Consumer Acceptance of Cloud Computing Based Gaming

Bachelor's Thesis in Informatics

Author: Krenz, Hubert
        Terziyski, Stefan
        Virjee, Farzad

Tutor: Wolfram Webers

Jönköping May, 2011
Abstract

Cloud computing is a set of technologies that provide efficient and effective usage of information technology resources. The application of cloud computing in games is a new market that is currently growing. Applying cloud computing to games results in a new gaming platform for the users, referred to as cloud gaming. This new platform has a set of different features that affect the user acceptance of this new platform.

Problem

There is a lack of understanding on how the users perceive cloud gaming. Investigating the factors that affect the users' acceptance of cloud gaming is crucial in determining the future of this new platform. A lack of awareness regarding these factors may lead to the users’ rejecting the new technology.

Method

This is a research conducted through an inductive approach, using a survey as a research method, where the primary data comes from a structured interview. A descriptive study is conducted in order to obtain the full set of user-related features of cloud gaming. After that the technology acceptance model is utilized in order to find out the user perception of these features.

Conclusions

The research ends-up with an applied version of the technology acceptance model. The platform features that affect the user's decision-making process establish user-related factors, which is their cognitive response to the new technology. These factors are: perceived quality, perceived availability of internet, perceived usefulness, perceived ease of use, perceived security, perceived ownership, interest in playing games, monetary, perceived availability of games. There are different conditions on each factor that provoke either negative or positive attitude of the users towards using cloud gaming.
Table of Contents

1 Introduction ........................................................................................................... 4
  1.1 Background ..................................................................................................... 4
  1.2 Problem ........................................................................................................ 4
  1.3 Purpose/Research Question ......................................................................... 5
  1.4 Perspectives ................................................................................................ 5
  1.5 Delimitations .............................................................................................. 6
  1.6 Definitions ................................................................................................... 6
  1.7 Time Line .................................................................................................... 8

2 Theoretical Framework ...................................................................................... 9
  2.1 Features of cloud gaming based on theory ............................................. 9
    2.1.1 Introduction to Cloud Computing .................................................... 9
    2.1.2 Infrastructure as a Service (IaaS) .................................................... 9
    2.1.3 Platform as a Service (PaaS) .......................................................... 10
    2.1.4 Software as a Service ..................................................................... 10
    2.1.5 Main technology characteristics ................................................. 12
    2.1.6 Related Technologies and Definitions .................................... 12
    2.1.7 The new Gaming Platform and Enabling Technologies ........ 15
    2.1.8 Summary of the user-related issues ........................................... 18
  2.2 Technology Acceptance Model ................................................................. 18
    2.2.1 Applicability of TAM ................................................................. 20
    2.2.2 Application to the research ........................................................... 20

3 Methodology ........................................................................................................ 21
  3.1 Research Outline ....................................................................................... 21
  3.2 Research Philosophy .............................................................................. 22
    3.2.1 Epistemology .............................................................................. 22
    3.2.2 Ontology ....................................................................................... 22
    3.2.3 Axiology ....................................................................................... 23
  3.3 Research Approach ................................................................................. 23
  3.4 Research Strategy ..................................................................................... 24
    3.4.1 Structured interview .................................................................... 24
    3.4.2 Secondary Data .......................................................................... 27
  3.5 Credibility .................................................................................................. 27
    3.5.1 Reliability .................................................................................. 27
    3.5.2 Validity ...................................................................................... 28
  3.6 Method of Analysis ................................................................................... 29

4 Empirical Findings ............................................................................................ 30
  4.1 Primary Data ............................................................................................... 30
  4.2 Secondary Data .......................................................................................... 33
    4.2.1 Automatic updates and upgrades .............................................. 33
    4.2.2 Overall Costs .............................................................................. 33
    4.2.3 Limited Choice of Games .......................................................... 35
    4.2.4 Internet (Availability) ................................................................. 35

5 Analysis ............................................................................................................ 36
  5.1 Features ....................................................................................................... 36
5.1.1 Bandwidth and Latency ........................................ 36
5.1.2 Automatic updates and upgrades .......................... 37
5.1.3 Risk of Viruses .................................................. 37
5.1.4 Thin Client Benefits ........................................... 38
5.1.5 Costs .................................................................. 39
5.1.6 Range of games .................................................. 40
5.1.7 Necessity of Internet ........................................... 40
5.1.8 Features & Factors from open-ended question ......... 40

5.2 Factors .................................................................. 41
5.2.1 Perceived quality ................................................ 42
5.2.2 Perceived availability of internet .......................... 43
5.2.3 Perceived usefulness .......................................... 43
5.2.4 Perceived ease of use ........................................ 44
5.2.5 Perceived security ............................................. 44
5.2.6 Perceived ownership .......................................... 44
5.2.7 Interest in playing games & monetary factor ......... 45
5.2.8 Perceived availability of games ........................... 46

