Mobile Phone Gaming (A Follow-up Survey of the Mobile Phone Gaming Sector and its Users)

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Abstract: Over the last decade the importance of network games has seen a tremendous growth. A large part includes the size reduction of the handheld devices. Mobile gaming in a wireless environment and the availability to play games at any place is receiving major importance. Thus more and more games are released in this section (including a huge number of different mobile phone games). Thus, the mobile market offers a wide variety of devices, such as the new handhelds like Nintendo DS and Sony PSP. With the increase in opportunities one must first look at the user behavior to understand how to improve current problems. This paper gives an introduction into the differences of current mobile gaming platforms and their capabilities. Furthermore it features a user survey about individual preferences and social coefficients with unexpected results. The current survey system features a database to handle the huge amount of answers (the predecessor used a polling system). Concluding the results of the previous inquiry, this paper contains a lobby tool based on J2ME and C# to increase the matching mechanisms in a local environment.

Keywords: Mobile Phone Games, Mobile Games, User Case Study, Handhelds, Lobby Tool

1. Introduction

With a still increasing importance the game market has already become a major part of the entertainment sector over the last decade. Especially interactive multimedia applications like mobile phone games show a rapid evolution. In order to understand the underlying facts one must first look at the technological progress in the handheld devices.

(1.1) Gaming scene

Gaming itself has mutated within the last years; so did its social acceptance. The society obviously has a huge impact on the local gaming scene; South-Korea for instance had the first professional e-sports league meanwhile other countries do not even feature a reliable Internet support [3]. But not only technological factors show great influence; it is also a matter of ethnological factors and motivation towards innovations [10]. Thus for various reasons gaming has become more that just pure entertainment; it has become communication, competition, business and social interaction.

(1.2) Mobile Phones

Along with the demand for mobile communication and entertainment the distribution of phones has also significantly increased. Depending on the country up to 90% of a peer group (age correlating group) own at least one mobile phone. The market saturation of the mobile phone therefore offers a great platform for gaming. But how do the new phones (including J2ME) compete against handheld devices? The technical background and market situation is described in section 2.

(1.3) Mobile Phones & Gaming

Meanwhile the overall mobile multimedia application market is still slightly growing there are differences with it. The revenue of mobile phone games in Europe has increased from 0.3 billion dollars (year 2000) to estimated 6.17 billion dollars (year 2006). The fact that the sales in 2006 are nearly 21 times as much compared to 2000 underlines that mobile phone games are sprouting massively. Compared to that, mobile phone ring-tones are having less than 8% growth per year. In fact the acceptance of mobile (phone) games is changing at the moment. Another example is the download statistic of Jamba.de [1, 11].

The rest of the paper is structured as following: Section 2 contains background information about the mobile phone market; Section 3 features our research approach (this includes the online survey based on already gathered data from [1]); Section 4 describes our analysis and the mobile gaming lobby approach; Section 5 refers to related work and Section 6 concludes the major statements and gives an outlook.

2. Background

Mobile multimedia applications are supported by different devices; mobile phones are just one category. Beside them there are PDAs (personal digital assistant) and next generation handheld devices (Nintendo DS and Sony PSP). In order to understand the current situation one must look at the technical data as well as the market segmentation (in the last 5 years).

(2.1) Market segmentation:

Forrester research points out that 90% of all teenagers (peer group) in Europe and northern America have at least one mobile phone. Other country score lower as a result of the missing technological background. Nevertheless the penetration of mobile phones (due to their size and high innovation) among the older people is significantly lower. None of the other devices shows such a massive dissemination, the need for communication made the mobile phone a common tool. Anyhow one should keep in mind that not every mobile phone is used as a gaming platform; although all of the current products feature one or two games within its retail version. Also the download statistic from jamba.de and other mobile phone providers show an immense trend towards entertainment. The other mobile gaming platforms clearly aim for a different audience. For instance the PDA penetration is definitely more stable in regard to the user's age. But the overall penetration is far behind the spreading of mobile phones. One should look at the large resellers for PDA games like Handango.com[12]; which expect their customers to be technological interested males with an over average wage.

