Conditions of Engagement in Game Simulation: Contexts of Gender, Culture and Age

Ralph Noble, Ph.D.
Associate Professor, Cognitive Science
nobler@rpi.edu

Kathleen Ruiz, Master of Arts
Assistant Professor, Interdisciplinary Electronic Arts
ruiz@rpi.edu

Marc Destefano
Technical Director, Rensselaer A.I and Reasoning Laboratory
destem@rpi.edu

Jonathan Mintz
Game Studies Research Assistant
mintzj@rpi.edu

Rensselaer Polytechnic Institute
Troy, NY 12180-3590, USA

ABSTRACT
We advocate a research approach to determining the conditions of engagement in game simulation that is a multi-disciplinary cultural and scientific inquiry at the juncture of psychological, artistic, and programming perspectives. What are the factors that cause some people to become enthralled with detail-oriented simulation game-play, while others are captivated by more abstracted, symbolic styles of play? How are the conditions of engagement influenced by gender, culture, and age?

Keywords
Research methodology, psychology of engagement, intuition, decision making, gender, culture, real world psychology and game worlds, game aesthetics, game composition, logistics of perception, synthesis of factors

INTRODUCTION

Problem statement

Game designers rarely give a detailed account of the creation process. Rather, they speak of feelings and intuition [1]. While an intuitive approach to game design by experts has been successful, we believe that it will not reliably support extension of the gaming industry beyond its current markets. Our reasoning for this is simple: the people who are usually interested in game design, and wind up becoming game designers, are what Rollings and Adams call the "hardcore" gamer – intense fans who dedicate a significant portion of their leisure time to playing games [2]. These players are marked by their loyalty, dedication, and attention to detail, and represent approximately 10% of the gaming population as a whole – which is where the problem lies. The intuition of a hardcore gamer leads the designer to create games for other hardcore gamers, not necessarily the "casual" gamers, so sought after by the gaming business.

Since the hardcore game designers rely on their intuition, they wind up making games for the small, but vocal, hardcore game market. Although the methods by which intuitive problem solving are used aren't fully understood, their basic features are well known [3]. Intuitive problem solving is based on relatively automated tools or macros developed through a pattern recognition approach that can take a lifetime to develop, and a key limitation is its dependence on the basic elements of the design problem staying the same. When these change dramatically, this pattern recognition based approach often breaks down. When hardcore game developers focus on the casual gamer market, intuition no longer provides a reliable guide. This situation is directly analogous to the pending crisis in the information technology industry, described by Norman [4]. He indicates that highly technical people develop the newest technology, for use by people who are also technologically sophisticated, and who must accept this new technology to solve their current problems. These individuals are what Norman calls the "early adopters" and who correspond to the hardcore gamers. At this stage of development, intuitive problem solving is a very effective approach. The designers are working within a very stable and familiar problem space – building things for themselves and people just like them. When the technology becomes more stable and more of a commodity, the situation seems to change. Now the market is increasingly composed of non-technical customers, whom Norman calls "late adopters", and they correspond to the game market's casual players. There is reason to believe that there are profound differences between core gamers and casual players, and some speculation that what appeals to a core gamer may turn off a casual user.

Project goal

Our purpose is to create an interdisciplinary dialog about the problems in discerning what the conditions of engagement are, and to present some of the real questions that are needed to develop a tool set to provide answers. We feel it is necessary to scientifically and culturally study casual players from a psychological point of view, to determine what motivates them to initiate and continue playing specific games. We will draw the fundamental research questions we ask from an informed perspective and a rich territory mined by cultural theorists and researchers such as N. Catherine Hales, Mihaly Csikszentmihalyi, Anita Borg, Paul Virilio, Jean Baudrillard, Roland Barthes, Phoebe Sengers and others.