5.3 Attitude towards using ......................................... 46

6 Conclusions ............................................................. 48
6.1 Contribution of the thesis ....................................... 49
6.2 Lessons Learned ..................................................... 49
6.3 Further research ..................................................... 49
**Figures**
Figure 2.1 - The level of the proposed cloud computing services .................. 11
Figure 2.2 - Levels of Clou Service used by OnLive ................................. 16
Figure 2.3 - Software agents in SOA architecture ..................................... 16
Figure 2.4 - The technology acceptance model ........................................... 19
Figure 4.1 - Game pricing for different platforms ....................................... 34
Figure 5.1 – Factors and Features from the research applied in TAM .......... 42

**Tables**
Table 1.1 - Research Time Line ............................................................... 8
Table 2.1 - Summary of the user issues ...................................................... 18
Table 3.1 - Features and variables derived from the theoretical framework. 25
Table 3.2 - Features and variables derived from the literature review ......... 26
Table 4.4 - Game pricing (SEK) on the cloud and conventional platform .... 34
Table 5.1 - Factors emerging from the features, suggested in the theoretical framework ................................................................. 39
Table 5.2 - Factors and conditions that form the user attitude ................... 47

**Appendix**
Appendix 1 – Structured Interview in English ........................................ 54
Appendix 2 – Structured Interview in Swedish ....................................... 56
I Introduction

This chapter aims at providing a background, in order to understand the objectives, purpose, and scope of this research. It starts off with giving a systematized background of the research field, presenting the current state of the gaming industry, and moves on to briefly outlining how cloud gaming is conducted. This chapter also presents and elaborates on the research question and the sub-questions, provides the scope and defines the perspective for the research. This chapter concludes by elaborating upon the delimitations, definitions and the time line for the research.

1.1 Background

Over the past few decades, games have become an important part of our society and the gaming industry has resulted in a multi-billion dollar colossus (Baage, 2009). The gaming industry has seen an exponential rise in its growth over the years thanks to the immense improvements in technology and an ever growing gaming interest in our society. In the U.S alone, the gaming industry witnessed sales of over $10.5 Billion in 2009, as compared to $5.5 billion in 1999 (ESA, 2010). It’s not just the new generation that is indulged in the world of gaming, but research has suggested that this phenomenon holds true throughout our society, irrespective of the age-group.

The facts being presented here are to stress on the wide-spread of gaming and its importance in our society, leading us to our research in a new trend in gaming referred to as cloud gaming. Cloud gaming is a term used throughout the research in order to name games, which use cloud computing within their infrastructure or implementation. The fundamental concept of cloud gaming is that it uses rapid data compression to allow the users to store their games in the cloud, on the web servers, and then pull these games down at any time and play them on any device which is capable of providing internet (Gross, 2010). The users input controls are received from the users’ device, all the processing is done on the servers and the result is streamed over the users’ internet connection (Schuster, 2011).

According to the technical division of CNN, CNN-Tech; if fully realized, they say, cloud gaming could be a console killer (Gross, 2010). It may be “a game changer” (Baker, 2009), therefore there is a growing interest in the topic alongside its significance.

1.2 Problem

It is not known how users will react to this new gaming platform. The gaming platform that uses cloud computing has different features as compared to a game that is installed locally on a machine (conventional gaming). There is a knowledge gap concerning how users accept this new technology and what their decision making process is affected by.

It is important to understand the users and the influence on their decision making process, since it will lead to a more thorough understanding in how the industry will develop over time. This is important for developers and providers in order to meet users’ needs. This is decisive for the future of the entire industry.
Cloud gaming is expanding as an industry: more companies are willing to participate and therefore its significance rises. Considering the fact that this is a market environment, the acceptance by the user has a big impact on this industry, since the users possess the buying power and the market revolves around them (Javalgi, Martin & Young 2006).

1.3 Purpose/Research Question

The purpose of the research is to understand what influences the user’s decision-making process. Games using the new platform are considered as a new technology since those games have different features as compared to the games offered through the conventional platform.

In order to address the purpose of this research the following research question was developed:

- What are the user factors that influence the decision-making process of the users?

The factors that the research aims at discovering are the different issues that the users perceive as important and which influences their decision making process regarding the acceptance of cloud gaming. In order to answer the main research question, we need to find out the factors that affect the users through developing sub-questions, which are as follows:

- What platform features of cloud gaming influence the users’ acceptance of the new gaming platform?
- How do the user factors influence the users’ attitude towards the new gaming platform?

The first question seeks the features of the new platform from a technological perspective, which influence the users. The research refers to features as the different qualities of the games, using cloud computing as a platform.

Thus knowing the factors, the research can highlight the effect of those factors and the different conditions that affect the users’ decision-making process. In this way the research will achieve its objective into finding out what the decision-making process of the user is influenced by.

1.4 Perspectives

The research approach is based on the users’ perspective. Users are the individuals who play games and therefore play a significant role in the development of the industry, (Javalgi et al., 2006). The gamers and their perspective regarding the implementation of cloud computing is at the core of this research. The research aims at providing answers for the public and does not specify on a particular segment of users. This perspective involves how the users perceive cloud gaming; the factors that influence their decision of accepting or rejecting cloud gaming.

