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How usability is visible in video games

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Abstract

As video games have become more popular and as popular as music and movies, the need for more video game developers have increased also. But even though there are more people developing video games, there still exists usability issues in video games like also in general computer software. The purpose of the thesis is to find out how usability issues can be seen in video games.

To find out the answer for this research question, research was done as literature review. There already existed a fair amount of literature relating to usability issues of video games. Also the usability issues of computer software were discussed a little bit as video games are similar to computer software. The research on existing literature provided usability issues to be discussed and to find out the answer.

Keywords

video games, usability, open source

Supervisor

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Introduction

One of the defined main product quality attributes is usability in the international standard ISO 9126. Usability defines the extent to which a product, like video game, can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use. Usability is one of the key factors that make the video game stand out because of competition and because of that it is important to focus on usability so that your video game will be able to compete in the tough competition of video games. (Laitinen, 2005) There is also so many video games released per year that consumers won't be able to buy all of them. Even though video games are similar to usual computer software, the way they are used may be entirely different. For example, in video games, challenges are usually positive game experiences while in computer software challenges are always negative experiences. (Desurvire, Caplan & Toth, 2004) Video game players like to have challenge when they play video games because video games are used for entertainment purpose while computer software users are usually people who use the software in their working time so they want to use it as easily and efficiently as possible. (Rajanen & Marghescu, 2006)

In the last 30 years video games have become as popular as movies and music (Snow, 2011). At the same time as video games have become more popular, the video game developers have increased and the size of developer teams have also increased. (EGDF, 2011) Video games have long history and even though video game developers can identify usability problems, there are still games being released with varying usability issues (Pinelle, Wong & Stach, 2008). It was estimated that in 2014 59% of the Americans were playing video games and the average of the video game player in America was 31 years (Entertainment Software Association, 2014). This shows that little over half of the Americans are playing video games but still not all of the Americans play. So there is clear need for researching about the usability problems in video games to keep the players entertained and to get more people to play video games.

Researchers have noticed the popularity of video games as video games have gained popularity. There has been done research about the usability problems and how to evaluate video games but there hasn't been enough research about general view of what are the consequences of different usability issues of video games (Pinelle et al., 2008). This thesis answers to research question: "*How usability issues can be seen in video games?*" Also the effects of the usability issues on the playability of video games will be discussed. Still this research will not focus in every type of usability issue but mainly on the most catastrophic ones and those which have the most impact for user. This research will discuss the possible outcomes of usability issues. But how usability can be described in video games and what elements can be described as usability elements in video games?

The research will be done with literature based methodology which will be described in more detail in the Method chapter. Differences between computer games and console games are not discussed in detail but both are taken into account when analyzing results. The structure of the thesis will be as follows. After Introduction used research methods and literature material will be presented and discussed. After methods, usability is

explained in general and how it is different in video games. After that research findings will be presented and explained in more detail. After research findings, discussion about the results and about the topic will be presented. The last chapter will be conclusion chapter which will present the conclusion of the thesis and future research topics. Finally the thesis will end with references.

Method

The purpose of this thesis is to find out how visible usability is in video games. The research will also take into account video game player's experiences and these will be discussed in later chapters. The research considers both sides: good and bad usability. If enough cases can be found, then those cases will be compared to each other to see whether they have connections to each other. And possibility to outstand bad case with good case will be considered during this research.

Video games are similar to general software and because of that, this thesis isn't only about video games. This means that this thesis will also compare and discuss usability issues of general software also.

Video games have already been developed over 30 years and fortunately there already exists research material about video games' usability (Snow, 2011). Because of that, one of the research methods which are used in this thesis is literature based methodology. Next will be presented the methodology in more detail.

Literature based methodology

Literature based methodology is a research method which focuses on already existing literature which is related to the research question. It is necessary to read through the material, analyze and sort the used literatures to identify the essential information of the material. (Guijuan, 2009) Literature based methodology was chosen because there was found enough material on both views of the research question of the thesis. And even though there already exists material, it hasn't been analyzed in this way before.