Specifically we apply Hales' concepts of how art can reveal more about the complexity of conceptual shifts and technological innovations than simply a theoretical scientific approach to the research. She leads us to ask, what happens as we disembody into the immateriality of simulated game space? We look to Csikszentmihalyi's seminal research on flow and the suspension of time in conceptualizing the optimal experience in game simulation and play. How does this occur for some and not for others? Anita Borg's ideas about the non neutrality of technology and tools which are shaped by the values and desires of the creators comes into play as many of the subjects, interface and hardware are specifically constructed by one gender. She reminds us that games are cultural artifacts which reflect social ideologies and belief structures within diverse cultures. Similarly Virilio's and Baudrillard's work in parsing out the virtual and the real, their questioning the "departure from duration" and the concepts that new technologies have created new logistics of perception come into play. As players dwell in and upon a simulated moment, game simulation is the perfect medium for the

expression of, and the existence within, the discontinuity of the real. We seek to explore Barths' ideas about the invisible signs which support existing power structures and purport to be natural, but are not. We can use these explorations to help measure the meaningfulness or meaninglessness of specific games to various groups and to widen the dialogs about the social and historical conditions these myths obscure. Finally Sengers' work will also inform the construction of our research questions. She stresses the exploration of the unique role of information artists who have insight to knowledge communities and are a valuable asset to assessing change. Further she reminds us that game design offers a unique nexus for rethinking how other research might be conceived in the future: trans disciplinary bridges coming from arts, computer science, cognitive science, information technology, literature, communication, and engineering. She shows us that massively multiplayer on line games are grappling with the social, political and aesthetic issues inherent in real worlds. Authorship, conflict resolution and the questions she raises about representation in virtual worlds and the very design of our tools and portals to these simulated spaces are of vital importance to the conditions of engagement.

To begin, we will build a taxonomy of games, in order to break down styles of play that would be attractive to different groups. We will examine the differences between gaming worlds and the real world, in order to better describe how to adapt psychological research of people in the real world to players exploring virtual worlds. We will describe relevant and applicable psychological phenomena that will be of use to anyone who wishes to psychologically study gamers, and we will discuss applications of this research for developers to use.

A major justification for this paper is the need to develop a viable approach to determining the motivation of users who are different from the game developers, much along the lines described by Norman. Increasingly, decisions are based on the assertions of recognized experts and the assumption that franchises that were successful in the past will be successful in the future. Ironically, both these decision-making strategies assume a stable situation. In other words, so-called "innovation" is based on the assumption that nothing important will change.

One of the key assumptions derived from these two dominant heuristics is that the more realistic the game, the more desirable it will be to play. Bill Gates has described his intent to move into the gaming industry based on the opportunities created by the new technology that allows a higher level of realism than has ever been achievable. While this may be a goal of designers and core gamers, is it that important to late adopters or casual players? One might more reasonably expect that there is an optimal level of reality, or an optimal level of "similarity to reality".

Difficulty of the game in relation to popularity

Games vary along an indefinitely large number of dimensions, many of which may have some bearing on the terms of engagement associated with each type of game. At this point we will put forward a simple hypothesis relating the effort required to play or learn a game type with both the size and homogeneity of the group playing the game.

What little evidence there is suggests that games which are easy to learn and quick to play have the largest appeal, while games which require long, hard study to master and take a long time to play appeal to a much smaller and select audience (see table 1). At a minimum, it seems reasonable to hypothesize that the less effort required toplay a game, the weaker and less specific the incentives are to get people to play the game, at

least initially or occasionally. It would also seem plausible that the less effort that is required to master a game, the more likely it is that motivational forces unrelated to the game (social pressures, opportunities) are sufficient to motivate people to play the game. In general, the shorter games are built around general problem solving and critical thinking skills of almost universal appeal while complex games with extended play times require the individual to become 'experts' in the domain of the game; a very real commitment reflecting the individuals specific interests, abilities and priorities.

Why people play games: basic psychological considerations

The motivation to play games derives both from the nature of real life and the nature of the games available. Individuals are drawn to games both for the incentives and attractions in the games and to avoid or escape elements of real life that are aversive.

In order to understand individual differences in gameplay we may need to examine not only how individuals differ in their reactions to elements of gameplay, but how these different reactions reflect differences in their daily lives.