- The perspective chosen is the influence on the user behaviour when applying a new gaming platform
1.5 Delimitations

There are time and resource constraints. The time constraints of the research are that it started effectively in the beginning of March and has to be finished by the end of May, which combined with the resource constrain (little or no access to corporate information and documentation), provides a serious obstacle for conducting an entire research concerning the full implication of cloud computing in the gaming industry.

There is also an access restraint, as none of the leading cloud gaming companies or any other company has decided to participate into the research. Therefore the entire research is based on users’ data, secondary data and theoretical framework.

There are financial restraints as well, since there is some existing literature concerning the implementation of cloud computing in games, but since they have not been provided by any institution, they remain out of the budget for this research.

➢ Thus having all the delimitations and constraints in mind, the research scope is limited to understanding the user-side of applying cloud gaming as a new gaming platform

1.6 Definitions

All of the definitions provided below are used throughout the research and further elaborated upon in the theoretical framework.

Cloud Computing – a set of patterns and techniques, aiming at providing on demand service, through the internet to users on a pay-per-use basis, thus improving management efficiency, resource efficiency and benefiting from economies of scale, (Mell & Grance, 2009).

Infrastructure as a Service (IaaS) – a level of cloud computing services, in which the provision of networking, bandwidth, computational and storage resources are provided to a user; these also form a layer within the next level of cloud computing services, (Mell & Grance, 2009).

Platform as Service (PaaS) – a level of cloud computing services in which there is a provided infrastructure, combined with a development environment and developed modules, enable the users to build their own applications and to store, exploit and manage them within the cloud, (Mell & Grance, 2009).

Software as a Service (SaaS) – a level of cloud computing services in which an application, which is stored and run on a cloud infrastructure, is rendered to the user on pay-per use basis, without the user managing or adapting the application, (Mell & Grance, 2009).

Distributed System – one or more software agents, running on more than one server, with the aim of achieving a common goal or task. Examples can include supercomputers, grids, clusters and cloud computing, (Peleg, 2000).

Latency – the difference between the moment of triggering a command from a client and the moment that the server responds, (Boustead, 2005).
**Virtualization** – refers to the technique of enabling the existence of more than one server, called virtual machines, on the same physical platform, without knowing interacting with each other, (Breznitz, Kushida & Zysman, 2010).

**Load Balancing** – technology that applies patterns in order to distribute the workflow over a network in the most efficient way, avoiding server-side overloading and software limitations, (Microsoft, 2011).

**Cloud Gaming Platform** – The way cloud computing is applied in games. The game code is adapted to run on the new infrastructure (IaaS), through (PaaS) provided by cloud game service provider and then it runs as software as a service (SaaS), which is accessed through a web-browser by the end-user.

**Service-Oriented Architecture (SOA)** – is a technique, which uses layering into building solutions and systems. Every layer is seen as a relation between a consumer and a provider, where the consumer requests a service and does not care how the service is conducted as long as it is being received from the providers, Tsai, Sun & Balasooriya (2010).

**Web Services** – is different set of protocols, applying the SOA principle over the internet, (Agrawal, 2009).

**Thin client** – is a client that does not conduct any of the software application code on its physical platform, but is used as a device to interact with the server that is executing the commands. The basic computations are required from a thin client: receiving, displaying and sending data, (PC Magazine, 2011).

**Streaming** – is a technology that enables the delivering of data, such as video, graphics or audio, over the internet in real-time, (Austerberry, 2005).

**Cloud Gaming** – Games that use rapid data compression to allow users to play them on the cloud, on any device which is capable of providing internet (Gross, 2010). These use cloud computing in their implementation.
## 1.7 Time Line

Table 1.1 - Research Time Line

<table>
<thead>
<tr>
<th>Deadlines</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>February, 20th</strong></td>
<td>➢ Develop research topic</td>
</tr>
<tr>
<td><strong>March, 10th</strong></td>
<td>➢ Finish literature Review ➢ Determine Research Scope &amp; Knowledge Gaps</td>
</tr>
<tr>
<td><strong>March, 20th</strong></td>
<td>➢ Introduction Chapter ➢ Finalize Background knowledge</td>
</tr>
<tr>
<td><strong>April, 3rd</strong></td>
<td>➢ Finish literature review ➢ Start writing theoretical framework</td>
</tr>
<tr>
<td><strong>April, 4th</strong></td>
<td>➢ Negotiate access</td>
</tr>
<tr>
<td><strong>April, 7th</strong></td>
<td>➢ Design structured interview</td>
</tr>
<tr>
<td><strong>April 15th</strong></td>
<td>➢ Validate structured interview ➢ Finalize Methodology</td>
</tr>
<tr>
<td><strong>April 30th</strong></td>
<td>➢ Collect the data</td>
</tr>
<tr>
<td><strong>May, 12th</strong></td>
<td>➢ Data analysis</td>
</tr>
<tr>
<td><strong>May, 17th</strong></td>
<td>➢ Conclusions ➢ Finalize the research report ➢ Submit for feedback from tutor</td>
</tr>
<tr>
<td><strong>May, 25th</strong></td>
<td>➢ Finalize thesis work and submission</td>
</tr>
</tbody>
</table>
2 Theoretical Framework

The aim of the theoretical framework is to examine the different features of cloud computing when implemented in games, as well as other features derived from related cloud computing technologies used in the new gaming platform. Therefore it is divided into two main sections. The first section provides a foundation for examining these features and the user perception of their user perspective. The second section introduces a framework for the analysis of the empirical findings, by applying the technology acceptance model (TAM) and thus addresses the main research question.