Literature review

Literature review focuses discussing published material in a particular subject area. (UNC College of Arts & Sciences, 2014) Since there already exists research material relating to the research question, literature review is suitable research method to be used. Literature materials focusing on video games' usability was used as references in this thesis. But all of the literature materials were not focused only on the video games' usability. Some of the used literature materials focused on usability of software in general and Open Source Software projects as those supported some discussions and findings relating to the main research question. Total number of used references in this thesis included 20 different literature material.

Usability

So what is usability? In software industry usability is one of the main quality attributes. It is mainly about maximizing effectiveness by taking into account efficiency, learnability, memorability, how easily users recovery from errors, and satisfaction but in game development it is similar but not entirely same. According to Nielsen, in case of general usability these are defined as follows. Efficiency, how quickly users can perform tasks. Learnability, how easily the users perform their tasks which they encounter for the first time. Memorability, how easily users re-establish proficiency after returning for using some feature which they have not used for some time. Errors, like mentioned, how quickly users can recover from errors. Satisfaction, how pleasant is it for user to use the software. (Nielsen, 2012)

Usability in games

In game development, usability is about better gaming experience with less unnecessary interruptions or challenges that have not been designed by the developers. (Laitinen, 2005) While the usability is similar between computer software products and video games, it's still different. The importance for video game to have good usability is because playing video games is voluntary while at least some computer software products are usually used while working. (Rajanen & Marghescu, 2006) Still of course it is important for both of products to have good usability, especially software products because those are used while working.

Like computer software products, video games can have many different usability problems. This research doesn't focus deeply in every kind of usability problem. The focus is in the most catastrophic usability problems which have more impact on user.

Heuristics

Some researchers have made own heuristics for evaluating video games while developing them. Those heuristics are modified from Nielsen's famous 10 heuristics to be more suitable for video games because Nielsen's heuristics are aimed for typical computer program. The heuristics are also based on literature, on productivity and playtesting heuristics which were specifically modified to evaluate games. Desurvire et al. defined four categories for their version of game heuristics: game play, game story, game mechanics and game usability. Their version of game heuristics focused on evaluating playability. (Desurvire et al., 2004) The benefits of using modified heuristics to evaluate video games is that more usability problems can be found and especially if usability experts are doing the evaluation, the evaluation is faster and more effective way to check the usability of video game. (Laitinen, 2005)

Laitinen (2005) used expert evaluation and usability testing to find usability problems and to evaluate Frozenbyte's Shadowgrounds video game while it was still in development. The game had many usability problems but in case of expert evaluation there was 2 catastrophic, 30 severe and 60 intermediate usability problems, rest were more minor problems. And when usability testing was done, there was one catastrophic, 26 severe and 28 intermediate usability problems, rest were more minor problems. One

of the catastrophic usability problems found in expert evaluation was that the game's map had one color with multiple meanings. For example, same color could mark the visited area, unknown area and unreachable areas. So reading the map was confusing for the player and it could lead to misunderstanding the meanings of the map. Fortunately this was solved with using one color for one meaning. In both, expert evaluation and usability testing, was found the same kind usability problem: no feedback is given if the player cannot pick an item and picking up a new weapon went unnoticed. Both happened because player didn't get enough feedback. This was solved by giving clear feedback for the player. (Laitinen, 2005)

Even though there already exists heuristics for evaluating video games, companies aren't using them. Nissinen (2014) made a survey and one part of the survey was relating to use of heuristic evaluation. Only four companies said to be using heuristic evaluation while 18 companies don't use it. The most common reason to not use it was that they don't know the method. The companies seem to have their own methods and reason for not to even try heuristics was from one company that they don't have time to test new methods. (Nissinen, 2014) So maybe the companies should make use of some reliable collaborator company which has already or would test new methods for both of them. Still companies would benefit more if they used some kind of evaluation because like Laitinen said, it's more effective and faster way to check the usability of video games. (Laitinen, 2005).