Inherent in this escape of reality are factors that are akin to Mihaly Csikszentmihalyi's concepts of flow experience where the following occur: 1) a challenging activity that requires skills, 2) the merging of action and awareness, 3) clear goals and feedback, 4) concentration on the task at hand, 5) the paradox of control, 6) the loss of self consciousness and 7) the transformation of time. [5].

Applying Csikszenmihalyi's thinking into an evaluation model regarding playability is covered in detail in "Communication and Community in Digital Entertainment Services Prestudy Research Report" by Aki Järvinen, Satu Helio and Franz Mäyrä at the Hypermedia Laboratory, at the Univerity of Tampere. [6].

It is clear that people play games to find sources of reinforcement and reward that are not available or imperfectly available in daily life, and to avoid sources of pain and punishment that dominate their daily lives. "Complex cultural, social and representational issues are tied up with conceptual shifts and technological innovations" which encourage and enable people to disembody into the immateriality of virtual gamespace. [7]. Cultural theorist N. Katherine Hales further describes this further in *How We Became Posthuman* detailing the fate of embodiment in the information age. A first step then in understanding why people play games is to understand the games they play.

How to construct a taxonomy of games

We are not aware of any surveys of gamers to determine who plays what games, or how many different games or categories of games different players engage in. At the extremes, it would seem that time-intensive and skill-intensive games command a level of dedication that would seem to require individuals to commit to an individual game or genre of game. Our preliminary study of linkage patterns among websites suggests that the different classes of games constitute distinct worlds that are not well connected.

For the purposes of constructing a game taxonomy, we will work with the definition of a game as "An interactive, self-contained system of rules containing a challenge and a victory condition that defines a focused reality for the purpose of entertainment" [8].

There are several different ways to construct taxonomies of games. For our purposes, we have adapted the taxonomy of Rollings and Adams, largely by adding a category of short, easily executed digital games, which have been referred to as "distraction" games

or "Flash" games (to reflect the technology used to implement many of them). There is preliminary evidence to suggest that generalizations about the motivation for gameplay may be game specific and that different classes of games may have largely non-overlapping constituencies. Survey research suggests that as many as 30 percent of individuals playing digital games are females, who primarily play the shorter distraction or Flash games. Preliminary analysis of website link patterns for action games, strategy games, and role-playing games [Noble, unpublished observations] suggests that there are few links among these different sets of games except through the websites for gaming magazines.

Table 1: A descriptive analysis of basic game types

Game Genre	Learning Curve	Length of typical session	Audience size	Audience Composition
"Flash" Games	Low	5-10 minutes	Large	Diverse
First-Person Shooters	Low to medium	30-60 minutes	Medium	?
Action Games	Low to Medium	30-60 minutes	Medium	?
Real-Time Strategy	Medium to High	1-2 hours	Medium	?
Turn-Based Strategy	High	2+ hours	Niche	?
RPGs	High	1-2 hours	Medium	?
Sports Games	Medium	30-60 minutes	Large	?
Simulations	High	2+ hours	Niche	?
Adventure Games	Medium	30-60 minutes	Medium	?

It is clear from this table that not enough demographic data is available. The Entertainment Software Association has done an admirable job in providing statistics regarding age and gender differences when purchasing games [9], but more detailed information is needed to further break down the categories of who plays what style of game.

Individual differences among gamers

There are many ways to describe or categorize people who play games. The most relevant distinction for our purposes is what Rollings and Adams argue is the major one: the distinction between hardcore gamers and casual gamers, which, as stated earlier, corresponds closely to Norman's distinction between early adopters and late adopters. Intuitively these two groups should have very different reasons for playing games and in some ways diametrically opposed patterns of preferences and aversions.

Age, ethnicity, and gender are also valid dimensions to base a study of individual differences. Very little is known about age based differences in play behavior other than a rapid decline in play with age [10]. There is a substantial decline in curiosity and sensation seeking with age [11], and increase in risk aversion with age [12]. Given the nature of the existing data, it is not clear whether these apparent patterns with age

reflect the effects of age per se or cohort differences among generations. There are clear ethnic or cultural dimensions to the digital gaming world that have not been extensively studied with centers of gaming activity in the USA, Korea, and Japan with fairly dramatic differences among these gaming traditions [13][14][15]. There is not the same extensive conceptual and empirical foundation for these differences that there is for gender differences in play and other game related issues. Later, we will conduct a conceptually driven review of key findings on gender differences as a prototype for how to develop empirically driven heuristics for understanding the needs and interests of targeted groups.