(2.2) Technical data:

The technical data is evaluated from a gaming oriented view; thus additional non-gaming relevant features are left aside. From a pure viewpoint of technical data sheets a mobile phone contains the least functionality due to various facts. Its limited displays of the current generation (176x220 pixels – 3.2cm x 4.0cm) cannot compete with the display of a PDA (320x240 / 480x320 pixels touch-screen or even 640x480) and next generation handhelds (256x192 pixels with two touch-screen displays at the DS and 480x272 pixels at the PSP). Another aspect is the lack of memory on the extractable RAM of the mobile phones (max 64MB). The PSP offers a DVD device. The PDAs offer hard disks between two and four GB. The category input devices most conspicuously indicates the major lack of the mobile phones. The cellular input structure (12 buttons + special buttons based on the mobile phone type) do not support rapid movement. Next generation handhelds have the most economic design, supporting touch screens and joy-pads. Even the PDA features a better input through its larger display and the touch screen.

(2.3) Game design for mobile games:

The mobile gaming sector did not evolve on its own. Rather than creating completely new games the current trend indicates that the most popular games for mobile devices are remakes from PC or console games. In contrast to the PC/console market that both evolved alongside, the mobile game development focuses on cloning already existing games. Thus the last five to six years revamped the mobile gaming scene. On pair with the new displays and opportunities like J2ME the current phone generation supports new technologies like multiplayer (in a mobile environment).
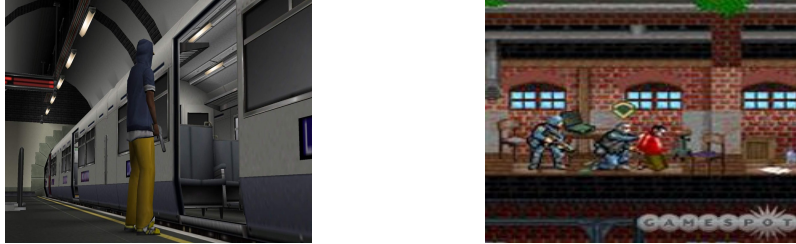

Fig. 1. Left screenshot – "Gangs of London" (Sony PSP), right screenshot "Swatforce" (Mobile Phone)

The graphic engine also changed accordingly. The next generation handhelds feature real time rendering and shading (PSP features real 3D applications). With the options of the new mobile phone displays the graphical game performance increased likewise. However, one should keep in mind that the FPS (frames per second) rate is still very low compared to PCs and consoles (fast scrolling and action paced games often lead to reduced sharpness). Another aspect are the new multiplayer options: all of the devices are capable of either running Bluetooth or WLAN to communicate in local network sessions [2].
Concluding the facts the market for mobile phone games is still growing. One should also keep in mind that there are other devices to play in a mobile environment. The technical evolution of mobile devices leads to the opportunity of having multiplayer sessions, which will be highly demanded in the future.

3. Research Approach

Our mobile phone research approach is mainly divided into two parts. Figure 2 gives an overview about the complete approach including its relations. For a complete statistic user survey analysis and the input limitation testbed we refer to [1].
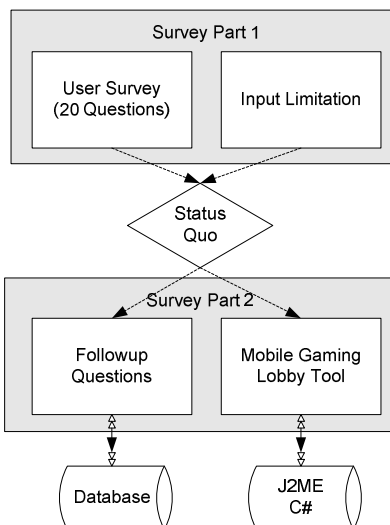

Fig. 2. An overview about the complete survey, including database & J2ME relation.

