed a stepwise regression. This regression had two steps. The first step had the model with usability as a direct effect, using the same controls as in the original regression. The second step had that same model plus our prediction figure. With Easy Fun, the sig F Change was < .005 so the GUM was significantly more predictive than usability as a direct effect.

5.3 Serious Fun Prediction

H3.1: The GUM predicts the amount of Serious Fun which players experience. A regression will be performed comparing Serious Fun Enjoyment as Modified by Usability to players' actual experienced Serious Fun. I hypothesize P < .05.

The regression performed comparing the Serious Fun that I predicted against the Serious Fun that participants experienced came out P < .001 with a $R^2 = .279$. *Hypothesis 3.1 was supported.*

H3.2: Usability directly influences Serious Fun experienced. A regression will be performed comparing Usability to players' actual experienced Serious Fun. This hypothesis will be supported if P < .05.

The regression testing for a direct effect of usability on Serious Fun came out P < .005 with a $R^2 = .090$. *Hypothesis 3.2 was supported.*

In order to test for the difference between our prediction and a direct effect from usability, I performed a stepwise regression. This regression had two steps. The first step had the model with usability as a direct effect, using the same controls as in the original regression. The second step had that same model plus our prediction figure. With Serious Fun, the sig F Change was < .005 so the GUM was significantly more predictive than usability as a direct effect.

5.4 People Fun Prediction

H4.1: The GUM predicts the amount of People Fun which players experience. A regression will be performed comparing People Fun Enjoyment as Modified by Usability to players' actual experienced People Fun. I hypothesize $P < .05$.

The regression performed comparing the People Fun that I predicted against the People Fun that participants experienced came out $P < .05$ with a $R^2 = .026$. *Hypothesis 4.1 was supported.*

H4.2: Usability directly influences People Fun experienced. A regression will be performed comparing Usability to players' actual experienced People Fun. This hypothesis will be supported if $P < .05$.

The regression testing for a direct effect of usability on People Fun came out $P = .717$ with a $R^2 = .009$. *Hypothesis 4.2 was not supported.*

In order to test for the difference between our prediction and a direct effect from usability, I performed a stepwise regression. This regression had two steps. The first step had the model with usability as a direct effect, using the same controls as in the original regression. The second step had that same model plus our prediction figure. With People Fun, the sig F Change was < .05 so the GUM was significantly more predictive than usability as a direct effect.

	Hard Fun	Easy Fun	Serious Fun	People Fun
Percentage Predicted by Usability as a Direct Effect	12.9%	2.8%	9.0%	0.9%
Percentage Predicted by the GUM	29.4%	7.4%	27.9%	26.0%

Figure 5.2: Percentages of the Fun Keys Predicted by the GUM and by a Direct Effect from Usability

5.5 Overall Enjoyment Prediction

Lastly, I also calculated a predicted Overall Enjoyment score by summing all four Fun Keys. I did a regression comparing this predicted Overall Enjoyment score against the actual Overall Enjoyment that participants experienced. Like with the Fun Keys, I also tested for the alternative hypothesis by doing a regression to test for direct effects from usability. See Figure 5.3 for a visual look at the predictive power of the different models.

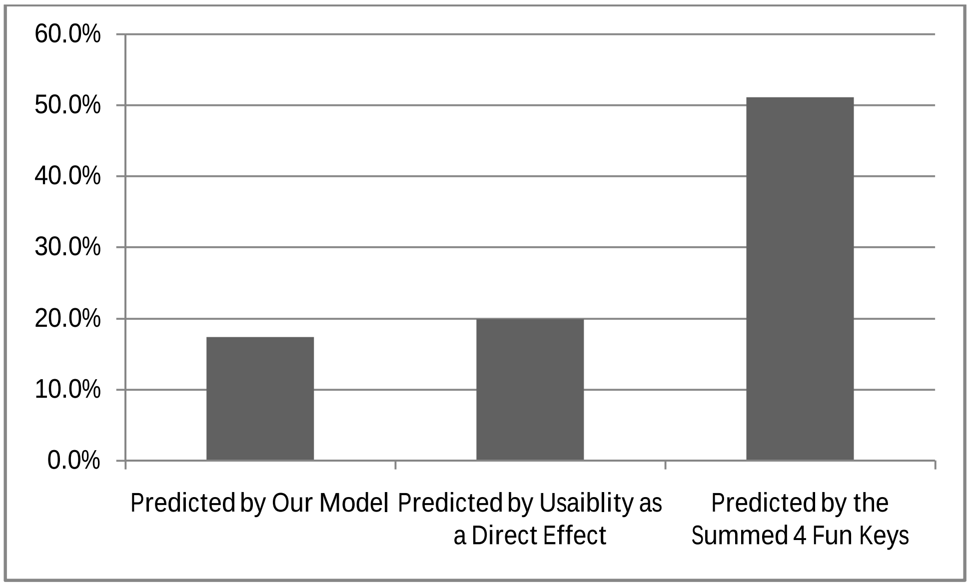

Figure 5.3: Amount of variance predicted by our model (the GUM), by the sum of the actual 4 Fun Keys, and by usability as a direct effect.

H5.1: ***The GUM predicts the amount of Overall Enjoyment which players experience. A regression will be performed comparing total predicted enjoyment with players' actual experienced total enjoyment. I hypothesize P < .05.***

The regression that compared the predicted Overall Enjoyment against the actual Overall Enjoyment came out $P < .001$ with a $R^2 = .174$. *Hypothesis 5.1 was supported, though not quite as strongly as hypothesis 5.2.*

H5.2: ***Usability directly influences Overall Enjoyment. A regression will be performed comparing the usability scores with the Overall Enjoyment experienced by each***

player. This hypothesis will be supported if P < .05.

However, the regression testing for a direct effect of usability on Overall Enjoyment came out $P < .001$ with a $R^2 = .199$. *Hypothesis 5.2 was supported.*

In order to better understand this comparison, I also performed a regression comparing the sum of the actual enjoyment scores for the four Fun Keys against the actual total fun. So this was the actual Hard Fun score rather than the predicted Hard Fun score. In this case, $P < .001$ and $R^2 = .511$.