THE MAPPING PROBLEM

We propose that the psychology based on the study of people in the real world can be used to understand players playing games. The basic conceptual and methodological approaches are substantially applicable. It is clear, though, that there are differences between reality and a digital world, and these differences must be systematically examined. The following discussion lays a foundation for such a systematic examination.

Computer based gaming takes place under special conditions that may be more or less attractive than real life. One of our key assumptions is that the human model of reality (or umwelt) is probably substantially simpler than objective reality and in some ways substantially different. Humans rely heavily on heuristics and functional simplifications of reality, some learned [16] and some quite possibly innate [17]. There are several key features that need to be examined:

Objects in virtual reality have no inertia and are not necessarily subject to the complex rules of physical reality. They have only the properties and constraints imposed by the game designer and the player. This provides an opportunity to design realities that correspond to the human model of reality [18]. The nature of the human umwelt is poorly understood, and the game world provides unique opportunities to define it.

Affect is poorly represented in virtual reality. At least with traditional modes of representation and 'realistic' representations of voice and face, virtual reality lacks the bandwidth to fully represent the complexities of human displays of affect and emotion. There are two separate issues requiring systematic investigation. Can recognizable representations of mood and affect be generated by iconic representations with reduced signal complexity? Secondly, can these representations not only depict the affect, but also trigger or modulate the affect in the recipient of the signal?

Social relationships in virtual reality may operate very differently. From the above considerations, it is plausible to hypothesize that relations are harder to form, develop, or even disrupt under these conditions. It is also reasonable to speculate that males who are relatively unskilled at reading non-verbal signals might find this set of circumstances more attractive than females would.

Symbols, stimuli, and even institutions in virtual reality lack the history of association with emotional events and primary reinforcing events that occur in real life. Thus, the affect and arousal-inducing effects of these symbols may require exaggeration to produce a significant emotional impact or a meaningful transfer to real life.

Reinforcers and rewards, which are basically a special set of symbols, do not have access to the same sorts of basic associations with material rewards and fully fleshed-out emotion-eliciting stimuli that they would in real life. This may be partially offset by the speed with which events can occur in virtual reality, a speed which permits very

immediate reinforcement, perhaps too immediate, and very frequent reinforcement relative to real life can produce very powerful conditioning [19]. It is not entirely clear what the currencies are in virtual reality or what their properties might be.

The role of Maslow's Hierarchy of Needs

Maslow's Hierarchy of Needs [20], while vague, provides us with an interesting and important glimpse into how games fit into people's lives. The hierarchy is shown in Figure 1:

Figure 1: Maslow's Hierarchy of Needs

Most people might assume that the role, if any, of video games in this hierarchy would be located exclusively near the top – answering some aesthetic needs that certain individuals may have, but certainly not answering any baser needs. However, new work has dramatically demonstrated the critical role of safety in video games, universally considered to be a "low-level" need of human beings.

First of all, there's the "no one's trying to kill me!" phenomenon that we've seen in our observations of women playing *Animal Crossing*. One can surmise that for people who don't disconnect themselves much from their on-screen avatar, they want a virtual world where they feel safe. Many people do not find violence particularly relaxing, for example. Second, there's the feeling of safety that goes along with the sense of detachment when a player controls an on-screen avatar, or even a voice in a chat room. Players are more willing to act out their fantasies, and will often lower the barriers that they have erected for use in face-to-face conversation. With the added degree of separation, players are able to escape their feelings of vulnerability. Third, and perhaps most importantly of all, there's the issue of safety in massively multiplayer online games targeted for children [21]. Playtesting of *Toontown Online* showed that young children gave out personal information to strangers that they met during the course of play. This is, naturally, a phenomenon that designers must be conscious of, and must be controlled, if not avoided altogether. In this case, the designers limited the player's ability to communicate by only allowing the avatar to "speak" one of a large collection of pre-written statements.