After completing the first part of the survey there were a lot of unanswered questions. Hypotheses of the first part of the survey [1] were partially proven, but we recognized that there are still further questions. The statistical analysis indicated a few already suggested common facts as well as unexpected results:

- The typical user group of mobile phone games is a young peer group from 12 to 20 years with a high interest in games, high expectations and a low budget.
- There is a clear correlation between age and game time as well as age and acceptance and interest in games. Generally younger people show an affinity to computer games.
- The average usage time of the mobile phone games is far less than 15 minutes a row. Longer game sessions are obviously exceptions.
- There has been no sign of a correlation between age and game time on mobile phone games.

With these insights we went on with two further research approaches. On the one hand a few follow-up questions still need to be taken into account. The general idea is "How can a game developer or firm release a successful application under the given circumstances?" (Section 3.3)

On the other hand our analysis indicated that mobility (head-to-head with input, graphics and game design) is an important aspect for gaming on cellular phones. However it seems impossible to create a better gaming input (like a joy-pad to reduce the input limitation) for all current mobile phone models; so we stick with a software solution. (Section 3.4)

(3.1) User survey (20 questions):

The base of a survey is a well designed set of questions. The existing data lacked on statistical depth, so we decided to build up our own polling system. Each user should answer a poll with 20 questions in it (we kept the number as low as possible to keep the audience from quitting before completely answering). The main idea was to receive a deeper understanding about the user preferences of current mobile (phone) games.

We divided the questions into 8 different categories (deterministic, mobile phone usage, game behavior, game categories, input & performance, prices and community, advantages & disadvantages and other gaming devices). The polling system used PHP and a java file system. An upgraded, well designed data base system replaced its predecessor in the second version of our survey (see Section 3.4). Each of the 20 questions uses the MOS (Mean Opinion Score) with the values: 1(strongly disagree), 2(disagree), 3(neutral), 4(agree), 5(strongly agree).

After gathering the data, statistic lab[13] was used to measure correlations between deterministic factors and game preferences. (Section 4 features the most interesting results from the user survey).

(3.2) Input limitation:

Parallel with the survey, a testbed was created in order to receive information about the impact of input limitations from mobile phones. Our player community was distributed into two groups (we ran the test three times with two groups of four players each and with an overall number of 24 players). During the test series one group suffered input limitations (they were playing the games on mobile phones with a cellular button input). Meanwhile the other group had an emulator and a PC keyboard and a mouse to coordinate their game-play (see figure 3).
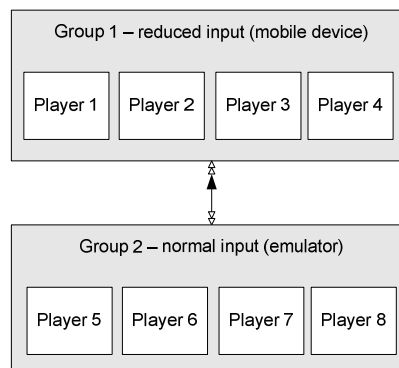

Fig. 3. Group distribution during the testbed.

Testbed Client Setup:
Emulator: 2GHz, 1GB RAM, WindowsXP
Mobile Phone: Nokia 7650 and Motorola V690

The testbed offered the option to take a close look at three different game genres: FPS (First Person Shooter), RTS (Real Time Strategy) and Arcade games. Each of those game-types has completely different game strategies so the tasks were designed based on the game type. This led to the conclusion that one can only take the difference between emulator usage and limited input results for a single game into account. For a detailed structure of the testbed refer to [1].

(3.3) Follow-up Questions:

