HCI Issues in Computer Games

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Introduction

"Play is older than culture … all culture is an element of play." (Huizinga 1944)

The mid 20th century witnessed some serious attempts in studies of play and games with an emphasis on their importance within culture. Most prominently, Johan Huizinga (1944) maintained in his book Homo Ludens that the earliest stage of culture is in the form of play and that culture proceeds in the shape and the mood of play. He also claimed that some elements of play crystallised as knowledge such as folklore, poetry and philosophy as culture advanced.

A more contemporary play scholar, Chris Crawford (1982), in his seminal book The Art of Computer Game Design scrutinised play within computer games and maintained in line with Huizinga that play is the sources of knowledge and that the most fundamental motivation of play is, in fact, to learn.

As cultures move forwards, the notion of play seems to receive more positive recognition among the society. In the society where youthfulness is regarded as a desirable state of human life (where cosmetic surgery is popular especially for women, and both sexes alter their hair colour with chemical dyes to hide the natural greying that occurs with age), playful behaviour might be one of the ways by which their members can present themselves as youthful (Kücklich 2004).

In addition, as human civilisation advances toward the post-industrialism era, people have more leisure time and disposable income to engage in play activities. As more emphasis is put on creative forms of labour, the boundaries between work and leisure time become blurred. Offe (as cited in Bills 2003) for example identified a trend away from work and toward leisure as the means by which people establish their identities in contemporary society.

Computers and games

With the development and pervasiveness of new technologies, play becomes one of the important beneficiaries. New technologies such as the computer have revolutionised the way games are played.

Computer games have become one of the fastest growing and most economically successful kinds of software. The worldwide market for computer games and interactive entertainment hardware and software is expected to grow from £11.7 billion in 2002 to £17 billion in 2007. In the US alone, retail sales of video game

hardware, software and accessories grew 10% per year in the last few years (RocResearch 2004).

However, the escalating economic importance of the computer game, indicated by the rapidly burgeoning revenue within the game industry over the past few decades, cannot be the sole yardstick in measuring its cultural value. As a matter of fact, as a new form of play, computer games continue to receive negative recognition from the society. They are still held in rather low value by policy makers. Most schools and organisations for example ban such forms of activities in the classroom or at the workplace.

This is exacerbated by a plethora of research writings that over-emphasise the detrimental effect computer games have from various perspectives. It is claimed that the prolonged use of computer games contribute to obsessive, addictive behaviour, dehumanisation of the player, desensitising of feelings, health problems, and other disorders (Setzer and Duckett 2000). Others argue that computer games encourage the development of anti-social behaviour among computer game players (Williams and Skoric 2001).

Perhaps the most debated issue concerning games and teenagers is its connection to violence. A growing body of research is correlating violent computer game play to aggressive cognitions, attitudes, and behaviours. A number of studies have shown a positive association between the amount of video game play and aggressiveness among children, adolescents and even adults. (Bushman and Anderson 2002; Gentile, et. al. 2004).

Nevertheless, the signs of change are all around us as the computer game industry is progressing towards maturity. New games are no longer primarily aimed at teenage male audiences. As the average age of game players is steadily growing, the target groups are expanding to include those in their twenties and thirties. Furthermore, more females are now becoming casual game players and this marks the gradual change of games as a mainstream medium.

In addition, there are some games that incorporate violence in a different context. Bestseller games like SimCity actually portray violence as a form of failure. Violence is thus regarded as destructive and will eventually lead to failure given that the goal of the game it to be self-sustaining and constructive (SFGate 2002).

Furthermore, studies about violence in computer games are being refuted with new research. Some reviews of studies on the subject of computer games and behaviour have concluded that there is no link between video game use and aggressive behaviour in children (IDSA 2001). Dmitri Williams (Williams and Skoric 2005) support the contention of those who suggest that some violent games do not necessarily lead to increased real-world aggression. Contrary to general opinions and most previous research, his study found that players' exposure to a violent online game does not cause any substantial real-world aggression. In other words, aggressive behaviours observed while playing in the game world have not been transferred to the real world. What is important to look at is the relation between games players and their social interaction to see if the violence in games affect players in any way.