Findings

In video games, bad usability can interfere the developers' goal of creating compelling experience for users, and can have a negative effect on the overall quality. This can also reflect on the success of the game as video game players may find bad usability frustrating and people don't like frustrating video games. (Pinelle et al., 2008) So it is important for the developers to focus on the usability of the video games. Another view of point which supports this is found in Rajanen and Marghescu (2006) research. According to Rajanen and Marghescu (2006) rating of the user interface and the playability of the game were third of the most affecting things to get a game in game reviews for video game players who answered their survey. Overall rating of the game and plot of the game were the only other two things which were found to be more important. But when asked about the most important factors when testing the game, user interface and playability of the game was found to be most important. In the case of usability, the result was same when asked about the most disturbing things while playing: bad user interface and playability placed first as the most disturbing thing while playing. Their cluster analysis also supports the results of the survey. (Rajanen & Marghescu, 2006) So it can be seen that usability plays important role when players are purchasing video games or considering which video game to purchase. This finding is in line with other studies highlighting the importance of good usability as a competitive advantage (Rajanen, 2006; Rajanen & Jokela, 2004). Players can hear or experience the usability from game reviews or from playing demo version of the game before purchasing the video game. This helps video game to get more attention to be able to get competitive advantage over other video games. So it's clear that developers should focus on usability in early phase of development so that the early versions of the game would have better chance to get positive feedback from the players of demo version. Furthermore, this finding can be compared to findings from another domains, such as Open Source Software development, where it has been argued that good usability might attract non-technical users to the project when they hear or experience the good usability (Rajanen & Iivari, 2010). So in that sense it's important to focus on usability so that Open Source Software projects, and also video games, get more users even from people who are non-technical oriented. Open Source Software means software released under a license which allows the end user to use the software freely and modify the source code. (Andreasen, Nielsen, Schröder and Stage, 2006) As video games are similar to usual computer software products, this could also apply to video games and so it is important to focus on usability in video game development also to get more players even from those people who don't usually play video games. (Rajanen & Marghescu, 2006)

Also Nichols, Thomson & Yeates (2001) did research relating to software development aimed at non-technical users. Their study was focused on the usability of the Open Source Software called Greenstone. Even though the research wasn't related to video games in any way, it still provided information on what kind of usability issues can be found and what should be taken into account for software development for non-technical users. Like mentioned, video games can benefit from this kind of development. The Greenstone is used for building, maintaining and serving digital

library collections. It can be used on multiple platforms and it supports full-text mirroring, indexing, searching, browsing and metadata extraction. Development is mainly done within the New Zealand Digital Library research group at the University of Waikato. The Greenstone is used by people who build collections and those who access the collections. So there is high chance that users are non-technical users. And like it is unfortunately typical in Open Source Software development, Greenstone has many developers, a fast release-schedule, a non-commercial nature and a lack of explicit project management. Nichols, Thomson & Yeates (2001) did research based on two kinds of use of the system: command-line based process and a browser-based tool also known as 'The Collector'. (Nichols, Thomson & Yeates, 2001)

It seems that the results of the research of Nichols, Thomson & Yeates (2001) shows that participants preferred to use the Collector instead of the command-line based version of the system. Also the questionnaire's responses support this preference. The main usability problems which were found during the research and which the researchers focused on can be placed into four following groups: developer knowledge, developer bias, interaction style and documentation. In this case the developer knowledge means that some issues could be traced to explicit pieces of knowledge which was known by the developers but not by the users. The software and documentation could not help with this knowledge and this led users into errors. One example of this is that one user tried to build a collection, completed the setup phase for this but then incorrectly specified the command to start building a collection. After that he consulted documentation to understand the problem, closed his command-line window, opened a new window and then specified the correct command. But this led to failed command because the environmental variables were not set correctly. User thought that this failure was due to syntax error rather than the system state and created another incorrect command. This was because of the lack of feedback from system during the setup command. Also training session could have helped with this issue in the actual use or at least it could have reduced time for this task. (Rajanen, 2006) As usual with many usability issues, common knowledge among the developers was not communicated to the users by the system. And it seems that especially for an Open Source Software project, many people knew about this text and behavior and still nobody had suggested that it would cause problems. (Nichols, Thomson & Yeates, 2001)