Like with the Fun Keys scores, I tested for the difference between our prediction and a direct effect from usability by performing a stepwise regression. This regression had two steps. The first step had the model with usability as a direct effect, using the same controls as in the original regression. The second step had that same model plus our Overall Enjoyment prediction figure. Unlike the Fun Keys scores, adding our predicted Overall Enjoyment score did not add a significant amount of predictive power. The Sig F. Change value was .639.

Predicted by the GUM	17.4%
Predicted by Usaiblity as a Direct Effect	19.9%
Predicted by the Summed 4 Fun Keys	51.1%

Figure 5.4: Amount of Variance in Total Enjoyment Predicted by the GUM, Predicted by Usability as a Direct Effect, and Predicted by the Summed 4 Fun Keys

6: CONCLUSION

6.1 Demographics

The sample I got seems to be somewhat skewed towards people with gaming and computing expertise. They also seem to have a particularly high need for Hard Fun, which is what I would expect if the sample is skewed towards expert gamers. However, there is also a high need for People Fun, which is less expected. Looking at the rates of each type of People Fun helped to explain this, as most of this People Fun is in the form of competition with other players. That competitive streak would be expected from expert gamers, in general.

6.2 Reliability in the Four Fun Keys and Usability

The first phase of the study confirmed that the four Fun Keys and usability all exist as constructs. Hard Fun and Usability both get rated consistently, as shown by the significant Chronback's Alpha number. All of the Fun Keys and usability were supported as valid by the significant correlations between the weighted ratings and the overall ratings.

The other notable thing here is that different games vary in the Four Fun Keys and in Usability. This is seen by comparing the scores of the different games. Some games have large amounts of Hard Fun, some games do not. The same goes for Easy Fun, Serious Fun, People Fun, and Usability.

6.3 Prediction Power

Participants had differing needs for each of the four Fun Keys. I did a calculation to predict how much actual Fun of each of those types they would have, based on how well the game they had played fit their needs. The predicted score also incorporated usability as a modifier. This prediction of how much of each of those types of Fun participants actually had was accurate within the acceptable range.

Usability as a direct effect was supported with Hard Fun and Serious Fun, but not with Easy Fun or People Fun. However, with both Hard Fun and Serious Fun, the GUM explained significantly more of the variance than usability as a direct effect. Naturally, the GUM predicted significantly more of the variance than usability as a direct effect in the cases of Easy Fun and People Fun as well. This indicates that the GUM is more accurate than a model with usability having a direct effect.

I also summed the four predicted enjoyment scores for an overall predicted enjoyment score. I performed a regression to see if this overall predicted enjoyment score was accurate in predicting actual overall enjoyment. This overall predicted enjoyment score predicted total enjoyment within the acceptable range. However, in the case of overall enjoyment, usability as a direct effect was a slightly stronger predictor of enjoyment than the GUM. I would account for this difference by pointing to attenuated unreliability, which I will discuss in the next section.

6.4 Attenuated Unreliability

In all the comparisons between GUM and the Direct Usability model, there are issues of comparison that result from attenuated unreliability. This is basically because GUM is somewhat removed from the actual enjoyment score. With the GUM, I start with the need for each of the four types of Fun. I multiply that by the capacity for the respective types of Fun in the game. Then I multiply that *again* by the usability score. This gives me the predicted Fun Component scores. Finally, to get the Predicted Overall Enjoyment score, I sum up all four of the scores for one total predicted enjoyment score.

All the constructs at each step of this process have some unreliability, and every time I introduce another rating I have to multiply the unreliability. So for the reliability of the predictions of each of the Fun Keys, I am multiplying 3 different unreliability scores. And for the predicted Overall Enjoyment score, I am multiplying 7 different unreliability scores. This looks like (Player Need unreliability) X (Game Characteristics unreliability) X (Usability Score unreliability) X (Hard Fun Prediction unreliability) X (Easy Fun Prediction unreliability) X (Serious Fun Prediction unreliability) X (People Fun

Prediction unreliability). So, just to get an idea, if all of these values were a very conservative .9 then the maximum amount of predictive power the GUM could possibly have would be .9 = 47.8%. In comparison, the usability rating score is just one rating score given to each game so there is no attenuated unreliability whatsoever. However, it is notable that usability by itself accounts for a relatively large amount of variance without taking into consideration all the other information that our prediction uses. I would suggest this speaks to the importance of usability more than anything else.

In order to get a comparison that had less attenuated unreliability than the predicted Overall Enjoyment score, I also did a regression to see how predictive it would be if I just summed the actual amount of the four types of fun which participants experienced. Presumably, this score already includes whatever the participants' preferences for fun are, whatever the game characteristics are, and also any modification by usability. However, the only unreliability attenuation is the four Fun Keys, and not the 3 other sources of unreliability. The score resulting from the summed Fun Keys was far superior to both of the other scores, predicting more than twice the variance that the other two regressions predicted. This supports the idea that the GUM's score is artificially low because of attenuated unreliability.

6.5 Covariates

Gender was a serious covariate with Hard Fun (< .05), with women having generally more Hard Fun. This seems to contradict the expectation that male gamers are typically more interested in Hard Fun. This outcome could be because the Hard Fun game with good usability was Mario Kart, which can be too cutesy for some stereotypical male gamers. Potentially, male gamers could also find the challenge ramp on Mario Kart to be too slow, especially given the skew in the population towards expert gamers.

Computing Expertise had a moderate positive effect on Easy Fun (.056, two tailed) and Serious Fun (.082, two tailed). These would be significant effects if I could make a good argument for a one-tailed expectation, but I am not sure that is a viable claim. Note that there was no significant effect from gaming expertise, so this rules out a number of potential explanations. For instance, it is unlikely that participants simply could not play the games if they did not have enough computing expertise, since that would also be reflected in covariance with gaming expertise. The best explanation I can give involves the nature of the question which I asked to assess computing expertise. I asked participants how many programming languages they know. Programming language use requires some amount of creativity that can look like the exploration and free play Easy Fun. Learning a programming language also requires a need for learning, so it would make sense that the more that people know programming languages, the more they would enjoy the learning component of Serious Fun.