Basically since game-reviews have become more and more popular the amount of low-quality gaming software reduced. The biggest game-review page is Gamespot.com[14]; it shows that with over 2000 mobile phone games there are less than 5% with a rating of "good" or better. The relative low development cost leads to a huge amount of games, mostly clones or remakes from successful PC and console games.
Such situation notwithstanding there is a major difference in the mobile phone game expectation between countries. Not only the game genre like in PC versions seems to be an important reason; also the acceptance of mobile phones as a gaming platform itself matters. For example: location aware MMOGs (Massive Multiplayer Online Games) like Botfighter2 or Merc Wars 2 are "successful" in Scandinavia as well as in Asia. Countries like Germany, France and the UK yet show a way lower interest.
In order to understand how the preferences are divided between the countries we build up a follow-up survey, which includes the results of its predecessor. The set of questions was reduced as much as possible to have a high number of answers (and thus reliability in results). Therefore the database system (see figure 4) was designed to offer the survey in four different languages (German, English, French and Spanish).
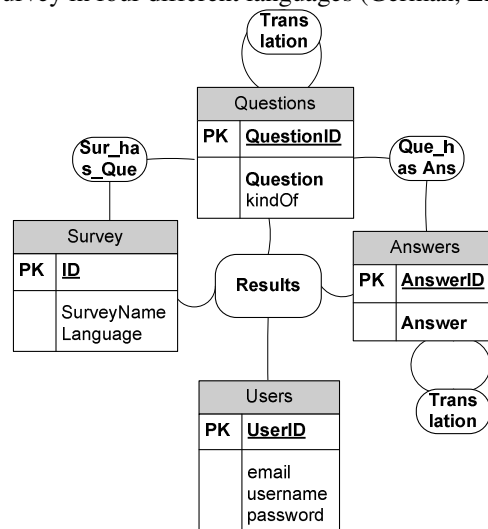

Fig. 4. ER – database model of the user survey.

The follow-up questions were:
- Would you like to play multiplayer mobile phone games with your friends? (yes/no)
- Would you also play these games with random participants? (yes/no)
- How important is a fast game setup with mobile phones for you? (Mean opinion score: 1-5)
- Would you pay to play mobile phone games? (yes/ no)
- Which game type do you prefer on mobile phones? (FPS, RTS, puzzle, arcade, action)
- Are you taking mobile phone games serious? (Mean opinion score: 1-5)
- Would you also play mobile phone games if you have a next generation handheld like Sony PSP or Nintendo DS? (yes/no)
- How do you like the graphic on Nintendo DS and Sony PSP? (Mean opinion score: 1-5)
- How do you like the graphic for games on current mobile phones? (Mean opinion score: 1-5)
- How long would you consider playing games with multiplayer support for mobile phones? (minutes)
With this set of questions we ran a small follow-up survey and statistically analyzed it afterwards. How huge is the impact of playing mobile games with friends/strangers? And if there is an impact, how can that affect game design? We will furthermore evaluate which mobile phone game types are capable of a multiplayer modus. On pair with that we will compare them with the next generation handhelds.

(3.4) Mobile Gaming Lobby Tool:

Together with the follow-up survey there was also a practical approach. In fact mobility (with 31%) was voted to be the most important advantages of mobile phone games [1]. Although one cannot improve the input devices of all different mobile phone types there is still a software solution for more flexible gaming.
The up-to-date mechanism for game finding in the mobile phone sector includes that each of the games features its own connection utility. Especially location aware games suffer a big disadvantage because potential players do not run the game client all the time and thus even if two players would be at the same location (like subway train-station or in the bus) the probability of having both with a running game client is pretty low. By having a growing number of potential multiplayer mobile phone games the likelihood of two players with the same game in the same place is even lower.
To raise the chance of finding other potential player one should have a general place to look out for ongoing games. At this point the gaming lobby becomes interesting. The idea is a text based lobby chatting application (like the Battle Net from blizzard[15]) to support a mobile forum. It must be game independent and able to handle even larger number of incoming players without previous network detection (ad-hoc network). Furthermore the lobby offers interfaces for each of the games to give the users the option to start their games as fast as possible.
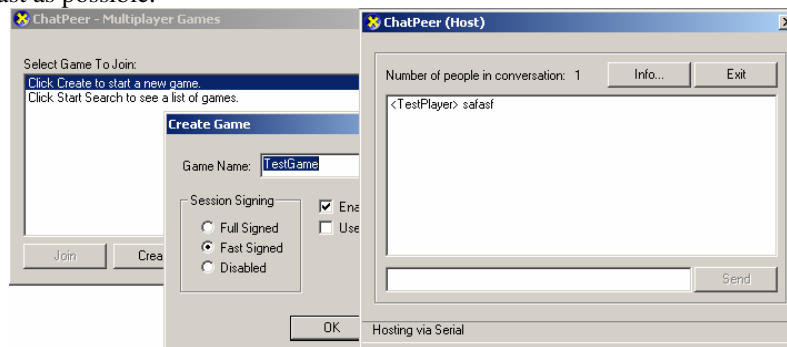

Fig. 5. Screenshots of the mobile gaming lobby.