Some issues were identified to be related to developers' different use of operating systems and environments. This isn't surprising as usually there seems to be many developers working on an Open Source Software project. One example is a problem relating the behavior of commands with incorrect arguments. This was rarely encountered by the developers which was most likely because they developed the system. The default response for the commands was to list available options on the screen. But the response text's length was greater than the default size of the command-line window as at the time they were using Windows 98. Also to make things worse, the default window had no scroll ball and that made the system's response inaccessible for the user. (Nichols, Thomson & Yeates, 2001)

Third example for usability issue from Nichols, Thomson & Yeates (2001) was related to interaction style with command-line version. The command-line interaction style with returning to a prompt without any feedback to indicate whether the operation was success or not. This caused problems and confusion for several participants as they didn't know whether they had worked correctly or they were uncertain about the process. The system's commands followed the Unix convention of return to the prompt

indicates success. But even though the users were generally familiar with this convention when using Linux operation system, they still were unsure when it appeared in the context of the study. But this may be because the commands used on the study were Greenstone specific and not the generic file management commands. So the observed users were expecting unfamiliar commands to provide feedback on success but the developers didn't expect this as they are used to the conventions in general. (Nichols, Thomson & Yeates, 2001) So this is similar problem as the first found problem on their research: both are related to the lack of feedback from the system. Also Laitinen mentioned this also on his research on better games through usability evaluation and testing. In Laitinen's research he mentioned that video games need to give clear feedback for the player for his or her doings in the video game. (Laitinen, 2005)

The fourth, which was the last one of the usability issue examples from Nichols, Thomson & Yeates, was related to documentation. Some users had problems with the Greenstone's documentation on both situations: as a reference source when they encountered some difficulties and as a guide to step through a sequence of actions. One example of this case was that one user interpreted lack of feedback from a command to be an error. In the documentation there was following paragraph which provided instructions to recover from a different type of error. But still the user applied these wrong commands of instructions even though he was aware that they were intended for a different kind of situation. So the links between errors and fixes can be understood by the developers but harder to be understood by the users. In context of video games, Rajanen (2006) also found that good usability reduces time needed for training session of video game which supports this finding about the need of good documentation if the usability is not so good. It seems that the documentation of the Collector contained only examples how to use the system in Unix environment. This confused participants who were used to use Windows operating system and didn't know the syntax of file path of Unix operating systems. The last found issue was related to documentation's description on the way to provide email address. The documentation gave an example for this in format of <your_email>. This lead some users to type also the brackets on the system. This caused significant delays for user but between developers it was obvious. But the reason wasn't only on the documentation, the system could have provided also instructions on this. This also supports the fact that the documentation needs to be good and understandable in the view of the end user, not only by the developers. So it seems that Open Source Software projects benefit from studying real users. (Nichols, Thomson & Yeates, 2001)

Like Nichols, Thomson & Yeates (2001) found out, Open Source Software developers don't focus so much on the users and usability. Also Andreasen, Nielsen, Schröder and Stage (2006) found same thing and discussed about the reasons for it. One argued reason is that the vast majority of Open Source Software project contributors are software developers with programming background and do not understand the problems of ordinary users. Others think the reason is lack of competence and resources. But a study of general usability issues and challenges that Open Source Software development was facing concluded that the lack of usability expertise and resources in the Open Source Software community was the key problem. (Andreasen, Nielsen, Schröder and Stage, 2006)