Overall Enjoyment had two separate notable covariates. The first is that Males had less Overall Enjoyment than females (< .05, two tailed). This is the same effect that happened for Hard Fun, though not for any of the other Fun Keys. So this effect could just be an extension of the effect that happened with Hard Fun. There is another possibility that results from the experiment's presentation as an experiment on games Females tend to self-identify as non-gamers or as disliking games. So females may have come to the experiment with lower expectations for enjoyment in general and felt like they had more fun in contrast. Similarly, because games like Mario Kart, IMVU, and Big Brain Academy can feel too cutesy for male gamers, males may have come away with some general disappointment.

The other effect with Overall Enjoyment was that people with more computing expertise generally had more Overall Enjoyment (.08, two tailed). Like with gender and Hard Fun, this is an effect that showed up with the Fun Keys. In this case, this same effect was present for both Easy Fun and Serious Fun. I think that another explanation of people with more computing expertise having more overall enjoyment is that they might be generally more overworked. As I mentioned before, the criteria I used was knowledge of programming languages. So participants who are taking classes in things like programming languages might be studying harder and better appreciate a break for play. This would also help to understand why something like Easy Fun would be appealing, since it is more of a break-time activity.

7: DISCUSSION

7.1 Uses of the GUM

The GUM can inform design in some direct ways. The model helps with understanding enjoyment. Players do seem to have varying needs for different types of Fun, so Nicole Lazzaro's suggestion that a good game should have at least three of the Four Fun Keys is supported (Lazzaro, 2004).

The GUM also helps understand the function of usability in game design. Rather than directly producing enjoyment, usability serves to remove barriers to enjoyment. So if a game has bad usability, the player would not get to enjoy the game experience. Likewise, if a game has poor game design, then no amount of usability will make the game more fun. And of course the GUM's verification of the function and impact of usability also supports the generalized importance of usability in games.

Beyond these understandings of enjoyment and usability, the GUM does not directly inform design very much. However, there are some ways that this model can act as a foundation for future research, as I will describe in the following *Next Steps* section.

7.2 Next Steps

Among other further steps that can be taken with the GUM is a more in-depth exploration and explication of the model's elements. The GUM functionally used a generalized usability element rather than a verified explication. I proposed some explication, but one of the further steps would be to verify that explication. The heuristics by Pinelle and his colleagues (2008) might be a better explication, for instance.

For a better understanding of the GUM, another potential study would involve some exploration of potential additional elements of enjoyment. This study verified the existence of Hard Fun, Easy Fun, Serious Fun, and People Fun. But the study did not look for other types of enjoyment.

Then there are ways that this model could be used as a foundation for more applied research. For instance, research could test the efficacy of different usability evaluation tools like retrospective testing. Or research could test the payoff of innovative techniques like biometric data tracking. There are also methods of analyzing user decisions and actions like the GOMS model that might benefit from the GUM, since it explains why the types of activities users engage in vary somewhat during play. For instance, users often shift between the Hard Fun of trying to meet a challenge to the Easy Fun of trying to crash or die in interesting ways.

All of these potential next steps are in addition to various confirmatory studies that could be performed. For instance, studies could be run to test for generalizability to other demographics, other game systems, or even other paradigms other than games. For a bit more on these issues, see the *Limitations* section that follows.

7.3 Limitations

This study has some limitations in terms of generalization. It is possible that our findings only relate to this set of games, for instance. I tested eight games, which indicates some possibility of generalization. However, it is possible that the GUM might not apply to some genres of games. For instance, our two Hard Fun exemplar games were both racing games, but Hard Fun might be different in side-scroller games. There are entire genres of games that we didn't use at all, like sports games and fighting games.

Like the issue with genres, the GUM might not generalize to other paradigms other than games. All the interfaces I tested were games, and even the ones that would not strictly be called games like IMVU were explicitly presented as "games." So the GUM may be different if someone is engaging with a productivity application, a website, a TV show, or even a toy.

The medium of play may also limit the generalizability of our study. All the games were tested either on a personal computer or on a Nintendo Dual Screen. So a system with more physical interaction like the Nintendo Wii might be different. Or a system with a standard control pad like an Xbox might get different results.

Another possible limitation of our study is the population. Our population was uniformly in the 18-19 age range, so older or younger game players might have different experiences. Likewise, our population was comparatively very technology literate and game literate. This may cause some serious biases in terms of generalization to other populations.

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APPENDICES

Appendix A. Protocol for Phase I

Preparation

- Open rooms and turn on lights
- Check which testers are playing which games 1^{st} and 2^{nd}
    - Figure out how to juggle which players switch rooms and such
- Unplug Nintendo DSs and check that they're charged
- Ready games
    - For PC
        - On, with no other programs running
        - Game is set to the start menu screen with all settings reset
    - For DS
        - Make sure correct cartridge is ready with settings reset
- Lay out the evaluation questionnaire and the game registration slip if applicable

Greet and Begin

- Welcome
- Reviewing two games this session.
- Session will be about 2 ½ hours total with a break in between games of about 10 minutes
- Introduce game, emphasize "single player mode" and/or specific map if applicable
- Start with a little normal play and get an overall feel for the game
- After about 10 or 15 minutes, you can start looking at the review sheet and trying to fill in answers
- We want your independent evaluation, so I won't be answering questions or helping with the review

During Testing

- If they come out to me with questions about the game or how to evaluate, those questions are not answered unless they're technical issues like game crashes

    - If they ask questions about the game, just tell them to make their best judgment and think about any ways that it might relate to the things they're evaluating in the game
- At the 1:15 hour mark, ask that they wrap up in about the next 10 minutes, then check in with me and start their break. WARN NOT TO TALK ABOUT GAMES
- During break, set up 2nd game
    - System on, game set up, new questionnaire in place
- Set them up on the next game when they're done with their break
    - Introduce game
    - Emphasize "single player mode" and/or specific map if applicable
    - Start with a little normal play and get an overall feel for the game
    - After about 10 or 15 minutes, you can start looking at the review sheet and trying to fill in answers
- At the 2 ½ hour mark, ask that they finish in the next 10 minutes and then find me