4. Analysis

(4.1) Overview about part one of the surveys:

In the prior part of the survey the results were statistically analyzed. We started out with four mayor hypotheses that turned out to be correct. However, there is a surprising outcome because we could not show any kind of correlation between average game-time spend on mobile games and other gaming platforms. Basically a missing correlation does not necessarily mean that there is none at all. Therefore, the follow-up questions will focus on other handheld devices and the acceptance of mobile phones as a gaming platform. Concluding the analysis of the prior survey [1] we found that the user group is characterized as young and gender indifferent. They are mainly low waged (which explains the results for price evaluations, because more than 85% of the poll users found that the mobile phone games are much overpriced). Furthermore, we have shown that there is no correlation between game time and other devices (mobile and non-mobile), which we lead to the minor interest of mobile phone games for hardcore and serious audience. The mobile phone games seem to have a very short average usage time; although the advantages appear to be equally distributed: the biggest disadvantage by far seems to be the graphic.
Combined with the survey the input limitation testbed shown some interesting results. We assumed that players with cellular input devices and low pixel displays will take at least 20% longer to complete given tasks. However, this did not hold completely true. Arcade games like "Bluetooth Bigplanes" showed nearly no to less than 20% difference; meanwhile fast action paced games (FPS and RTS) greatly decreased in performance due to the very limited input structure. The consequence was more than 100% (sometimes 190%) difference in playing speed between the emulation and mobile phone users. (See figure 6 for a brief overview about FPS, RTS and Arcade difference).
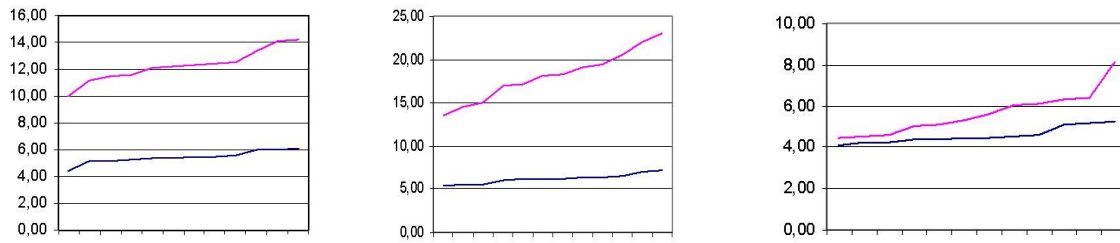
Fig. 6. Overview about input limitation performance. Upper function indicates mobile phone group, lower function indicates emulator users.

Both of the approaches gave a good insight into the problem field of current mobile phone multiplayer games. However the open questions in game behavior were taken on in the follow-up survey. The practical testbed proposal has not been developed farther; instead we focussed on the software solution with the lobby application. For further information about part one of the surveys we refer to [1].

(4.2) Follow-up Survey:

The amount of answers through the ASP / database survey extended the polling system by far. Overall 1123 people participated, 1080 participants within answered all ten questions. We included a small deterministic part (location, sex, age) to statistically analyse correlations with those values. The results underline important aspects of the current mobile phone gaming situation:
The data shows that a majority of over 90% would like to play mobile phone games with their friends; whereas only 42% (36% women, 45% men) would consider playing the same games with random people (see figure 7). We found a minor correlation (0.51) between gender and preference to play mobile phone games with friends. Women tend to prefer not playing those games with strangers even more than men. Hence the game design should seriously take into account that random matching obviously does not fit in the preference of the users. Furthermore it leads to the question how important a fast game setup is.
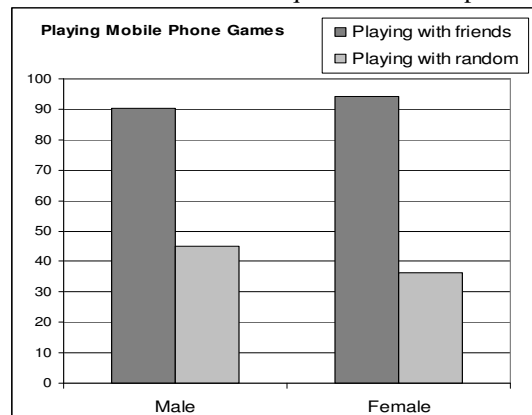