The first section begins with introducing cloud computing and explains how some feature are derived from it. Then the field of distributed systems is explained with its enabling technologies which also derive features. The section continues with examining the actual application of cloud computing and provides a basic application model of cloud computing as a gaming platform in the case of a company that adapts conventional games for the cloud.

This first section ends up with a summary of the platform features, which are derived from cloud computing and its related technologies. These platform features are the ones that affect the users, according to the different researchers, and are to be further examined through the structured interview and the analysis.

2.1 Features of cloud gaming based on theory

2.1.1 Introduction to Cloud Computing

The terms cloud computing, Infrastructure as a Service, Platform as a Service and Software as a Service are not strictly defined, as they may have different variations and therefore definitions. Mell and Grance (2009), suggest that the definition of cloud computing is argued about and evolved by different stakeholders over time and that this is an ever changing paradigm and its definitions will change over time. However, the following provided definitions give a basic understanding and the common usage of these technologies.

According to the US National Institute of Standards and Technology, cloud computing is a technique or a pattern of combining different set of existing technologies in order to provide and ensure the availability of existing computer resources, through the internet, on-demand, in a convenient way, and to minimize management efforts (Mell & Grance, 2009). Such resources include networking, computational capacity, storage capacity, services and applications, and the cloud promotes availability (Mell & Grance, 2009).

2.1.2 Infrastructure as a Service (IaaS)

This is the delivery of: networking capacity, data storage, the virtualization technology that suits the hardware and resource management, the operating systems and hardware (e.g. servers on which data is stored and/or applications are running), as suggested by Hurwitz, Bloor, Kaufman & Halperl, (2010) and (Mell & Grance, 2009). According to Weinhardt, Anandasivam, Blau, Borissov, Meinl, Michalk & Stosser (2009), infrastructure as a service can be viewed into two main categories: provisioning of data storage and the provisioning of computing power.
“So far, pricing models are mostly pay-per-use or subscription-based. In most cases, Cloud Computing infrastructures are organized in a cluster-like structure facilitating virtualization technologies.” (Weinhardt et al., 2009, p. 396)

Infrastructure as a Service is the possibility to rent resources over the internet. These resources include: processing, storage and bandwidth and the possibility for the customer to deploy and run any operating systems and/or applications, according to Mora (2009). The infrastructure is not managed by the customer, or the user, but by the provider. What the user controls is the operating system, the storage, the application and occasionally the networking components (e.g. firewall, load balancing). (Mora, 2009)

- **IaaS (offers to the customer/user of the service)** – bandwidth, data storage, processing power

IaaS is the basis of cloud computing, on top of which the other layers are built. Therefore the above listed attributes are features of the new technology – games using cloud computing in their implementation.

### 2.1.3 Platform as a Service (PaaS)

Platform as a service is the provision of the possibility to deploy customer/user developed applications on an infrastructure of a provider and making use of the provider’s development environment, tools and languages, according to Mora (2009) and Mell & Grance (2009).

“The consumer doesn’t manage or control the infrastructure, the network, the servers, the operating system and the storage but he has control over the deployed applications and occasionally the applications hosting configuration environments.” (Mora, 2009, p. 13)

If the management of the infrastructure and the applications running on it is conducted entirely by the provider, then this may sometimes lead to dependency of the users to the provider. If the users decide to change the provider, they may have to adopt the application to the new provider’s infrastructural requirements, or development requirements, according to Hurwitz et al., (2010).

“Development platforms enable developers to write their applications and upload their code into the cloud where the application is accessible and can be run in a web-based manner. Developers do not have to care about issues like system scalability as the usage of their applications grows.” (Weinhardt et al., 2009, p. 396)

- **PaaS** – Integration service (Infrastructure is entirely managed by the provider); management of applications (by the user), (Mell & Grance, 2009)

At this level of Cloud computing its features remain the same, with the addition of management of the operating systems of the servers and the load balancing services.

### 2.1.4 Software as a Service

In this form of cloud computing, the user rents and uses an application. The application is not owned by the user, but the customer only pays for its use. The service provided makes use of the provider’s applications accessible through a client interface, such as a web browser (ex. Gmail) (Mora, 2009) (Mell & Grance, 2009). The infrastructure (serv-
ers, broadband, operating systems and data storage) and the application itself are entirely managed by the provider, according to Mora (2009) and Mell and Grance (2009).