For video game development, there is also bigger cost-benefit for the developing company if they focus also on usability in early phase of development because it is easier to include in new project than already running project. It would cost more and

take more time especially if the already running project is big and has been running for some time. Good usability also reduces the time needed for training the end user of the product and while this might not be such a big thing in video games it still has some effect because video game players don't necessarily need to spend time in training before starting to play the actual video game. (Rajanen, 2006)

Even though there exists usability issues, it seems that there are only a few development organizations in general which have integrated usability activities, like heuristic evaluation and usability cost-benefit analysis, as a part of the development. One of the reasons might be that the costs and benefits are not so well visible to the management of the organizations. (Rajanen, 2006)

Video games are not used only for entertainment purpose. Because of the popularity of video games amongst young people, some games are being developed solely for the educational purpose. Molnar & Kostkova (2014) researched this topic and focused on "educational games developed with the aim of promoting responsible antibiotic use and hygiene part of the edugames4all project." In their research they noticed that even though video game players like to have challenges when they play, video games' challenges can also be too hard especially for children if the player haven't been playing video games before. In this case too hard challenges lead to giving up playing the game on the long run which is serious issue for the video game. Like Laitinen says, no one wants to play video games which are either frustrating or difficult for wrong reasons. (Laitinen, 2005) Molnar et al solved this problem by providing training mission to help players familiarize themselves with the possible new game play. The training mission was not mandatory to play so students with knowledge about video games could skip the training mission if they wanted. The results of the research have shown that significant knowledge can be obtained as a result of playing the educational game. (Molnar et al, 2014) This shows how important it is that the video games have good usability and are not too hard to play or that the game mechanics are explained so that the players would be willing to play the whole game. The results are great if the educational game is done so that the players like it. On the other hand, some of the games have already done the tutorial of the game successfully. The Sims is an example of this with it's simple interface and clear tutorial which shows how to play the game, not how to manipulate the game's interface. The interface was the result of 11 iterations and 100 play-testers' work. So hard work has clearly paid off. (Jørgensen, 2004)

The possibility to not finishing the game isn't limited to educational games or difficult games. Even though video games are popular nowadays, it seems that only one of every 10 people actually finish the game. And this applies even the most popular video game titles, which are awarded as Game of the Year. But the reason isn't only in the game itself but the culture. Nowadays people have more distractions like for example Facebook and other social media. Also the average players don't have as much time as before. (Snow, 2011) This should be taken into account when developing video games. The longer the video game is the higher possibility is that most people don't finish the game. This might be one of the reasons that more games are being released as short episodes first. For example some of the role playing games might take even 50 hours to finish but on the other hand some new games like The Walking Dead, which is a video game released as short episodes first, can take only 12 hours to finish according to <http://howlongtobeat.com/>

Free to play games have gained popularity recently but even though those games are called free to play, they also offer players possibility to pay to move on the game faster.

But it seems that only a small percentage of players are committed enough to pay for the game. One of the main reasons for not paying is the poor quality of games. Paavilainen, Korhonen & Alha (2014) examined 12 social free to play games and states that majority of the usability problems were related to game usability category. Most common problems were related to navigation, help, feedback and various graphical representation problems. They offered solution for this. In their opinion, more emphasis should be placed on the user interface design. Gameplay problems were also a category which had many problems. In gameplay problems most common problems were related to the basics of game design: challenge, goals and rewards. So it's not surprising that only some of the players are committed to play those games. (Paavilainen, Korhonen & Alha, 2014)

There are also other reasons why balancing difficulty is important. Nowadays some of the modern video games are so large and complex that players may even have multiple interfaces to use in one game. Because of this it is important that those interfaces are easy to use and that the game is as easy and intuitive as possible to play. (Laitinen, 2005)