As their potentiality as a new medium for expression continues to grow, computer games are being used for more than simply entertainment. Some argue that it is time for games to deal with more serious matters. The term "serious game" was coined in 2002 with the start of the serious game initiative lead by David Rejeski and Ben Sawyer (Stokes 2005). It focuses on the use of games in education, training, health, public policy, etc.

The early advent of serious games is marked by the inclusion of serious elements in commercial games which are designed predominantly for entertainment. These commercial games, such as Civilisation and SimCity, although aim to be entertaining, include serious elements, namely human history and civilisation as well as city management.

More recently, there are some games developed specifically for non-entertainment purposes. The first political campaign game was launched at Christmas 2003. The game, called "the Iowa Game", was developed to help Howard Dean supporters understand grassroots outreach and to encourage them to participate in pre-caucus campaigning in Iowa (Dean for America 2004). Following this in 2005, the World Food Programme (2004) developed "Food Force", which seeks to take advantage of the popularity of computer games to educate children about hunger and the work of the aid agency.

Another example is the game designed with the help of the New York Fire Department, aimed at training fire fighters on how to deal with conventional, environmental, biological and terror-based incidents while functioning as a team where the players play the game through networked computers communicating through headsets to complete cooperative tasks (Entertainment Technology Center and Carnegie Mellon University 2005).

Although these accounts might be anecdotal, they seem to indicate that computer games, or games in general are no longer seen as mere child's play, but rather as important forms of expression that play a central role in our culture. As Huizinga claims, *"that culture arises in the form of play, that it is played from the very beginning"*

In the summer of 2002 the Barbican Art Gallery in London presented Europe's largest gallery exhibition to explore the history and the culture of computer games, showcasing international leading talent and innovation within the game industry. The show presented a definitive overview of the past, present and future of games, from the earliest computer game through to the latest advances of technologies and interaction. It successfully attracted 50,000 visitors and can be regarded as an acknowledgement of the cultural importance of games in the late 20th and early 21st centuries.

Undoubtedly, computer technologies are not only a tool for work. Starbuck and Webster (1991) predict that current and future forms of computer technologies will be used for both work and fun, causing a reduced distinction between work and play. The modern conceptualisation of play presents two different concepts: unproductive play

(something that is unproductive and enjoyable) and playful work (something that is productive and enjoyable). Even systems that are not built for entertainment are expected to be a pleasurable experience. Thus studying computer games as a serious activity might be beneficial in many ways: e.g. designing pleasurable and playful (collaborative) work, communication or learning.

Computer game studies

There is now almost no doubt that games and play are something worth studying academically due to their commercial importance, their increasing recognition from the society regarding their cultural importance, and their application on non-play or serious domains.

Most notably, this area has received a fair amount of attention from anthropologists and sociologists. The emergence of computer games pushes the envelope of scholarly game studies while artists are now earnest about deconstructing computer games as a piece of artwork and psychologists are interested in human behaviour of playing such games. Naturally, being a subset of software, computer games are also becoming a popular topic among computer scientists including those who deal with human factors of computer use.

Although the game itself is as old as human culture, game design does not have a history of theoretical work like graphic design or architecture to support game analysis and research. Furthermore, the basics of game design and evaluation are still unexplored. Indeed, the migration of play to the new computerised platform calls for new forms of academic studies as well as special ways of handling in term of design and evaluation

The advent of computer games marks a new milestone of game studies. Like its classic counterparts, the computer game is now gaining more and more attention from the academic field. Now not only have we a body of research devoted to game development that deals with the technical, hardware, software and programming issues, we are expanding the study to deal with the theoretical and aesthetic aspects of computer games. Some areas of game studies (not exhaustive) are listed below:

Theoretical issues

The study of games as a system including narratives or interactive stories, rules and simulation, semiotic systems and formal models. Some scholars examine the theoretical question of how to understand ludic systems using semiotics, while others explore how games can be considered formal models, and how we can use this to analyse specific games.