“Applications are delivered through the Cloud facilitating the platform and infrastructure layer below which are opaque for the user.” (Weinhardt et al., 2009, p.396)

According to Mell and Grance (2009), the term software as a service is seen as the provision of the capability to a consumer of accessing and using a provider’s application, which is running on the provider’s network. Compared to PaaS, SaaS also provides the infrastructure, but this time adding a ready-to-use application to the user directly on a pay-per-use basis (Mell, Grance, 2009).

- **SaaS** – pay per use of a software, which can be accessed through a variety of thin clients, mainly web-browsers, (Mell & Grance, 2009).

At this stage of cloud computing the features that are directly affecting the user are: the management of the software itself (the application or that is the actual game). Since SaaS build-up on IaaS, this level of the services provides the most features that related to the user.

![Figure 2.1 - The level of the proposed cloud computing services](image)

Hoogvliet (2008) outlines arguments which are in essence user benefits of using software as a service with regards to the client perspective of the model:

- **Small costs** – there is a low cost of acquiring, suing and managing the application (Hoogvliet, 2008)
- **Fast acquisition** – the process of implementing and acquiring an application is time-efficient (Hoogvliet, 2008)
- **Improved maintenance** – the level of customer support, service (such as updates, upgrades) and feedback is improved (Hoogvliet, 2008)
- **Infrastructure** – the responsibility for the infrastructure is shared and therefore well managed (Hoogvliet, 2008)
- **Costs planning** – the predictability of the expected ongoing costs gives greater flexibility to the user (Hoogvliet, 2008)
- **Security** - risk factors are reduced, security is increased (Hoogvliet, 2008)
2.1.5 Main technology characteristics

The following five characteristics of cloud computing are created by the Gartner Group, according to Plummer, et al. (2009) and Mell and Grance (2009), and have a summarizing purpose for applying cloud computing in general (cited in Mora, 2009).

- **Service based** – The technology is service-oriented, thus abstracting the concerns of the consumer with the concerns of the providers (Mora, 2009). The services are provisioned automatically without human interaction (Mell & Grance, 2009).

- **Rapid elasticity and scalability** – The services are scaled upon demand by adding or removing resources depending on the demand (Mora, 2009). To the consumer these services may appear unlimited as they are purchased and left on the go (Mell & Grance, 2009).

- **Shared resources** – Services share a pool of resources in order to build economies of scale. Economies of scale are such that through increasing the output, costs of the services are decreased (Mora, 2009).

- **Pay per use** – These services are tracked with usage metrics, enabling a “pay-as-you-go model”. (Mora, 2009) The tracking is done automatically as there are embedded mechanisms for doing that (Mell & Grance, 2009).

- **Ubiquitous network access** – Services are delivered through the web, using web identifiers, protocols and formats and have an identical access (Mora, 2009). Those resources are available over the internet and can be accessed from any platform such as thin or thick clients, which includes PCs, mobile phones and so on (Mell & Grance, 2009).

2.1.6 Related Technologies and Definitions

Cloud computing is related to the field of distributed systems, as shown below, and is also dependent on technologies such as virtualization and load balancing in order to operate. There are some issues that arise from the field of distributed systems and distributed computing, which is inherently connected to cloud gaming as it can be seen as a distributed system.

2.1.6.1 Distributed Computing

A *distributed system* is any system that has two or more autonomous processors working together, by communicating with each other, in order to achieve a common goal (Peleg, 2000). These processors are active throughout the working process of the system and are still capable of operating on their own. Peleg (2000) outlines another significant characteristic of the distributed systems, they (the distribute systems) are non-uniform. This implies the sense that these processors may vary in their size, power and organizational architecture and may be geographically dispersed. According to Foster, Zhao, Raicu and Lu (2008), depending on the different characteristics of the distributed systems, they have different subsets. Foster et al. (2008) suggest that those subsets can be supercomputers, grids, clusters, and clouds (cited in Giacomo & Brunzel, 2010).

Peleg (2000) suggests that there are many problems associated with distributed systems some of them being communication, time and synchronization. The issue with *commu-
communication is that it should be considered as a computational resource as well (other being, for example, storage capacity, processing time, etc...), since this may lead to a limitation on the communication as well (Peleg, 2000).

According to Peleg (2000), understanding the concept of time in distributed systems and developing effective methodologies for dealing with it is still a phenomenon under active research. One aspect of this domain is the level of synchronization and the different patterns presently existing that address it. According to Peleg (2000), different patterns may vary according to the level of synchronization.

- An issue in Distributed Computing is bandwidth
- Another issue in Distributed Computing is synchronization, which is dependent on time

With regards to cloud gaming, those features impose limitations, since a cloud game is a distributed system and its implementation increases the requirements for bandwidth. Another limitation is the distance to the server which results in a time difference. Hence it affects the synchronization and might induce poor gaming performance.

The result of an insufficient bandwidth may result in poor performance of the game and may result in visibly slow actions. Poor gaming experience may have other causes as well. Those that are being addressed by the research also include latency and hardware with insufficient capabilities. That is how these features appear to the user.