End of Session

- Give gift certificate if it's the 4th session
- Remind to not talk about study with other evaluators before Nov 7th
- Thank and dismiss
- Turn off PCs
- Turn off and plug in DSs
- Sort evaluation questionnaires

Appendix B. Phase I Informed Consent Form

Institutional Review Board
Rensselaer Polytechnic Institute

Informed Consent Form
(Student Researcher)

I understand that Noah Schaffer is a graduate student research assistant who wishes to interview me as part of the research project on an integrated model for game usability that he is working on with Professors Katherine Isbister, James Watt, Roger Grice, and Ralph Noble of the Language, Literature, and Communication Department at Rensselaer Polytechnic Institute. I understand that this project will involve a total of approximately 4 hours of classroom style training and a total of approximately 8 hours of game review. This amounts to a total of approximately 12 hours, which will be divided into 2 hour sessions. I understand that I will be compensated for my time on this project with a gift certificate for $150. I understand that he will be making his best possible effort to guarantee me every possible protection, including the following:

1. I am under no obligation to be interviewed if I do not wish to do so.

2. I am not obligated to answer any of the questions. I may decline to answer any or all of the questions, and I may terminate the interview at any point.

3. If there is anything that I do not wish to have quoted, I may say at any point during or after the interview say what I wish to have kept "off the record," and it will not be quoted.

4. I understand that I will remain anonymous in this study. Any quotes or data taken from my participation will be kept separate from any personally identifying information about me. Due to this anonymity, I understand that I will not be consulted directly about any such quotes.

6. Based on reading this form (check one):

_____ I agree to be interviewed.
_____ I do not agree to be interviewed.

______________________	__________________________________	____________
Name of Participant	Signature	Date

For further information contact:

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Chair, Institutional Review Board, Rensselaer Polytechnic Institute, CII 7015, 110 8th Street, Troy, New York, 12180; phone: (518) 276-4873, fax: (518) 276-4002.

Appendix C. Forms For Phase I Evaluation

Evaluation sheet for <Game Name>

Game elements that would cause Hard Fun for a player	low 1	2	3	4	5	6	high 7
Levels to defeat							
Characters to defeat							
Powers and abilities to earn							
Challenging, balanced goals							

Game elements that would cause Easy Fun for a player	low 1	2	3	4	5	6	high 7
Exploring a game world							
Exploring a storyline							
Producing or playing with sounds and colors							
Fun without goals							

Game elements that would cause Serious Fun for a player	low 1	2	3	4	5	6	high 7
Getting smarter							
Learning specific subject matter like social issues							
Getting exercise							
Affecting the player in a way that's outside the game							

Game elements that would cause People Fun for a player	low 1	2	3	4	5	6	high 7
Competing against other players							
Playing against the computer with other players							
Communicating with other players							
Interacting with other players							

Usability	bad 1	2	3	4	5	6	good 7
Intuitive?							
Easy to Learn?							
Immediate Feedback?							
Consistent interface?							
Good Usability?							

With the game as it is, I'd expect a player to have fun doing things like:

- Defeating levels, or
- Defeating characters, or
- Earning powers and abilities

disagree 1	2	3	4	5	6	agree 7

Circle the item from the above bulleted list that happens most in the game

With the game as it is, I'd expect a player to have fun doing things like:

- Exploring a game world, or
- Exploring a storyline, or
- Making sounds and colors

disagree 1	2	3	4	5	6	agree 7

Circle the item from the above bulleted list that happens most in the game

With the game as it is, I'd expect a player to have fun doing things like:

- Getting smarter, or
- Learning about discrimination, or
- Getting exercise

disagree 1	2	3	4	5	6	agree 7

Circle the item from the above bulleted list that happens most in the game

---

With the game as it is, I'd expect a player to have fun doing things like:

- Competing against other players, or
- Chatting with other players, or
- Playing against the computer with other players

disagree 1	2	3	4	5	6	agree 7

Circle the item from the above bulleted list that happens most in the game

---

When you're finished completing this questionnaire, please bring it to Noah

Appendix D. Phase II Protocol

Preparation

- Open rooms and turn on lights
- Check which testers are playing which games 1^{st} and 2^{nd}
- Unplug Nintendo DSs and check that they're charged
- Ready games
  - For PC
    - On, with no other programs running
    - Game is set to the start menu screen with all settings reset
    - Log in info for online games
  - For DS
    - Make sure correct cartridge is ready with settings reset
- Prepare the forms: consent, demographics, game registration slip if applicable

Greet and Begin

- Welcome, give informed consent form
- Session will be about 1 hour total: answer questionnaire, play game, answer another questionnaire
- Fill out forms (I gave some explanation of the forms here, since they weren't totally clear), take your time
- (After getting forms back) Introduce game, emphasize "single player mode" and/or specific map if applicable
- Play normally for about 40 minutes, then I'll come in.

During Testing

- Set 40 min timer
- If they come out to me with questions about the game, those questions are not answered unless they're technical issues like game crashes
  - If they ask questions about the game, just ask what they'd do if they were playing at home.

    - If they'd normally stop playing, then give them the questionnaire to fill out.
- End play session and give them the questionnaire to fill out.

End of Session

- Take and check questionnaire (make sure they answered all questions)
- Thank and dismiss
- Turn off PCs
- Turn off and plug in DSs
- Sort evaluation questionnaires

Appendix E. Phase II Consent Form

Institutional Review Board
Rensselaer Polytechnic Institute

<u>Informed Consent Form</u>
(Student Researcher)

I understand that Noah Schaffer is a graduate student research assistant who wishes for my participation as part of the research project on a model of game interaction that s/he is working on with Professors Katherine Isbister, James Watt, Roger Grice, and Ralph Noble of the Language, Literature, and Communication Department at Rensselaer Polytechnic Institute. I understand that I will fill out a questionnaire, play a game, and then fill out a second questionnaire. I understand that this session will take approximately one hour. I understand that Noah Schaffer will be making his best possible effort to guarantee me every possible protection, including the following:

1. I am under no obligation to participate if I do not wish to do so.

2. I am not obligated to answer any of the questions. I may decline to answer any or all of the questions, and I may terminate the session at any point.