Fig. 7. Male and Female opinion on playing mobile phone games with friends / random people.

Game preference results have been somewhat surprising. The probe shows a strong correlation between location and favourites in mobile phone games. Most participants in all country favour arcade games (31.5% in Sweden up to 64% in the UK). Overall the other game types (RTS, FPS, action and puzzle) are head-to-head with around 15% each. However there is a huge variance regarding the countries. We assume that the popularity of arcade games is based on their very simple game control mechanism. Nevertheless, only 10% would pay to play mobile phone games (like other MMOGs). On pair with that the average MOS of taking those games serious is 2.1 (1=definitely not serious, 5=very serious) [3]. Both facts together show that location, sex and age independent (only very weak correlation have been found) players are not willing to pay or take the current mobile phone games serious. The main goal seems to be quick play with friends.
Up to date games on handheld devices feature a better graphical support like 3D rendering on the Sony PSP or shading and pseudo 3D design on the Nintendo DS. If one compares the two mean opinion scores of graphic popularity it points out that handhelds (MOS overall 3.78) score significantly higher than mobile phones (MOS overall 2.33). This means on average a player is satisfied with the graphical performance on

handhelds, meanwhile the average player dislikes them on mobile phones. Additionally the data indicates a strong linear negative correlation (0.77) between age and the difference. Mature player see less difference within the two devices. As a result one can conclude that shading and layer usage would increase the acceptance of current mobile phone games. Especially fast movement combined with the low frame rate of current phones causes a blurring effect (on small sized displays it greatly decreases the game performance). The game speed setup was rated with a mean opinion score from 1(very unimportant) to 5(very important). With an overall score of 4.43 the majority sets a strong focus on fast game setup. However the preferences varied between countries, ranging from 3.89 in Italy to 4.90 in Germany. This noticeable result leads us to the software solution of a mobile gaming lobby in order to decrease the search and setup time.

(4.3) Mobile gaming lobby application:

Both, PDA and mobile phones have the opportunity to run custom software (3rd party applications). Thus, the gaming lobby was designed in .NET with a support for both C# (for PDAs) and J2ME (Java for mobile phones). Each player only has to pick a nickname and will be automatically connected into the lobby. In the current version the application contains a single chat-room where all players can meat up. No further configuration is needed; the underlying ad-hoc network manages the IP addresses on its own. The idea is to offer a fast and very simple way to get in contact with as many other players as possible.
Furthermore, the lobby contains interfaces for different games (generic extendable). Thus, a player must configure the personal profile only once and with that the lobby would be able to start the owned multiplayer games accordingly. The great advantage of game interfaces is that the participants are capable of meeting up with others without having a certain game. The game details are discussed / configured within the chat and its interfaces.
A good example for the professional use of a lobby is the Battle Net [15]. Blizzard entertainment hosts the server for the chat clients and offers interfaces to their games (Diablo, WarcraftIII and Starcraft). Within the lobby there is a ranking (ladder system) and the option to chat/ start games. The games themselves are run on the clients with a peer-to-peer architecture.