Maslow's hierarchy as a basis for game description and analysis

Maslow's hierarchy of needs can be used as the basis for an empirical analysis of existing games in an attempt to understand why different group of people play different games. It should be relatively straightforward to characterize major popular games in terms of the needs (in Maslow's terms) that are either met or, in the case of safety and danger, exacerbated for some groups of individuals. If we combine an analysis of the

demographics of different games with a reasonably detailed analysis of how these games meet or fail to meet the needs of different groups then we can come to a deeper understanding of the terms of engagement for digital games. In this approach it is important to keep in mind a key feature of Maslow's model, a feature which has been substantiated in general terms by a great deal of careful research, that the higher levels of needs only come to operate when the lower level needs are met [22] at least in the sense that the individual has the strong expectation that they could meet those needs if they chose [23].

AN EMPIRICAL BASIS FOR DEVELOPING GAMING HEURISTICS

Perspectives from Ethology and Evolutionary Psychology

Gaming is an international phenomenon, and at least some elements of gameplay may have universal appeal based on cross-cultural invariants. The study of cross-cultural invariants or universal elements of human behavior have been most extensively studied by ethologists and evolutionary psychologists. [24]. Many features of human behavior - from specific and concrete gestures and movements (reflexes, fixed action patterns), basic predispositions to learn some things more readily than others [25], preferences and values, fundamental aesthetic preferences, and even the overall model of reality have been shaped by their contribution to the overall ability of humans to behave adaptively within the social and ecological environment within which humans evolved. Within our limited space we can only point to core concepts that might provide a valuable basis for the development of overarching strategic approaches to game design. Schiller's concept of umwelt is foundational to any realistic approach to gaming [26]. Once we recognize that the human brain is designed to support effective action rather than to provide an accurate and rational picture of the world around them, the concept of an umwelt, or model of reality inherent in the human perception of things, becomes relatively straightforward. Learning about reality requires some primitive model of framework for organizing the learning experiences. The basic approach to recoding music into MP3s is based on the realization that the human representation of sound is highly simplified. All of these examples are intended to illustrate a key concept: the human representation of reality is in all likelihood much simpler and easier to represent than one might expect, and super-realism may be both unnecessary and unproductive.

Key elements of social interactions may also be represented in a simplified fashion as what ethologists labeled as social releasers [27]. Both Konrad Lorenz and Walt Disney share the belief that certain elements of the appearance of newborn human infants act as powerful social releasers triggering complex combinations of emotional responses, cognitive dispositions, and behavioral tendencies. One feature of social releasers is that it is often possible to design synthetic "supernormal stimuli" that are simplified and highly potent substitutes for the natural stimuli. It is possible that cross-cultural universals exist in several components of social interaction that could be reduced to highly simplified stereotyped sequences of "social releasers" [28].

Conditioning Theory

While hardwired innate releasers may play a significant role in motivating human behavior, the vast majority of emotional responses are elicited by stimuli which have acquired their significance and capacity to elicit organized emotional responses from repeated and organized pairing with events that have inherent emotional significance (e.g. pleasure, pain, sexual arousal, fear) to produce conditioned emotional responses (CERs). While conditioned emotional responses are inherently specific to the life history of the individual, uniformities of experiences common to particular specific

groups may produce some shared emotional symbols [29]. There are two key questions here. First, can conditioned emotional responses developed in the analog world transfer to the digital world (or vice versa)? Second, can conditioned emotional responses be effectively developed in the digital reality (e.g. the CER associated with Microsoft's "Blue Screen of Death", or the 'smiley face')?

There are several factors that contribute to difficulties with forming CERs in digital reality. Conditioned emotional responses are often much more easily formed to the olfactory, or tactile dimensions of the experience while the auditory and visual dimensions of the experience do not form conditioned emotional responses as readily [30]. The limbic system and associated neural structures that play the dominant role in emotional experiences evolved from the olfactory cortex and retains privileged relationships to olfactory stimuli [31]. Digital reality is highly impoverished with respect to the kind of event that elicits primary emotional responses. Finally, when playing games in digital reality there are few and limited behavioral responses so that not much is going on in the body to support the development of CERs. It is possible that these limitations can be offset by the frequency with which potentially significant events can occur in digital reality.