Still challenge is good in video games and players are expecting some challenge, but the game mechanics should be explained so that the player can easily learn them. In fact video games are described as easy to learn, difficult to master. But this is different from usual usability evidence as computer software products are usually expected to be easy to learn, easy to master. But this is because video games are for entertainment and computer software products are usually used for working. The video game's challenge should be balanced so that it isn't too easy and not too hard. Because of that there is also different difficult levels in video games. (Jørgensen (2004), Desurvire et al., 2004)

Discussion

During the literature review, a fair amount of usable literature was found. Even though these were not related to only video games, they were still usable as they focused on the usability issues. During the literature review, there was found a good amount of viewpoints for usability issues. Like it was intended, some of the findings were from the user's perspective in case how usability affects user. And another perspective was how usability affects video game developers and what kind of consequences came from different usability issues. Still the results came from user and the results were mainly focused on how user responds on the usability. The following table was made from both of these perspectives and it shows the main issues on how usability affects user or video game developers which were found during literature review of this research. There was also minor usability issues found during the research but those didn't have as much affect for the user. Because of that those minor usability issues were not included in the following table and were not discussed in much detail in this research.

Table 1. The affects of main usability issues

Number	Affect	Perspective
1	Good usability can attract more users	Positive
2	Good usability can attract new users who don't usually play video games	Positive
3	Focusing on usability in early phase of development makes it easier to make changes with less cost	Positive
4	Good usability reduces the time needed for training the end user	Positive
5	Bad usability with poor training or documentation can lead to delays for the player or user	Negative
6	Bad usability can interfere the developers' goal of creating compelling experience for users	Negative
7	Bad usability can have a negative effect on the overall quality	Negative
8	Bad usability can reflect on the success of the video game	Negative
9	Players may find video game with bad usability frustrating	Negative
10	Cost benefits are not so well visible to the management of the organizations	Negative
11	Too hard video games can lead player to give up playing or finishing the video game	Negative

As shown on Table 1, there was in the end 4 positive affects of usability issues and 7 negative affects of usability issues. Positive affects of usability issues were not so called issues but usability points which has some affects for the user. These affects of usability issues can be clearly organized on the following four categories: Affects that relate to the amount of players, affects that relate to the cost of development, affects that relate to the training or documentation and finally other affects. Affects number 1, 2, 8, 9 and 11 can be seen to be on the category affects that relate to the amount of players. Affects number 3 and 10 can be seen to be on the category affects that relate to the cost of development. Then the affects number 4 and 5 can be seen to be on the category affects that relate to the training or documentation. And finally affects number 6 and 7 are different from other affects and from each other so they can be seen to be on category other affects. So it's clear that the category "affects that relate to the amount of players" is the largest one as it has even five affects in the category. Other categories have only two affects in each. But in case of usability this kind of category organizing seems to

easily have the most affects included in the categories which affects the players. In this case there could not be other than these mentioned categories created based on the affects found during this research.

Good usability attracts more users, or in this case players, for video games. This is because people can write good ratings on their video game reviews and others can read from those. Good reviews and opinions from other people in general seems to get even the attention of people who don't usually play video games and that is why it's important to focus on good usability so that the video game can get even more players than usually. This should be done in early phases of development because it's easier to make changes earlier than later and which won't cost as much as they would cost later. This is because in early phases changes are easier to make as the system or video game isn't so complex yet. Good usability also reduces the time needed for training session which can be significant advance especially in video games as usually players don't necessarily need to spend time in training. In that way the player can get to play the actual video game sooner also. (Rajanen, 2006)

On the other hand if the usability is bad and it's accompanied with poor training or documentation, it can lead to delays for the user as the user might not be familiar with possible new way to play video game. So it takes more time for the player to get to play the actual video game. While video game players don't necessarily need training, some video games can be too hard for the player and if those video games have poor training, then the player might even give up playing the video game. This is because the video game can be too hard and take longer than usual to proceed in the video game. So it's important to not only focus on good usability but also on the training or documentation. (Laitinen, 2005)