Methodological issues

Another important topic in this area (and perhaps more interesting in the game industry) is that of methodologies in design and evaluation which are most closely related with HCI. Various design evaluation methods such as player-centred design, player (user) testing, usability and playability are explored. There is a call for early involvement of players in scenario studies for game design.

Technical aspects

It is the traditional computer science research involving algorithm and artificial intelligence, mathematical solutions for graphics and visualisation, technicality on audio/video/network issues, etc.

Social cultural aspects

Social cultural studies on computer games are gaining much popularity recently due to the emergence of Massively Multiplayer Online Role Playing Games (MMORPG) in which player-player interaction plays a very important role. Research in this area ranges from virtual identity, sociability design, cultural impacts of games, participatory culture as well as media and communication.

Application to other areas:

Finally there is also an increasing amount of interest in applying computer games, or game design methods to other areas, most notably military or corporate training, education (especially children education), HCI as well as CSCW.

Despite the lack of formalist methodologies, some computer games are highly successful commercially. James Gee (Gee 2003) believed that this is due to the fact that games that people cannot learn to play and from which they do not get the enjoyment of learning would not sell. In other words, the commercially successful games are designed with good learning theories even though it is not intentional. On the other hand, business applications are driven by business needs and thus can get away with a much higher level of difficulty.

Besides, a good game is also accompanied by the pleasure of socialising and interaction with other players. Thus we argue that learning and sociability are two important criteria game designers may want to apply to game design. Playing computer games is interrelated to learning and socialising. One cannot play a game solitarily in a meaningful sense without interacting with the others. Similarly, playing games involves some extents of learning.

HCI studies in computer games

There is an increasing interest in approaching game studies from the perspectives HCI. Although there has not been much published on this topic, some relevant work has been undertaken to study computer games from various aspects through the lens of HCI. Some examples include the research of game technologies such as 3D graphics and 3D sound (Zhou et. al. 2004) to enhance engagement and immersion in game playing. Visual and audio elements of computer games such as background colours and the sound volume have also been studied in order to find out the effect of such elements on player performance (Wolfson and Case 2000).

Others investigated novel forms of interaction such as tangible interfaces (Price et. al. 2003) to encourage collaboration and techniques of gathering user requirement for design educational game (Bekker et. al. 2003). Some studies focused on the human behaviour and physiological responses such as frustration (Scheirer et. al 2002) in

order to better understand the interface design toward building affective computer through the study of computer game play.

In term of research in game usability, Federoff (2002) attempted to generate heuristics and usability guidelines for the creation and evaluation of fun in video games by working closely with game developers. Following this, Desurvire, Caplan and Toth (2004) developed a method, known as HEP (Heuristic Evaluation for Playability) as a comprehensive set of heuristics for playability specifically for evaluating games. Another project, known as the 400 Project (Falstein and Barwood 2006) is another attempt to gather computer game heuristics which are being compiled by game designer and producers from the game industry. Some of this work attempts to generalise the findings across work-based software: how understanding computer games help design pleasurable and enjoyable CSCW, learning and HCI in general. (Davis and Carini 2004).

An other example is Malone's work on educational games. Malone in his early work on the motivation of computer game based learning, proposes the heuristics for game designers and researchers. The heuristics for the fun factor of computer games consists of three main elements that draw largely from Csikszentmihalyi's (Csikszentmihaly 1990) flow theory: challenge, fantasy and curiosity. Apart from these, there has also been research on the evaluation of the usability of games (Höysniemi, Hämäläinen and Turkki 2003)

The contents of this special issue
Our special issue starts with two papers that look at the issue of new forms of input and output for computer games. In the first paper, titled *'Bimanual Text Entry using Game Controllers: Relying on Users' Spatial Familiarity with QWERTY'* Frode Eika Sandnes and Andre Aubert propose a strategy for entering text using two handed game controllers with two analogue joysticks. The QWERTY keyboard layout was used as a spatial mnemonic. The technique can be realised with commonly available off-the-shelf hardware and it is especially applicable to online gamers communicating textually. The paper concludes by presenting findings that support that it can be very efficient for players in the use of such an input style.

