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Investigating Intention To Use An Interactive Television Game

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DIGITAL INTERACTIVE MEDIA

INVESTIGATING INTENTION TO USE AN INTERACTIVE TELEVISION GAME

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Abstract

Besides the excellent quality of picture and sound, and the plethora of available channels, digital interactive television provides access to applications and services with the touch of a button. Interactive television games are becoming popular since television viewers are able to virtually participate in the game. The aim of the work presented in this paper is to investigate factors affecting users' intention to use an interactive television game that is built upon a popular television game. Towards this aim, we formed a model based on the Technology Acceptance Model (TAM) as well as additional factors derived from previous research in the domains of online games and fun information systems.

Keywords: *Digital Television, Interaction, Interactive Television Game, Technology Acceptance Model*

1 INTRODUCTION

Digital interactive television has dramatically changed the television viewing experience turning passive viewers to active participants enhancing the viewing process. TV program control, product and service purchasing, voting and expressing opinions, access to services such as electronic program guides, video on demand, games, or t-banking are only some examples of the digital television offerings (Fontaine & Meyer 2000).

Among the most popular applications in the Internet environment are interactive games. Several researches have studied the factors that influence the adoption of these games or more generally the adoption of entertaining information systems. However, there is relatively little work done in the domain of interactive television games, concerning the intention to use these applications. In particular there is a growing interest for on-line games that are built upon television games, providing viewers the ability to play concurrently with the player(s) in the studio.

The aim of this research is to investigate viewers' (users') intention to use an interactive game over a TV ga,e, and to explore influencing factors. For this purpose a Macromedia Director interactive application was developed and multiplexed with the video of the popular TV show "Deal". Television viewers were invited to use the interactive application and play within the context of the TV quiz.

The theoretical framework of our research is based on the Technology Acceptance Model (TAM) which has been used in several cases where the aim was to predict the acceptance, adoption and use of modern information technologies (Davis, 1989). Theoretical insights concerning the factors that affect intention to use were drawn from the online games domain (Wu & Liu 2006) as well as from the entertaining and fun information systems domain (Chesney 2006).

The remaining of the paper is organized as follows: in the next section the design of the interactive application is briefly presented followed by the presentation of background work and the formulation of the research hypotheses. In section 4, the results of the empirical research are discussed and the paper concludes by presenting the limitations of this research and future work plans.

2 DESIGN OF THE INTERACTIVE GAME

In the general version of the game "Deal", there are 22 closed boxes or briefcases each one containing an amount of money ranging from 0.01 to 200,000 Euros (or more). All 22 amounts are displayed on a large board. The player of the game picks-up a briefcase that is reserved and opened only at the end of the game. The player is entitled to collect the amount of the reserved briefcase if she has not accepted the 'banker's' offer at some point of the game. The player starts selecting briefcases one-by-one, which are opened and the amount of money contained is removed from the board. If small amounts are removed then the possibilities the reserved briefcase contains a large amount. The banker makes offers to the player at certain intervals estimating the possibility that her reserved briefcase contains a small or large amount. The goal of the palyer is to leave the game with largest possible amount.

Before we ran the scenario of the game, we made an exploratory field research, observing the reactions of members of a family while they were watching the game. The reactions were recorded in two certain points of the game: a) when the player rejected (i.e. responded 'no deal') the banker's offer while there were still large amounts in the game (the reactions included comments such as: *"go on", "don't stop", "no deal"* and *"take the money"*) and b) when the player rejected the banker's offer, when only small amounts of money had remained (i.e. less possibilities that the reserved briefcase contains a large amount). The reactions included comments such as: *"stop", "no", "take the money"* and *"he will lose everything"*.

This field research although of limited range, provided insights for the development of the interactive game's scenario. The main idea underlying the scenario was to enable the viewer to select "Deal" or "No Deal" from his house (to accept or reject the offers of the banker) using the TV remote control and influence with his preferences the basic player in the studio. First, the viewer makes his "Deal" or "No Deal" from his house (Figure 1). Then, the basic player is able to see statistics concerning the viewers' choices and after that he makes his own "Deal" or "No Deal". Thus, at the same time the game involves both the viewer and the basic player.

Figure 1. *Viewer is able to select "Deal" by pressing the green button on the remote control or "No Deal" by pressing the blue button*

The game was designed in accordance with the principles of Human – Computer Interaction (HCI) taking into account. TV-specific parameters such as the relatively long distance between the viewer and the TV set, the screen resolution, the limitations of input devices (i.e. remote control) etc. In order to avoid major usability problems (that might affect the empirical research), the heuristic evaluation method was used. (Nielsen 1993). Five experts contributed for this purpose and the final prototype (Figure 2) was developed following the experts' comments.

Figure 2. On-line menu navigation

3 BACKGROUND WORK AND METHODOLOGY

3.1 Research Hypotheses

In order to investigate intention to use the interactive game we utilized the Technology Acceptance Model and exploited findings from previous researches concerning intention to use hedonic information systems (Van der Heijden 2004, Chesney 2006); intention to play online computer games (Gao 2004), and the effects of trust and enjoyment on intention to play online games (Wu & Liu 2006).