2.1.6.2 Latency

Latency is an essential issue to cloud gaming and is setting a limit to for geographical distribution. The maximum distance between the end user and the data-centre hosting the cloud gaming service (OnLive) should be no more than 1000 miles (1600 km) (OnLive a, 2010). According to Burgess and Roy (2009), latency can be viewed as the time difference between the moment of initiating an action from the client and the moment when it is recognized physically by the server. “The presentation and interaction consistency are directly influenced by the network latency” (Boustead 2005, p.151.)

The significance of the gaming experience varies in different genre of games. In a shooter game the game environment requires frequent and precise interaction with the user; therefore it can be heavily affected by the delay. As low as 60 milliseconds of latency can cause disturbing experiences when playing games (Boustead, 2005). It is proved that strategy games and role-playing games are less affected or can be playable with higher latency values, where the nature emphasizes strategy rather than rapid movement actions (Boustead, 2005).

The lack of synchronization caused by the network delay brings inconsistency among players. In an example of a racing game the car’s position displayed on one players’ monitor will not be the same on the other player’s monitor (Ikedo, Ishibashi & Yasui, 2005). This is a possible outcome when latency occurs and is to be further examined with regards to the user perception of it. However, if there is little or no latency, such inconsistencies will not occur.

Inconsistencies are basically the difference between the state of program in the client and in the server. According to Davison (2005), simulations can be run when data losses occur and then the program send messages for updating the system information. Heck-
mann (2006), suggests that one of the mechanism of reducing the effect of latency is predictions. These predictions may end-up differing from the reality. Because the predictions can be different from the reality and can lead to inconsistencies. These inconsistencies caused by the predictions are referred to throughout the research as simulations.

2.1.6.3 Cloud computing enabling technologies

There are two main technologies that enable cloud computing and those are virtualization and load balancing. As suggested earlier by Mora (2009), load balancing is a technology used in providing infrastructure as a service (IaaS). The infrastructure is the foundation part of cloud computing and its subsequent levels of service (PaaS, SaaS).

2.1.6.4 Virtualization

Virtualization is the technology of enabling a software-created virtual machine that has properties of a physical server. This makes it possible to run multiple virtual environments on one physical machine. Virtualization is customizable in terms of resource distribution, both virtual and physical, as it enables flexible usage of the hardware power of the real machine. Virtualization’s main goal is improving scalability and balancing workloads making more efficient use of the hardware (Breznitz et al., 2010). Virtualization inevitably increases the requirements for bandwidth with regards to cloud gaming. Thus this technology contributes to form one of the features of cloud gaming – bandwidth.

2.1.6.5 Load Balancing

Load balancing is a technology that enables the distribution of information over a network in order to ensure maximum efficiency within a distributed system (Microsoft, 2011). The aim of load balancing is to create a scalable infrastructure that provides a satisfactory level of performance of a system. Load balancing is usually conducted in between the client and the application/database server (depends on the type of system), (Microsoft, 2011). There are many issues affecting load balancing. Such can be: Server-side overloading; application requirement limitations (limited number of CPUs is required); servers as end-nodes in a network fail; too many servers might complicate the performance measurement (Microsoft, 2011). The load balancing technology is supposed to deal with these issues.

There are two types of load balancing: software-based and hardware based (Microsoft, 2011). In the case of software-based load balancing, there is software installed on the loaded server within a system, which controls the flow of requests from the client side according to predefined algorithms (Microsoft, 2011). In the case of the hardware-based load balancing, there is a router or another networking device that regulates the flow (Microsoft, 2011). Load balancing is a crucial technology that provides the smooth workflow of the infrastructure and therefore is a crucial enabler of cloud computing and its applications.

2.1.6.6 Streaming

Streaming is another enabling technology that provides the possibility for using thin clients or the so called low-end devices. This technology allows the smoother communication between the client and the server, by easing the requirements for the bandwidth.
Media streaming – the technology that enables capturing video, graphics or audio and delivering it from the source to the end user through a network, in real-time. The initial content can be pre-recorded or a live broadcast. If the transmission is a continuous process it does not require any intermediate storage space on the end device. The quality of the content is determined by original material, processing power and bandwidth of the network. This technology enabled on-demand services (Austerberry, 2005). The process of streaming involves four stages: Capturing the media, Encoding, Distribution and Playing on the end device (Austerberry, 2005).

Cloud gaming utilizes streaming to deliver the content of played game to the user in form of video and audio. This enables the rendering of the game to be outsourced and the outcome (game visuals) be viewed by the user on a low-end machine. Moreover, the stream is real-time broadcast it can change it contents on-demand enabling thin client features.

Streaming requires stable and low latency network connection in order to keep the real-time consistency that is crucial specifically in gaming. Usage of the cloud gaming service states the minimum bandwidth requirement and evaluates the latency which gives a recommendation (OnLive [b], 2010).