Bad usability can also make harder the goal of developers to create compelling experience for the users. This is because the negative impact of the video game can make the experience frustrating instead of compelling. It's easier to stop playing video game which is frustrating. Bad usability can also have negative effect on the overall quality of the video game. (Pinelle et al., 2008) So bad usability can reflect on the success of the video game if the bad usability leads to players stop playing the game. But this may not stop only on the already playing people because poor usability can be mentioned on the video game reviews and that can make people even stop buying the video game if they read about bad usability issues on the game reviews. (Rajanen & Marghescu, 2006) And last but not the least, cost benefits may not be so visible to the management of the organizations. This may be the reason why only a few development organizations in general have integrated usability activities, like heuristic evaluation and usability cost-benefit analysis, as a part of the development. (Rajanen, 2006) This is serious issue as cost benefits are important thing for organizations and if the management of the organizations are not aware of cost benefits, then it's really likely that the organizations won't make use of the cost benefits and won't adapt the use of usability activities as easily as they would if they were aware of the cost benefits.

Table 2. Found usability issues

Number	Issue	Perspective
1	Too hard challenges	Negative
2	Too easy challenges	Negative
3	Map had one color with multiple meanings	Negative
4	No feedback if player cannot pick an item	Negative
5	No feedback if player picks up a new weapon	Negative
6	User interface doesn't inform enough for new users how to use the system easily	Negative
7	No feedback whether operation was success	Negative
8	Documentation made only for developer, not for the user	Negative
9	Open Source Software projects doesn't focus so much on users or the usability	Negative
10	Bad user interface	Negative
11	Bad playability	Negative

Like may be expected because this research was related usability issues, during this research every found usability issue was negative issue as shown on Table 2. This means that the issue caused user bad experience or interfered the enjoyment of the video game. Still also solutions for these usability issues could be found and discussed during this research so it makes it worthwhile. Still in the end there wasn't any actual positive usability issue found during this research. This may be because of the approach or the scale of the research as this research was done as literature review.

These found usability issues can be divided to the following four categories: Issues that relate to the challenge of the video game, issues that relate to the user interface, issues that relate to the feedback given to the user and finally other issues. Issues number 1 and 2 can be seen to be on the category issues that relate to the challenge of the video game. Issues number 3, 6 and 10 can be seen to be in the category issues that relate to the user interface. Issues number 4, 5, 6, and 7 can be seen to be in the category issues that relate to the feedback given to the user. So issue number 6, User interface doesn't inform enough for new users how to use the system easily, is in two categories because it's related to both. And finally issues number 8, 9 and 11 can be seen to be in the category other issues. This is because these three issues doesn't belong to any of the other categories and doesn't have any similarity between them other than that they doesn't belong to other categories. Between these categories one has more issues than others: issues that relate to the feedback given to the user. During this research there was four usability issues relating to the feedback given to the user which makes this category biggest one. But other categories had also a fair amount of usability issues. Only one had issues less than other categories: issues that relate to the challenge of the video game. This category had only two usability issues.

Two of the found usability issues were related to challenges in video games. Video games can be too hard for the player and that can cause for the player to give up playing as he or she might get stuck too long time at some point in the video game. So this issue reduces the amount of players for the video game. And later on can affect even more because the players who gave up can tell their friends about the video game and in that way the video game could lose even more players. So this is serious usability issue. (Laitinen, 2005) Second usability issue relating to challenges was complete opposite, that video games can have too easy challenges. Video game players expect video game to have some kind of challenge. It's good to have video game made so that it challenges the player because that motivates player to keep playing. And in general, usually

challenges are positive usability issues and players are expecting some challenge. (Desurvire et al., 2004) So in the end video game developers should try to find balance between easy and hard challenges for video game because that keeps players playing video games for longer time.