Moreover, this research is differentiated from previous works since it investigates the factors that affect intention to use an interactive television game (previous researches have focused on online computer games and useful and fun information systems in internet environment). In addition, the scenario of the interactive game, involves the virtual co-operation between the home players and the main player in the studio providing a new form of interactive playing.

Van der Heijden (2004) found a positive relationship between Perceived Ease of Use and Perceived Entertainment, as well as Perceived Entertainment and Behavioural Intention to Use. These two relationships lead us in the first two hypotheses:

- Hypothesis 1 (H1): There is a positive relationship between Perceived Ease of Use and Perceived Entertainment of the game.
- Hypothesis 2 (H2): There is a positive relationship between Perceived Entertainment and Behavioural Intention to use the game.

The next hypothesis is based on existing relationships of Technology Acceptance Model (Davis 1989, Davis, Bagozzi & Warshaw 1989) and is as follows:

- Hypothesis 3 (H3): There is a positive relationship between Perceived Ease of Use and Behavioural Intention to use the game.

According to Wu and Liu (2006) attitude towards the use of games include an overall evaluation of the outcome of the use of games. If a player has a positive attitude towards the use of games, she is more likely to participate in the games. Also the players that they perceive the games as fun/enjoyable and pleasant are more likely to be satisfied. Subsequently, satisfied players will develop a favorable attitude towards the use of games. The above, lead us to following hypotheses:

- Hypothesis 4 (H4): There is a positive relationship between the Attitude towards the Use and the Behavioural Intention to Use the game.
- Hypothesis 5 (H5): Perceived Entertainment is positively related with the Attitude Towards the Use of the game.

The sixth hypothesis is based on the existing relationships of Technology Acceptance Model (Davis 1989, Davis et al 1989) and is the following:

- Hypothesis 6 (H6): Attitude towards the Use of the game is positively related with the Perceived Ease of Use of the game.

The figure below (Figure 3) shows the research model with the research hypotheses:

Figure3. The research model

3.2 Empirical Research

In order to empirically test the above hypotheses, a survey was performed among the inhabitants of Larissa city, Greece. The survey was conducted in a period in January and February 2009. The target population was residents of the municipality of Larissa mainly of higher education level, because according to the Diffusion of Innovation theory (Rogers 1995) the early adopters of innovative technologies are technology-familiar persons, typically of higher education level.

The survey involved a total of 51 persons, 49.0% males and 51.0% females, with a average age of 34.18 years, mainly belonging in the age category of 30-40 years old with minimum age of 15 and maximum of 50 years. The 58.8% of the respondents was of University level education followed by 29.4% of High-School (Lyceum) education.

The participants were firstly introduced to the features of the interactive television and the services it provides. Most of the respondents were familiar with the rules of the game “Deal” on analogue television, making easier their understanding of interactive game scenario. The necessary explanations were given as to the terms and purpose of the game and the time needed to familiarize their selves with the application.

After, a questionnaire was given to the users which it was developed based on the items included in the TAM questionnaire. More specifically, the construction of the questionnaire was based on instructions from the relevant literature (Wu & Liu 2006, Chesney 2006) and similar researches that have dealt with the Technology Acceptance Model for entertainment systems (Chesney 2006), online games (Wu & Liu 2006, Gao 2004, Shih 2003), multimedia information systems (Saade & Galloway 2005).

The questionnaire consists of four parts:

- The first part focuses on demographics such as age, gender, employment and education level of the respondents.
- The second part consists of a closed set of four questions concerning the familiarity of the respondent with computers and the Internet.

- The third part consists of a set of five closed questions referring to frequency of watching television programs, purpose of watching, type of television programs watched frequently and the possible participation in TV games.
- The fourth and most important part is based on the Technology Acceptance Model (TAM) and it consists of four groups of questions:

  The first group consists of four questions concerning the Perceived Ease of Use (Chesney 2006).

  The second group consists of three questions concerning viewer's Attitude towards the Use of the game (Agarwal & Prasad 1999).

  The third group consists of three questions concerning the Intention to Use the game (Agarwal & Karahanna 2000).

  The fourth group consists of three questions concerning the Perceived Entertainment (Koufaris 2002).

The Cronbach's alpha measure on the reliability of the above items was in all cases greater than 0.90, supporting the reliability of the questionnaire.

4 RESULTS AND DISCUSSION

4.1 Familiarity of the participants with computers and the internet

The majority of the respondents (86.3%) stated that they were familiar with computers at either good to very good level. Also, the majority of respondents have computers at home (74%) while in most cases the PC is connected to the Internet. Browsing the Internet is the main purpose of the use of computers (83.3%) as opposed to the use of computer games that involve a smaller percentage.