- Streaming enables **outsourced rendering** and **on-demand services** which are part of thin client benefits feature
- Streaming requires adequate **bandwidth** and **latency** affects it negatively

### 2.1.7 The new Gaming Platform and Enabling Technologies

The chapter is going to discuss the implementation of cloud computing in games. A particular example is chose, that of OnLive. This company is chosen, because it is the largest active provider of cloud games at the moment of the research. Besides that this company utilizes the cloud computing technology in a common way as the others are. The presented below application of cloud computing is at a very high, conceptual level and aims at providing an overall logical connection of the technologies involved.

This company has on-demand instant gaming (OnLive b, 2010). The company uses monthly rates for membership, which in January 2011 was planned to be $9.99 per month (OnLive b, 2010). The service is offered over the internet to low-end devices, as the company names them (OnLive, 2011). Thus the company is deploying a SaaS gaming platform, available to anyone over the internet on a pay-per-use basis. The users’ agreement to subscribe for a month is considered to be a period that they will be using the service.

Another cloud service is offered by OnLive and that is the PaaS, with which OnLive provides both infrastructure and development environment, together with SDK, for the game developers, who wish to adapt their program to the new platform and use the SaaS channel provided with OnLive in order to explore the new market (OnLive, 2011). In Figure 2.2 below, a simple explanation of the technology mentioned above is shown. PlayPack is the package of games that OnLive offers with the subscription fee, (OnLive b, 2010). Within the PaaS layer, OnLive offers a development environment with SDK (Software Development Kit), in which developers can adapt their source code and test it safely (OnLive, 2011).
2.1.7.1 **Service-Oriented Architecture**

The service-oriented architecture is a method, which enables the new cloud gaming platform. According et al. (2010), cloud computing and SOA are related, since SOA is an organizational method that enables the organization to build and reuse solutions and cloud computing is the technology that enables the use of hardware on a massive scale, both effectively and efficiently. According to Agrawal (2009), the service-oriented architecture is a method that aims at providing independency between interacting software agents (Figure 2.3). Agrawal (2009) suggests that the software agents are any of the components of a system that are interacting, thus applying the layering technique, and make it possible for system components to be reused (Tsai et al., 2010).
According to Agrawal (2009), Web Services are inherently coupled with the SOA structure, since what Web Services achieve is to provide common protocols for every component of a system using the web and thus making the access ubiquitous, standardized and therefore cost-efficient. The model suggests that any interaction of the software agents is seen as service and there is an agent called consumer that wants the service and a software agent that provides the service, called consumer and provider respectively (Agrawal, 2009). The consumer should not care how the service is conducted, what matters is the final result (Agrawal, 2009).

- The **service-oriented architecture**, combines with the **Web Services**, provides a universal access to the services offered from anywhere on the web.

A rule in the SOA style is the independence, achieved through layering and Web Services utilizes the internet, through protocols, which are also open, such as Web Service Definition Language (WSDL), Simple Object Access Protocol (SOAP), Universal Description, Discovery and Integration (UDDI) (Agrawal, 2009).

### 2.1.7.2 Thin-Client Platform

According to the PCMagazine (2011), there are three types of thin clients: 1) Shared Resources (UI Processing), which is a computer that has basic functions such as User Interface (UI) processing, Input and Output (I/O) processing and other basic function used and the rest is hosted on a server, where the entire processing occurs (the server is shared with other thin clients as well); 2) Desktop Virtualization (UI Processing), which is the same as the previous one, but this time the server is virtual and not shared with any other client and 3) Browser Based (Data Processing), which can be any computer, regardless of hardware capabilities and functions, however application-wise, the whole data processing occurs on a server.

The latter type of thin client is the one related to cloud gaming, as the users of the service access it through their web browser and rely on the Web Services, streaming and other technologies to play the game on a remote server. The only computations that occurs are input, output, presentation and networking on their side (the client side). Hoogvliet (2008), describes the Web-applications/Thin Clients as distributed applications over the internet, which in most cases do not need to be installed. They can be started and loaded over a network (Hoogvliet, 2008).

Hoogvliet (2008) outlines four main reasons why web-applications are preferable to use rather than desktop application as follows (with regards to cloud gaming, these are seen as features of the new platform):

- The **web-based thin client** runs the application through a browser on a remote server, thus **eliminating** the **necessity of installing** the application, (plug-ins may be required occasionally)
- The updates, upgrades are **automatic** and vendor-managed
- **Any computer** (hardware in general with regards to cloud gaming) with a connection, which has access to the internet, can become **access point to the game**, thus providing **independence** of the operating system (OS)
There is less risk of viruses, when using the application over the internet, rather than as an executable one. (provided that the website or web-application is a trusted one)