It is impossible to predict the ease with which conditioned emotional responses can generalize between analog reality and digital reality. Certainly the factors suggesting that it would be difficult to form CERs in digital reality would also suggest that it is difficult for CERS formed in analog reality to generalize to digital reality. Generalizing from digital reality to analog reality might be easier.

Reinforcement models

Clearly something about digital games has a powerful potential to produce intense focus and extended play. Given the speed of cyberspace and the frequency with which events can take place, digital games have enormous potential for acting like digital Skinner boxes. The reinforcement model focuses attention on two issues: the reinforcement structure of the game, the frequency, immediacy, and schedule of reinforcement; and the sources of reinforcement built into the game, including opportunities for victory, problem solving, and social interaction. Extensive research with operant conditioning makes it clear that the power of conditioning is the frequency with which reinforcing events takes place, and the immediacy with which reinforcement follows the behavioral event. The frequency and immediacy of events in digital games provides an opportunity for very intense and powerful conditioning.

The key question is what kinds of events can act as reinforcers in digital reality. Most of the motives that would seem to support reinforcement in cyberspace would be related to cognitively mediated motives. Some motives seem to lend themselves to reinforcing performance in digital gaming are play, mastery, and competition.

Cognitively mediated motivation

Cognitively mediated reinforcement is a highly individualized process. While the potential for immediate high frequency reinforcement is inherent in the nature of digital games and there is even evidence that game designers have reinvented the partial reinforcement effect [32], the nature of reinforcing events within the gaming reality is not well defined. Players who are trying to solve problems or master a challenging system may derive reinforcement from solving problems, while players operating in a competitive frame of mind derive reinforcement from defeating others. Still others may derive reinforcement from social interactions. There is always the possibility that

substantial reinforcement for playing comes from avoiding aversive elements of the external reality.

Gender differences relevant to playing digital games

If all forms of digital games are included, as many as 30 percent of game players are female, and a general understanding of gender differences is critical to the analysis of motives for engaging in games. The gaming industry has been characterized as highly dominated by technically oriented males and the cultural values and beliefs specific to this overriding group. Many of the efforts to diversify the gaming market are not well anchored in an understanding of gender differences. Take for instance the following post by Jane Pickard, Sanford Law School Center for Internet and Society fellow, to the http://www.gamegirladvance.com website:

> As a woman who plays video games, I've *had* to think about gender in videogames, because it's so obvious that I'm playing in a boys' world.
> The late Dr. Anita Borg taught that technology isn't neutral; tools are shaped by the values and desires of the creators. Often the creators tend to be clueless to the values encoded in their tools, because to them, the tools are transparent - they reflect pure utilitarianism. But to those who are excluded, the tools are highly charged.
> This is especially true I think of videogames, where everything from the environment (the marketing, the merchandising, the image of the industry) to the peripherals (the laughably phallic joystick, the original Xbox controllers which are too big for my hands, the color scheme of the Xbox) are male-friendly. The attitude seems to be, "Maybe some women play our games, but we don't really know, and frankly, we don't care." [33]

Can a knowledge of gender differences facilitate the design of gender appropriate games or games that appeal to both genders, and what kind of information is most useful? For example it is plausible that men seek the "safe" opportunities for aggression in virtual realities while women may be seeking refuge from the excessive violence of reality.

It is an interesting open question whether games can be designed with strong universal appeal. Men and women live in substantially different realities; both in terms of their experiences and the amount of time and other resources they have available for discretionary activities. Further our research aim in investigating the conditions of engagement in game simulation is to explore the meaningfulness or meaninglessness of specific games to various groups and to recognize that games are cultural artifacts which reflect social ideologies and belief structures within diverse cultures. [34]

Gender differences in aptitudes

The most dramatic gender differences are in the area of social perception and the recognition of affective displays. Females are much better at detecting social signals and interpreting emotional displays both in real life and symbolic representations even in representations as abstract as smiley faces [35]. It is possible that the inhibition of emotional language in virtual reality [36] leads to a level of emotional signaling that is comfortable for males, but actually painful for females. There are also fairly reliable differences in depth perception (males superior to females) [37], and multitasking with

small motor activity (females superior to males) [38] that would influence considerations of usability.