There were total four feedback related issues. One of the feedback related usability issue found during this research was that one video game's map had one color with multiple meanings. This can easily confuse video game players because for example if the same color would mean starting point of next mission in the video game and at the same time same color would mean the place where player can buy weapons. In this case the player wouldn't know where he or she could go to replace the weapon at least not by looking at the map. But fortunately this issue can be easily solved by adding more colors on the map and this issue was solved by that. (Laitinen, 2005)

Another issue was found in the same research as the video game's map's color issue: no feedback was given to the player if the player could not pick an item. Also if the player picked up a new weapon the video game didn't inform the player even about that. These are also serious usability issues because the player can be confused whether he or she actually picked the item or not. And the new weapon can easily be unnoticed. The player clearly needs to make sure about that by himself. These were solved by giving the player clear feedback about not being able to pick up an item or about picking up a new weapon.

Another one was that the system didn't inform new users how to use the system easily. This issue was related to the fact that the developers assumed the end user to have the same knowledge as the developers have.

The last of the four feedback related usability issues was that there was no feedback given for the user whether the operation was successful or not. So the user couldn't know whether he or she used the system correctly or whether there was some error. This is serious usability problem as this can lead the user to use the system in the wrong way without knowing about it.

Conclusion

This research focused on the research question "*How usability issues can be seen in video games?*" but also the effects of the usability issues on the playability of video games was discussed. The Open Source Software projects were also related on this research topic as there was a little bit research on usability on general software to be able to know the differences and similarities between general software usability issues and video game usability issues. Also the findings from the Open Source Software project's supported and helped the discussion of the findings from other references which were more related to video games and the actual research question. There actually was similarities between video games' and softwares' usability issues but it's expectable as video games and software are similar.

This research combined found usability issues and the affects of the main usability issues from multiple literature materials and discussed the findings. The findings could be grouped in two tables: The affects of main usability issues and Found usability issues. From each these tables the affects and issues could be divided to four categories.

In the case of the affects of main usability issues, the affects could be divided to the following four categories: Affects that relate to the amount of players, affects that relate to the cost of development, affects that relate to the training or documentation and finally other affects. In total there was eleven affects of main usability issues found during the research. The biggest category with the most of affects included was the affects that relate to the amount of players. The other categories had the same amount of affects which was two affects and the biggest category had four affects. Four of the found affects of main usability issues were positive ones and the other seven were negative ones. So in the end it seems that usability issues' main affect seems to be on the amount of players. Because of that it's important for the video game developers to focus on the usability of video game because that way they have better chance to get more players for the video game and sell more.

In the case of the found usability issues, the usability issues could be divided to the following four categories: Issues that relate to the challenge of the video game, issues that relate to the user interface, issues that relate to the feedback given to the user and finally other issues. In total there was eleven usability issues during the research. The biggest category of these four with the most of usability issues included was the issues that relate to the feedback given to the user. This category had four usability issues. The least amount of usability issues was in the category issues that relate to the challenge of the video game. The other two categories had three usability issues. All of the found usability issues were negative usability issues.

This research also answers the research question which was "*How usability issues can be seen in video games?*" The answer is the group of the findings. Usability issues in video games can be seen in many ways and these groups describe the issues found during this research. The main point is that most of the usability issues can be seen negatively and because of that the usability of video games is important to focus on during the development of the video game.

Future work

As this research was done with literature review, it is needed to continue researching this topic further. Possible way to continue the research would be by making survey for video game companies and to be involved in the development of some video game to get information from the developer's perspective in more detail and to be able to gather own information in actual development. The most ideal way to get involved in the video game development would be from the start of the development to the release of the video game so that the whole development could be reported and the sales of the video game could be analyzed after releasing the video game. In this way, research could take into account how the video game developers use usability activities and what are the benefits of using them. And to be able to get better information from the video game developer, it would need to be an organization which is using usability activities already. An organization which is already using usability activities, has better knowledge on how to conduct usability activities.

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