The second paper under this theme, titled *'High-Resolution Gaming: Interfaces, Notifications and the User Experience'* is authored by Andrew J Sabri, Robert G Ball, Alain Fabian, Saurabh Bhatia and Chris North. The authors developed various display prototypes to explore the different aspects of gaming on large, high-resolution displays. By running a series of HCI experiments, they were not only able to evaluate the benefits of these displays for gaming, but also identify potential user interface and hardware issues that can arise. In many cases, the new techniques developed can be applied to single-monitor games as well as solve the same problems in other high-resolution applications.

Our second theme looks at the human side of HCI issues in computer games. In their paper *'A Model of Cognitive Loads in Massively Multiplayer Online Role Playing Games'* Chee Siang Ang, Panayiotis Zaphiris and Shumaila Mahmood start by pointing out that playing Massively Multiplayer Online Role Playing Games (MMORPGs) might cause cognitive overload problems among the players as they

have to constantly interact with the game world as well as with other users. They report the findings of an exploratory study that shows that several types of cognitive overloads emerge during the game playing. While some of these overloads pose serious problems even to expert players, players seem to develop strategies to overcome them. It is found that some forms of cognitive load are actually desirable in order to make the game challenging. The authors also list a number of recommendations that help game developers handle cognitive load problems in MMORPGs. The second paper under this theme, titled '*Videogame Values: Human-Computer Interaction and Games*' authored by Pippin Barr, James Noble and Robert Biddle advocates that current HCI research into videogames rarely considers how they are different from other forms of software and argues that videogames contain systems of values which players perceive and adopt, and which shape the play of the game.

The next paper for this special issue looks at the area of Inclusive Design and accessibility of computer games. Saija Patomäki, Roope Raisamo, Matias Hasu and Virpi Pasto in their paper '*Design and Evaluation of a Tactile Memory Game for Visually Impaired Children*' advocate that there is a lack of proper software and hardware that allows visually impaired people to easily make use of modern technologies. The purpose of their study was to develop usable games for visually impaired children making use of low-cost vibro-tactile devices in multimodal applications. A tactile memory game using multimodal navigation support with high-contrast visual feedback and audio cues was implemented. The usability and playability of the game was tested with a group of seven 12-13-year-old visually impaired children. A classical memory game was designed to be played with a tactile gamepad. The results showed that a gamepad was usable and the game got a positive response from the focus group.

The special issue concludes with a short paper under the general theme of Game Design proposing directions for future research in this area. The paper is titled '*Applying Simulation Experience Design Principles to Creating Serious Games for Adaptive Thinking Training*' and is authored by Elaine Raybourn . It discusses the Simulation Experience Design method employed to create an engaging computer game for training teams to think adaptively.

This special issue aimed at raising the major HCI issues in the study of computer games and provides an overview of what is being done in this interesting field. Hopefully it will benefit those who are working in this exciting area.

John Knight, Anita Komlodi, Julian Kücklich, Sri Hastuti Kurniawan, Maria Kutar, Effie Lai-Chong Law, Loucas Louca, Catriona Macaulay, Michael McNeill, Omar Merhi, Dean Mohamedally, Adrian Moore, Lene Nielsen, Sylvie Noël, Ulrike Pfeil, Ian Pitt, Marisa Ponti, Pertti Saariluoma, Ben Salem, John Salisbury, Till Schuemmer, Magy Seif El-Nasr, Roger Stone, Karl Stringer, Penelope Sweetser, Sharon Tettegah, Phil Turner, Charlotte Wiberg, Mikael Wiberg, Peta Wyeth, Giorgos Zacharia, Daniela Zambarbieri, Jürgen Ziegler.

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