Gender differences in play style

Probably the most dramatic and widespread gender difference is the disparity in rough-and-tumble play. Primate males, including humans, engage in rough-and-tumble play as long as they have enough social standing to get away with it [39]. Primate females, human and otherwise, don't engage in rough-and-tumble play growing up. Rough-and-tumble play has been observed in males of many unrelated cultures [40], and there is reasonably good evidence suggesting that the tendency to engage in rough-and-tumble play reflects prenatal exposure to androgen, which is the putative biological mechanism for masculinity in mammals. Human males early on show a disposition for simple active play in large groups while females engage in more complex role playing types of behavior in small groups. These differences are most pronounced in the first four years of life and may be substantially overlaid by later socialization processes [41].

Gender differences in motivations and preferences

There is evidence to suggest that while males and females share similar goals in the pursuit of status, they obtain status in different ways. The standard canonical version stating that males pursue status by competing within linearly arranged dominance hierarchies while females pursue status within complex nonlinear affinity networks has substantial support from many different sources. This point of view can best be illustrated by some relatively simple research conducted some time ago.

Omark demonstrated that males and females understand different elements of the social system at a very early age. In some innovative work on the social structure of kindergarten classrooms, Omark was able to demonstrate that males clearly and accurately perceived the linear dominance hierarchy among males, although most males systematically exaggerated their own standing. Strikingly six-year-old females were unable to accurately describe the male hierarchy, and females in general were unable to accurately describe the male hierarchy until about fourth grade. This is perhaps still the only research demonstrating male superiority in social perception. Even in kindergarten, females are capable of describing elaborate nonlinear systems of social affinities and clearly are able to describe patterns of friendship and association beyond the ability of kindergarten males, or even fourth grade males, to comprehend.

The differences between males and females may be more a matter of style than substance. Noble and Noble [42] explored this possibility by examining interactions among males and females that focused on the outcomes of confrontations over popular toys in a preschool classroom. There were no gender differences in the frequency of attempts to take possession of the desired object or in the outcome of such attempts. When objects of equal value to males and females of that age are involved gender differences in confrontation frequency or outcome are minimal. Differences in style and technique however are quite revealing. While most confrontations were of the straightforward grab and run variety, a significant number speak directly to a possible difference in the social realities of males and females. On occasion the children would resort to verbal threats. Males would threaten to beat up the target, and possibly recruit their friends to beat them up too. Females would threaten other females that they would not be their friend any more and would recruit their friends to do likewise.

RESEARCH APPLICATIONS FOR INDUSTRY

Norman's analysis of the early/late adopter model is easily recognizable to people used to working in high-tech markets. The business community has developed certain strategies for dealing with this particular problem set, typified by the approach outlined in Moore's *Crossing the Chasm* [43]. His methodology involves recognizing and targeting increasingly larger segments of the total potential market with specific applications of a technology, a model that has been applied to a number of products.

The task of bringing gaming to a larger audience, however, does not readily conform to such tactics. The high cost of console publishing in the gaming world mean that targeted niche marketing is generally confined to PC gaming (e.g. complex, turn-based war games.) With the decline of the video game arcade, new customers for gaming must instead be brought in from the sizable audience of "flash" game players and casual gamers – those who enjoy games from time to time, but have not found any game experience attractive enough to warrant an investment.

The understanding of gamers and their motivations offered by research methods outlined here will be invaluable in discovering the paths to this mainstream market. Solving the mapping problem will allow the use of psychological models to examine the differences between the "flash" game player and the devoted gaming enthusiasts. Once an understanding of this distinction is acquired, it can be directly applied to game development that is able to break away from intuitive or derivative models of design and thereby attract a broader audience. This work will open the door to the feasibility of developing new types of games which include among others, first person actor type games as described by Craig Lindley [44], immersive reality games, abstract play and innovative emerging forms.

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