3. I understand that there is no interview to be conducted or quoted from, so there will be no comments for the researchers to quote. Multiple choice questionnaires will be used for data collection.

4. I understand that my anonymity will be preserved in this study. If identifying information is collected, it will be kept separate from all questionnaires involved in this study. I also understand that I will not be credited with any authorship of publications resulting from this study.

______________________	__________________________________	____________
Name of Participant	Signature	Date

For further information contact:
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Appendix F. Phase II Demographics and Play Needs Form

Demographics Participant ID _____________

Gender

Male		Female	

Age _____

How often do you play games?

Once a year or less	
once every few months	
once a month	
once a week	
once a day or more	

Do you know any programming languages? If so, how many? ______

In general, if you're playing a game, do you enjoy doing things like:

- getting high scores, or
- defeating levels, or
- defeating characters, or
- earning powers and abilities?

Dislike 1	2	3	4	5	6	Like 7

Circle the item from the above bulleted list that you most enjoy

---

In general, if you're playing a game, do you enjoy doing things like:

- exploring, or
- making sounds and colors, or
- just messing around?

Dislike 1	2	3	4	5	6	Like 7

Circle the item from the above bulleted list that you most enjoy

---

In general, if you're playing a game, do you enjoy things like:

- getting smarter, or
- learning about social issues, or
- getting exercise?

Dislike 1	2	3	4	5	6	Like 7

Circle the item from the above bulleted list that you most enjoy

---

In general, if you're playing a game, do you enjoy things like:

- competing against other players, or
- chatting with other players, or
- playing against the computer with other players?

Dislike 1	2	3	4	5	6	Like 7

Circle the item from the above bulleted list that you most enjoy

---

Appendix G. Slips with Instructions for Setting Up Accounts with Online Games IMVU and Second Life

Use the following temporary gmail account to set up an IMVU game account:

Gmail username: <generic name with numbers>

Password: <generic easy to use password>

If you already have an account with this game, please do **NOT** use that account. We want all participants to have a similar experience in this game.

Also note that the game is already installed. When you're prompted to download the game, just start it from the start menu. Get help from the test facilitator if there's any trouble getting the game to start.

Appendix H. Phase II Post-Play Questionnaire

<GAME NAME> Participant ID _____________

Have you played this game before? Mark yes even if you've only played a little, or played the same game on a different system, or played a similar version of the same game.

Yes		No	

I enjoyed playing this game.

disagree 1	2	3	4	5	6	agree 7

I would play this game longer if I had the opportunity.

disagree 1	2	3	4	5	6	agree 7

I would recommend this game to a friend.

disagree 1	2	3	4	5	6	agree 7

This game was fun.

disagree 1	2	3	4	5	6	agree 7

I had fun doing things like:

- Defeating levels, or
- Defeating characters, or
- Earning powers and abilities

disagree 1	2	3	4	5	6	agree 7

Circle the item from the above bulleted list that you most enjoyed

---

I had fun doing things like:

- Exploring a game world, or
- Exploring a storyline, or
- Making sounds and colors

disagree 1	2	3	4	5	6	agree 7

Circle the item from the above bulleted list that you most enjoyed

---

I had fun doing things like:

- Getting smarter, or
- Learning about social issues, or
- Getting exercise

disagree 1	2	3	4	5	6	agree 7

Circle the item from the above bulleted list that you most enjoyed

---

I had fun doing things like

- Competing against other players, or
- Chatting with other players, or
- Playing against the computer with other players

disagree 1	2	3	4	5	6	agree 7

Circle the item from the above bulleted list that you most enjoyed

---

Please return this questionnaire to the facilitator when you're finished.

Appendix I: Relevant Outputs for Phase I

Hard Fun Chronbach's Alpha:

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.785	.792	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
lvls	4.38	9.887	.617	.426	.737
chars	5.25	10.752	.733	.538	.589
powers	5.12	13.916	.558	.353	.781

Hard Fun Correlation with Factor Score:

Correlations

		hardfun	Factor Analysis Hard Fun
hardfun	Pearson Correlation	1.000	.824**
	Sig. (2-tailed)		.000
	N	104	104
Factor Analysis Hard Fun	Pearson Correlation	.824**	1.000
	Sig. (2-tailed)	.000	
	N	104	104

**. Correlation is significant at the 0.01 level (2-tailed).

Easy Fun Chronbach's Alpha:

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.426	.519	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
world	4.76	6.786	.319	.210	.202
story	7.08	10.907	.380	.203	.311
soundvis	5.30	6.386	.205	.043	.504

Easy Fun Correlation with Factor Score:

Correlations

		easyfun	Factor Analysis Easy Fun
easyfun	Pearson Correlation	1.000	.473**
	Sig. (2-tailed)		.000
	N	104	104
Factor Analysis Easy Fun	Pearson Correlation	.473**	1.000
	Sig. (2-tailed)	.000	
	N	104	104

**. Correlation is significant at the 0.01 level (2-tailed).

Easy Fun Correlation with only Sound & Vision score:

Correlations

		soundvis	easyfun
soundvis	Pearson Correlation	1.000	.713**
	Sig. (2-tailed)		.000
	N	104	104
easyfun	Pearson Correlation	.713**	1.000
	Sig. (2-tailed)	.000	
	N	104	104

**. Correlation is significant at the 0.01 level (2-tailed).

Serious Fun Chronbach's Alpha:

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.610	.671	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
smart	3.52	5.611	.456	.241	.494
learn	4.19	7.031	.426	.203	.503
exercise	4.96	10.484	.520	.271	.525

Serious Fun Correlation with Factor Score:

Correlations

		Factor Analysis Seroius Fun	seriousfun
Factor Analysis Seroius Fun	Pearson Correlation	1.000	.803**
	Sig. (2-tailed)		.000
	N	104	104
seriousfun	Pearson Correlation	.803**	1.000
	Sig. (2-tailed)	.000	
	N	104	104

**. Correlation is significant at the 0.01 level (2-tailed).

People Fun Chronbach's Alpha:

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.615	.704	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
compete	4.28	8.844	.584	.634	.323
coop	4.62	10.528	.550	.618	.437
commun	3.35	7.141	.289	.094	.870

People Fun Correlation with Factor Score:

Correlations

		Factor Analysis People Fun	peoplefun
Factor Analysis People Fun	Pearson Correlation	1.000	.451**
	Sig. (2-tailed)		.000
	N	104	104
peoplefun	Pearson Correlation	.451**	1.000
	Sig. (2-tailed)	.000	
	N	104	104

**. Correlation is significant at the 0.01 level (2-tailed).

People Fun Correlation with only Communication score:

Correlations

		commun	peoplefun
commun	Pearson Correlation	1.000	.948**
	Sig. (2-tailed)		.000
	N	104	104
peoplefun	Pearson Correlation	.948**	1.000
	Sig. (2-tailed)	.000	
	N	104	104

**. Correlation is significant at the 0.01 level (2-tailed).

Usability Chronbach's Alpha:

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.899	.899	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
intuitive	15.03	20.650	.807	.668	.858
learnable	14.85	21.296	.793	.653	.864
feedback	14.38	20.142	.789	.623	.865
consistant	14.21	21.683	.714	.513	.892

Usability Correlation with Factor Score:

Correlations

		Factor Analysis Usability	usable
Factor Analysis Usability	Pearson Correlation	1.000	.947**
	Sig. (2-tailed)		.000
	N	104	104
usable	Pearson Correlation	.947**	1.000
	Sig. (2-tailed)	.000	
	N	104	104

**. Correlation is significant at the 0.01 level (2-tailed).

Note: The remaining portion of Appendix I is made up of statistics showing that the games for a given type of fun were significantly different from the other games. For all these following statistics, the encoding for the games is:

1. ATV Quad Frenzy
2. Big Brain Academy
3. Electroplankton
4. Fatworld
5. Gary's Mod
6. IMVU
7. Mario Kart
8. Second Life

Hard Fun ANOVA to show higher Hard Fun in Hard Fun Games

Tests of Between-Subjects Effects

Dependent Variable:Factor Analysis Hard Fun

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	76.608[a]	7	10.944	39.809	.000	.744	278.663	1.000
Intercept	.000	1	.000	.000	1.000	.000	.000	.050
Game	76.608	7	10.944	39.809	.000	.744	278.663	1.000
Error	26.392	96	.275					
Total	103.000	104						
Corrected Total	103.000	103						

a. R Squared = .744 (Adjusted R Squared = .725)

b. Computed using alpha = .05

Relevant Scheffe Multiple Comparisons

(I) Game	(J) Game	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
1	2	.8648318*	.20565610	.020	.0751215	1.6545420
	3	1.6997514*	.20565610	.000	.9100412	2.4894617
	4	1.1134444*	.20565610	.000	.3237341	1.9031547
	5	1.5993298*	.20565610	.000	.8096195	2.3890400
	6	1.5951212*	.20565610	.000	.8054109	2.3848314
	7	-.8652968*	.20565610	.020	-1.6550070	-.0755865
	8	1.4631644*	.20565610	.000	.6734542	2.2528747
7	1	.8652968*	.20565610	.020	.0755865	1.6550070
	2	1.7301285*	.20565610	.000	.9404183	2.5198388
	3	2.5650482*	.20565610	.000	1.7753379	3.3547585
	4	1.9787412*	.20565610	.000	1.1890309	2.7684514
	5	2.4646265*	.20565610	.000	1.6749162	3.2543368
	6	2.4604179*	.20565610	.000	1.6707077	3.2501282
	8	2.3284612*	.20565610	.000	1.5387509	3.1181715

1 is ATV Quad Frenzy. 7 is Mario Kart.

Scheffe Homogeneous Subsets:

Game	N	Subset 1	2	3	4
3	13	-.7659582			
5	13	-.6655365	-.6655365		
6	13	-.6613279	-.6613279		
8	13	-.5293712	-.5293712		
4	13	-.1796511	-.1796511		
2	13		.0689615		
1	13			.9337933	
7	13				1.7990900
Sig.		.332	.092	1.000	1.000

Means for groups in homogeneous subsets are displayed.

Based on observed means.

The error term is Mean Square(Error) = .275.

Easy Fun ANOVA to show higher Easy Fun in Easy Fun Games

Tests of Between-Subjects Effects

Dependent Variable:soundvis

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	308.769[a]	7	44.110	18.120	.000	.569	126.841	1.000
Intercept	1111.538	1	1111.538	456.616	.000	.826	456.616	1.000
Game	308.769	7	44.110	18.120	.000	.569	126.841	1.000
Error	233.692	96	2.434					
Total	1654.000	104						
Corrected Total	542.462	103						

a. R Squared = .569 (Adjusted R Squared = .538)

b. Computed using alpha = .05

Relevant Scheffe Multiple Comparisons

(I) Game	(J) Game	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
3	1	5.31*	.612	.000	2.96	7.66
	2	4.62*	.612	.000	2.27	6.97
	4	5.00*	.612	.000	2.65	7.35
	5	1.85	.612	.259	-.50	4.20
	6	3.85*	.612	.000	1.50	6.20
	7	4.85*	.612	.000	2.50	7.20
	8	3.15*	.612	.001	.80	5.50
5	1	3.46*	.612	.000	1.11	5.81
	2	2.77*	.612	.008	.42	5.12
	3	-1.85	.612	.259	-4.20	.50
	4	3.15*	.612	.001	.80	5.50
	6	2.00	.612	.168	-.35	4.35
	7	3.00*	.612	.003	.65	5.35
	8	1.31	.612	.712	-1.04	3.66

3 is Electroplankton. 5 is Gary’s Mod.

Scheffe Homogeneous Subsets

Game	N	Subset 1	2	3
1	13	1.54		
4	13	1.85		
7	13	2.00		
2	13	2.23		
6	13	3.00	3.00	
8	13	3.69	3.69	
5	13		5.00	5.00
3	13			6.85
Sig.		.102	.168	.259

Means for groups in homogeneous subsets are displayed.