5. Related Work

Together with the still growing importance of multimedia gaming applications application, portable devices (and especially mobile phones) offer a wide range of related research approaches. There are three main categories with a close relation to our research work:

(5.1) Mobile platform analysis:

There is plenty research material about other mobile devices that are capable of running up-to-date games (like PDAs or handhelds). This includes an overall research approach [2] of next generation handhelds with a focus on performance, protocols and problems that gaming applications on those devices suffer. Another approach is the categorization of requirements for such games [6] and software options for mobile platforms [4]. Both aim to understand the requirements of next generation multimedia applications in a mobile content. Thus, the attempts focus on existing technologies to understand which part can be further upgraded. The ambition is a realization of even more complex applications like distributed databases, ad-hoc network sessions or large scoped applications (such as a massive multiplayer game for mobile phones).

(5.2) Concept design for mobile phones:

Another approach is the new and rapidly growing technique of J2ME [3], [5]; the java module that helps to build secure applications on a common standard. Techniques such as WAP2 or J2ME significantly changed the function set of current mobile phones. Although there is plenty material for J2ME, especially on the controversial discussion referring to its security, the multimedia real time application approach is not that well analyzed yet. Reason therefore is the rarity of java based multiplayer games and other real time

applications (like video streaming). The current camera design of most mobile phones does not support video conferencing. On pair with that the bandwidth is also an issue. However, due to the high amount of work in this section there will be probably more papers in the near future. Another important fact is the constantly increasing amount of bandwidth due to UTMS, HSDPA and WiMAX.

(5.3) Models for mobile scenarios:

The mobile scenario model features a larger scope. The idea behind this approach is to find a fitting model in order to render user behavior. With an accurate prediction one could test applications on given network structures such as Client/ Server to P2P [8]. Model analysis furthermore helps to provide testbed scenarios [7] and scalability tests that map even huge numbers of clients. With a well designed model one can simulate problematic network situations (like a train with half of the players from a local ad-hoc network suddenly leaves the train station).

Concluding the three main related fields of our topic the mobile platform analysis provides additional information of other devices; similarities can be used to find common conclusions. The concept design, especially the new technique of J2ME adds new structures to the portable multimedia application field. However, the models also have a big influence on our topic, especially due to the mapping of user behavior. Nevertheless, there are several minor relations to economical research fields and psychological researches (especially user preferences and subjective perception).

6. Conclusion

Concluding the complete user case study on mobile phone games and their evolution one should look at them based on two main approaches.

In the first part of the survey the statistical analysis of user preferences showed that the target group for mobile phone games is gender indifferent, young, high expecting and low waged. Furthermore, there is a strong positive linear correlation between age and the interest in games. However, the analysis did not show any correlation between average game-time on mobile phones and other gaming platforms. As a result we assumed that hardcore players obviously prefer other devices (from this point the follow-up survey began). Additionally, a testbed was set up in order to evaluate the effect of input limitations on mobile phone games (mobile phone users with cellular inputs vs. emulator users with a keyboard and a mouse). Depending on the game type it points out that fast action games are strongly influenced by the mentioned limitations.

The second part of the survey featured a follow-up set of questions and a software application to improve the matching of mobile players. Thereby a database system with ASP pages and a well selected set of questions was used to further estimate the gaming preferences; especially with a focus on mobile phones compared to handheld gaming devices. The data indicates that mobile phone users (with a higher number of women) tend to prefer playing games on their phones with friends over playing them with random people. Also fast game setup and playing for fun (casual gaming) were supported by a majority. Furthermore, the comparison between graphics on mobile phones and handhelds appear to give the current handhelds an advantage. As a result of the follow-up survey the lobby tool was created to support the matching of players in a mobile environment. One of the main advantages for mobile phone games was the aspect of mobility. Combined with a very strong demand for fast game setups the lobby tool supports two main aspects: it increases the number of potential players and decreases the time needed to setup a game.

The research on gaming preferences for mobile games has not come to an end yet. The designed lobby tool will be the focus of upcoming work. Especially the large number of different end-devices can be implemented to support even more mobile phones. In parallel with that the existing database and the ASP pages offer a good possibility for in-depth user case studies. One of the upcoming aspects will be the behavior of hardcore gamers (taking games serious to win them and playing a large amount of time) in combination with professional gaming (e-sports and world championships). Further we will focus on the psychological effect of splitting game and real world behavior, so called virtual fragmentation.

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