4.2 Relationship of respondents with television and television games

Two to three hours daily of watching TV is the most frequent pattern for the participants at 62.7% rate. The entertainment and information/news are the main content watched as selected by 78.4 and 80.4% of the respondents, respectively.

4.3 Intention to Use the interactive game according to TAM

The analysis of the results of the four factors (constructs) revealed a generally positive attitude of people towards the game, as it is depicted in Table 1 (1 is the positive value of 5 point Likert scale).

Composite Variables	N	Mean	Standard Deviation
Perceived Ease of Use	51	1,3922	0,74036
Attitude Towards Use	51	2,0586	1,00599
Intension to Use	51	2,5751	1,06678
Perceived Entertainment	51	2,1047	1,06361
Valid N (listwise)	51		

Table 1. Mean and standard deviation of the composite variables

Applying control correlations (R) to check for relations between the four factors, we found statistically significant positive correlation in all combinations (Table 2). The strongest correlation (R=0.843) appears between the factors Perceived Entertainment and Intention to Use. Strong positive correlation is also observed between Attitude towards Use in relation to Perceived Entertainment and Intention to Use. The lower correlations observed between Perceived Ease of Use with the other factors.

Pearson Correlation Sig. (2-tailed)	Perceived Ease of Use	Attitude Towards Use	Intension to Use	Perceived Entertainment
Perceived Ease of Use	1	0,398(**[29]) 0,004	0,342(**) 0,014	0,482(**) 0,000
Attitude Towards Use		1	0,759(**) 0,000	0,761(**) 0,000
Intension to Use			1	0,843(**) 0,000
Perceived Entertainment				1

Table 2. Correlations among the factors under investigation

Additionally, the results of multiple regression revealed that the value of the factor Intention to Use is determined by the values of factors Perceived Entertainment and Attitude Towards Use but not from the factor Perceived Ease of Use. This relationship has a positive correlation. Also, the value of factor Attitude towards Use is determined only by the value of Perceived Entertainment, also with a positive relationship. Finally, the factor Perceived Ease of Use is linked with the factor Perceived Entertainment and it is not determined by any other factor. From the above it becomes obvious that the Ease of Use affects the Entertainment, but it is not capable to affect the Intention for Use. The Intention to Use is determined only by the Attitude towards the Use and by the Entertainment. That is, an easy to use game facilitates the entertainment but this does not mean that a game which is easy to use but not entertaining will stimulate the intention to use it.

The above results confirmed hypotheses H1, H2, H4, and H5 (Intention to Use is mainly determined by the factors Perceived Entertainment and Attitude Towards Use and the Perceived Entertainment determines Intention to Use and Attitude towards Use). Hypotheses H3 and H6 are rejected (the factor Ease of Use associates with the Perceived Entertainment and not with Intention to Use or Attitude towards Use).

Hypotheses	Acceptance
Hypothesis 1 (H1): There is a positive relationship between Perceived Ease of Use and Perceived Entertainment of the game.	Yes
Hypothesis 2 (H2): There is a positive relationship between Perceived Entertainment and Behavioural Intention to Use the game.	Yes
Hypothesis 3 (H3): There is a positive relationship between Perceived Ease of Use and Behavioural Intention to Use the game.	No
Hypothesis 4 (H4): Attitude Towards the Use of the game is positively related with the Behavioural Intention to Use the game.	Yes
Hypothesis 5 (H5): Perceived Entertainment is positively related with the Attitude Towards the Use of the game.	Yes
Hypothesis 6 (H6): Attitude Towards the Use of the game is positively related with the Perceived Ease of Use of the game.	No

Table 3. Research Hypotheses' acceptance/rejection

Additional findings from the above research related to the effect of demographic variables include:

- The only demographic variable that affects all four factors is occupation. Respondents who work in IT related firms are more positive with respect to all factors examined.

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

- Familiarity with computers, PC usage at home, and the purpose of using the Internet does not affect the values of the four factors, revealing that the attitude to the interactive game does not depend from these parameters.
- The attitude towards to the interactive game depends on television viewing habits. Particularly, the daily amount of time that someone spends on watching television, affects the values of the four factors. People who watch television for more hours have the more positive Attitude towards Use, Intension to Use and Perceived Entertainment of the interactive game.
- The reason behind watching television affects the values of the four factors. People who watch information shows and people who watch television games present increased scores for the four factors.
- The familiarity and knowledge of the television game leads to better scores on the four factors.

4.4 Limitations and Future Research

The limitations of this research are associated with the sample size as well as the sampling frame since respondents from an urban area cannot be considered as representative of the whole population.

Future work will expand the empirical research to a representative sample of the population as well as to the investigation of additional research questions including other possible factors that may affect intention to use. More specifically the social environment that interaction with the game takes place, formulate a reference group (e.g. family or friends) that may affect the behaviour and attitudes of the members of this group. In the scenario of the game presented in this paper, other underlying interactions are implied (i.e. interactions among different groups that watch the game). These secondary reference groups may also lead to the identification of additional social factors that affect viewers' attitudes.

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