Based on observed means.

The error term is Mean Square(Error) = 2.434.

Serious Fun ANOVA to show higher Serious Fun in Serious Fun Games

Tests of Between-Subjects Effects

Dependent Variable:Factor Analysis Seroius Fun

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	55.596[a]	7	7.942	16.084	.000	.540	112.590	1.000
Intercept	.000	1	.000	.000	1.000	.000	.000	.050
Game	55.596	7	7.942	16.084	.000	.540	112.590	1.000
Error	47.404	96	.494					
Total	103.000	104						
Corrected Total	103.000	103						

a. R Squared = .540 (Adjusted R Squared = .506)

b. Computed using alpha = .05

Relevant Scheffe Multiple Comparisons

Multiple Comparisons

Factor Analysis Seroius Fun

Scheffe

(I) Game	(J) Game	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
2	1	1.4318411*	.27562290	.001	.3734614	2.4902207
	3	1.1817170*	.27562290	.016	.1233374	2.2400967
	4	-.7169350	.27562290	.460	-1.7753146	.3414447
	5	1.2058258*	.27562290	.012	.1474462	2.2642054
	6	1.2304134*	.27562290	.010	.1720338	2.2887930
	7	1.4680195*	.27562290	.001	.4096399	2.5263992
	8	.8153702	.27562290	.283	-.2430095	1.8737498
4	1	2.1487760*	.27562290	.000	1.0903964	3.2071557
	2	.7169350	.27562290	.460	-.3414447	1.7753146
	3	1.8986520*	.27562290	.000	.8402724	2.9570317
	5	1.9227608*	.27562290	.000	.8643811	2.9811404
	6	1.9473484*	.27562290	.000	.8889687	3.0057280
	7	2.1849545*	.27562290	.000	1.1265749	3.2433342
	8	1.5323051*	.27562290	.000	.4739255	2.5906848

2 is Big Brain Academy. 4 is Fatworld.

Scheffe Homogeneous Subsets:

Game	N	Subset 1	2	3
7	13	-.6409880		
1	13	-.6048095		
6	13	-.4033819		
5	13	-.3787943		
3	13	-.3546855		
8	13	.0116613	.0116613	
2	13		.8270315	.8270315
4	13			1.5439665
Sig.		.588	.283	.460

Means for groups in homogeneous subsets are displayed.

Based on observed means.

The error term is Mean Square(Error) = .494.

People Fun ANOVA to show higher People Fun in People Fun Games

Tests of Between-Subjects Effects

Dependent Variable:commun

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	495.298[a]	7	70.757	66.195	.000	.828	463.367	1.000
Intercept	803.087	1	803.087	751.313	.000	.887	751.313	1.000
Game	495.298	7	70.757	66.195	.000	.828	463.367	1.000
Error	102.615	96	1.069					
Total	1401.000	104						
Corrected Total	597.913	103						

a. R Squared = .828 (Adjusted R Squared = .816)

b. Computed using alpha = .05

Relevant Scheffe Multiple Comparisons

(I) Game	(J) Game	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
6	1	5.38*	.406	.000	3.83	6.94
	2	5.31*	.406	.000	3.75	6.86
	3	4.92*	.406	.000	3.37	6.48
	4	4.62*	.406	.000	3.06	6.17
	5	5.15*	.406	.000	3.60	6.71
	7	5.15*	.406	.000	3.60	6.71
	8	.15	.406	1.000	-1.40	1.71
8	1	5.23*	.406	.000	3.67	6.79
	2	5.15*	.406	.000	3.60	6.71
	3	4.77*	.406	.000	3.21	6.33
	4	4.46*	.406	.000	2.90	6.02
	5	5.00*	.406	.000	3.44	6.56
	6	-.15	.406	1.000	-1.71	1.40
	7	5.00*	.406	.000	3.44	6.56

6 is IMVU. 8 is Second Life.

Scheffe Homogeneous Subsets

Game	N	Subset 1	Subset 2
1	13	1.23	
2	13	1.31	
5	13	1.46	
7	13	1.46	
3	13	1.69	
4	13	2.00	
8	13		6.46
6	13		6.62
Sig.		.822	1.000

Means for groups in homogeneous subsets are displayed.

Based on observed means.

The error term is Mean Square(Error) = 1.069.

Usability ANOVA to show differences in usability in the games

Tests of Between-Subjects Effects

Dependent Variable:Factor Analysis Usability

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	58.009[a]	7	8.287	17.682	.000	.563	123.776	1.000
Intercept	.000	1	.000	.000	1.000	.000	.000	.050
Game	58.009	7	8.287	17.682	.000	.563	123.776	1.000
Error	44.991	96	.469					
Total	103.000	104						
Corrected Total	103.000	103						

a. R Squared = .563 (Adjusted R Squared = .531)

b. Computed using alpha = .05

Scheffe Homogeneous Subsets

Game	N	Subset			
		1	2	3	4
4	13	-1.1097958			
1	13	-.8339102	-.8339102		
8	13	-.4575888	-.4575888		
5	13	-.1573547	-.1573547	-.1573547	
6	13		-.0610742	-.0610742	-.0610742
7	13			.7987532	.7987532
3	13				.8848836
2	13				.9360869
Sig.		.097	.320	.094	.067

Means for groups in homogeneous subsets are displayed.

Based on observed means.

The error term is Mean Square(Error) = .469.

Appendix J: Relevant Outputs for Phase II

Prediction of Hard Fun by the GUM:

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.542[a]	.294	.276	1.671

a. Predictors: (Constant), Male, HardPredTotal, proglang, GameExpert

b. Dependent Variable: HardHad

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	2.470	.546		4.521	.000			
	HardPredTotal	.015	.002	.480	7.039	.000	.491	.492	.475
	GameExpert	.205	.147	.111	1.395	.165	.031	.111	.094
	proglang	.105	.113	.063	.925	.356	.002	.074	.062
	Male	-1.281	.379	-.271	-3.380	.001	-.203	-.262	-.228

a. Dependent Variable: HardHad

Prediction of Hard Fun by Direct-from-Usability Model:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.359[a]	.129	.106	1.856

a. Predictors: (Constant), proglang, GameExpert, UsableRate, Male

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	2.250	.689		3.266	.001			
	UsableRate	.309	.094	.247	3.276	.001	.233	.254	.246
	Male	-1.523	.421	-.322	-3.621	.000	-.203	-.279	-.271
	GameExpert	.336	.162	.182	2.072	.040	.031	.164	.155
	proglang	.114	.127	.069	.904	.368	.002	.072	.068

a. Dependent Variable: HardHad

Prediction of Easy Fun by the GUM:

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.273[a]	.074	.051	1.706

a. Predictors: (Constant), Male, EasyPredTotal, proglang, GameExpert

b. Dependent Variable: EasyHad

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	3.834	.561		6.840	.000			
	EasyPredTotal	.008	.003	.233	2.984	.003	.210	.233	.231
	GameExpert	.011	.149	.007	.073	.942	-.036	.006	.006
	proglang	.224	.116	.152	1.925	.056	.116	.153	.149
	Male	-.507	.388	-.120	-1.307	.193	-.068	-.104	-.101

a. Dependent Variable: EasyHad

Prediction of Easy Fun by Direct-from-Usability Model:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.166[a]	.028	.003	1.748

a. Predictors: (Constant), proglang, GameExpert, UsableRate, Male

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations		
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part
1	(Constant)	3.938	.649		6.070	.000			
	UsableRate	.090	.089	.081	1.015	.312	.063	.081	.080
	Male	-.408	.396	-.097	-1.031	.304	-.068	-.083	-.082
	GameExpert	.003	.153	.002	.021	.983	-.036	.002	.002
	proglang	.205	.119	.139	1.723	.087	.116	.137	.136

a. Dependent Variable: EasyHad

Prediction of Serious Fun by the GUM:

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.528[a]	.279	.261	1.615

a. Predictors: (Constant), Male, SeriousPredTotal, proglang, GameExpert

b. Dependent Variable: SeriousHad

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	2.142	.551		3.891	.000			
	SeriousPredTotal	.020	.003	.501	7.329	.000	.508	.507	.500
	GameExpert	.056	.141	.032	.397	.692	-.051	.032	.027
	proglang	.192	.110	.121	1.753	.082	.115	.139	.120
	Male	-.518	.366	-.114	-1.416	.159	-.106	-.113	-.097

a. Dependent Variable: SeriousHad

Prediction of Serious Fun by Direct-from-Usability Model:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.300[a]	.090	.066	1.815

a. Predictors: (Constant), proglang, GameExpert, UsableRate, Male

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	2.505	.674		3.718	.000			
	UsableRate	.296	.092	.248	3.210	.002	.225	.250	.246
	Male	-.673	.411	-.148	-1.635	.104	-.106	-.130	-.125
	GameExpert	.008	.158	.004	.049	.961	-.051	.004	.004
	proglang	.258	.124	.163	2.082	.039	.115	.165	.160

a. Dependent Variable: SeriousHad

Prediction of People Fun by the GUM:

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.162[a]	.026	.001	1.896

a. Predictors: (Constant), Male, PeoplePredTotal, proglang, GameExpert

b. Dependent Variable: PeopleHad

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	3.559	.620		5.739	.000			
	PeoplePredTotal	.006	.003	.137	1.706	.090	.122	.136	.135
	GameExpert	.001	.165	.001	.006	.995	-.044	.001	.001
	proglang	-.005	.129	-.003	-.039	.969	-.022	-.003	-.003
	Male	-.491	.432	-.107	-1.137	.257	-.088	-.091	-.090

a. Dependent Variable: PeopleHad

Prediction of People Fun by Direct-from-Usability Model:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.093[a]	.009	-.017	1.913

a. Predictors: (Constant), proglang, GameExpert, UsableRate, Male

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	3.690	.710		5.198	.000			
	UsableRate	.035	.097	.029	.364	.717	.025	.029	.029
	Male	-.411	.433	-.090	-.949	.344	-.088	-.076	-.076
	GameExpert	.002	.167	.001	.013	.990	-.044	.001	.001
	proglang	-.006	.130	-.004	-.049	.961	-.022	-.004	-.004

a. Dependent Variable: PeopleHad

Prediction of Overall Enjoyment by the GUM:

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.418[a]	.174	.153	6.53025

a. Predictors: (Constant), proglang, TotalPredEnjoy, GameExpert, Male

b. Dependent Variable: TotalActualEnjoy

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	7.984	2.327		3.431	.001			
	TotalPredEnjoy	.023	.004	.380	5.180	.000	.367	.384	.378
	Male	-3.470	1.479	-.203	-2.345	.020	-.106	-.185	-.171
	GameExpert	.611	.571	.091	1.070	.286	.028	.086	.078
	proglang	.781	.444	.131	1.760	.080	.083	.140	.128

a. Dependent Variable: TotalActualEnjoy

Prediction of Overall Enjoyment by Direct-from-Usability Model:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.446[a]	.199	.178	6.43376

a. Predictors: (Constant), proglang, GameExpert, UsableRate, Male

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	6.431	2.388		2.693	.008			
	UsableRate	1.861	.327	.412	5.686	.000	.392	.415	.409
	Male	-3.552	1.458	-.208	-2.436	.016	-.106	-.192	-.175
	GameExpert	.712	.562	.106	1.267	.207	.028	.101	.091
	proglang	.903	.439	.151	2.058	.041	.083	.163	.148

a. Dependent Variable: totalenjoy

Prediction of Overall Enjoyment by the sum of the four Fun Keys:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.715[a]	.511	.498	5.02677

a. Predictors: (Constant), proglang, GameExpert, SummedFunKeysActual, Male

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	-.248	1.944		-.128	.899			
	SummedFunKeysActual	.907	.074	.706	12.324	.000	.712	.703	.692
	Male	-.555	1.157	-.032	-.480	.632	-.106	-.039	-.027
	GameExpert	.439	.440	.066	.998	.320	.028	.080	.056
	proglang	.216	.343	.036	.631	.529	.083	.051	.035

a. Dependent Variable: TotalActualEnjoy