### 2.1.8 Summary of the user-related issues

Table 2.1 - Summary of the user issues

<table>
<thead>
<tr>
<th>Reason</th>
<th>Technical issues</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ Distributed system</td>
<td>The network requirements are higher</td>
<td>Bandwidth</td>
</tr>
<tr>
<td>➢ Distributed system</td>
<td>Synchronization and time problems</td>
<td>Latency</td>
</tr>
<tr>
<td></td>
<td>Simulations (inconsistencies)</td>
<td></td>
</tr>
<tr>
<td>➢ SaaS</td>
<td>The management of the application is conducted by the provider</td>
<td>Automatic Updates and Upgrades</td>
</tr>
<tr>
<td>➢ SaaS</td>
<td>A safer way to play games</td>
<td>Risk of viruses</td>
</tr>
<tr>
<td>➢ SOA</td>
<td>Platform independent access</td>
<td>Thin client benefits</td>
</tr>
<tr>
<td>➢ Thin Client</td>
<td>On-demand access</td>
<td></td>
</tr>
<tr>
<td>➢ Thin Client</td>
<td>Lower acquisition efforts</td>
<td></td>
</tr>
<tr>
<td>➢ Streaming</td>
<td>Lower hardware requirements</td>
<td></td>
</tr>
</tbody>
</table>

Table 2.1, see above, provides the full set of features of the new technology that are being further examined. The relationships between the features and their technical reasons are summarized. Those are used in the construction of the structured interview in order to examine the user perception of those.

Regarding the first variable – bandwidth – there are technologies presented that reduce the effects of it. The fact that a game is processed on more than one computer makes it a distributed system and therefore increases the requirements on the bandwidth.

Latency still remains an issue for the user as the distance to the server still remains an issue. Too long distance from the servers can result in poor gaming experience, which causes obvious disturbances in playing games (Boustead, 2005).

The risk of viruses feature is examined in the scenario when the cloud game providers themselves are not sources of viruses. In that case it is safer to play the games on the cloud, as Hoogvliet (2008) suggests.

### 2.2 Technology Acceptance Model

In order to examine how the users perceive these features derived from the application of cloud computing in games (summarized in Table 2.1, see below). Cloud gaming is seen as a new technology that has got characteristics and based on those characteristics, the users decide to accept it or not. In order to find out the factors affecting the user decision, the technology acceptance model (TAM) is applied.
According to Davis, Bagozzi and Warshaw (1989), the TAM states that users adopt new technology when they see it as easy to use and useful. Davis et al. (1989) continue that the model is applicable when evaluating a system before it is being implemented, meaning that users should not have interacted with the system previously.

According to Davis (1993), the TAM includes: system design features, two factors that affect user behaviour (1) perceived ease of use and 2) perceived usefulness); attitudes towards using the system; and actual system use. Davis (1993) concludes that the actual feature of a system directly affect how a user perceives it. This means that users perceive the usefulness and the ease of use of a system according to its features. Davis (1993) continues that system features have no direct impact on actual system use other than affecting the user perception of the system and that the attitude towards using a system has a strong relationship to the actual system use. The relationships established by Davis (1993) are described in the model, presented in Figure 2.4 (see below). Furneaux (2006) argues that the perceived ease of use affects the perceived usefulness of a system.

The first component of the model is system design features, which is also considered as an external stimulus. The system design features are the way in which qualities and attributes of this system appear to the user (Davis, 1993). It is seen as external stimulus as it is part of the environment of the user.

The next stage of the model considers the cognitive response of the users, which means how users perceive those external stimuli. According to Davis (1993) there are two factors that are relevant. These are perceived usefulness and perceived ease of use. According to Davis et al. (1989), the perceived ease of use is the manner in which a user perceives the features presented by the external world (the system features in particular). Davis et al. (1989) continues with defining the perceived usefulness as the manner in which the users perceive the system features useful in enhancing their performance.

The stage of affection includes the attitude of the users towards using the system. According to Davis et al. (1989), this is the manner in which the users realize and rationalize of the external features presented to them. This results in behaviour, or that is the actual system use (the user acts).

Figure 2.4 - The technology acceptance model - Davis (1993), retrieved from: http://deepblue.lib.umich.edu/bitstream/2027.42/30954/1/0000626.pdf
2.2.1 Applicability of TAM

There is an on-going discussion on TAM and its applicability. Tseng and Lo (2011) conduct a research on the factors that will make users shift from using 2G/3G mobile users to 3G/4G mobile users. The context of the research is within the telecommunications technology and considers customers shifting from one product to another, and the latter is a new technology. Tseng and Lo (2011) argue that TAM is partially applicable and also confirm other factors to be important when considering this shift (both technologies are alternative to each other): satisfaction, perceived price, enjoyment.

According to Burton-Jones and Hubona (2006), TAM is not complete and there are other variables relevant to the user acceptance of a new technology. They conducted a research within a US Government agency on system usage, where they found out that there are other factors affecting the user behaviour that the two proposed in TAM by Davis (1993). Such additional factors for that case are: system experience, level of education and age.

2.2.2 Application to the research

As stated above TAM is applied in an organization, before a new system is implemented. However the context of the research is not an organization. TAM will be applied in analysing the users behaviour in a context of a market, where the external stimuli is a new gaming platform, which uses cloud computing and has new features as compared to conventional gaming. Another difference from the original and intended application of TAM, which is an organization, is that the research is within the domain of the entertainment industry.

Therefore the confirmed logic of TAM will be applied in this research and that is the pattern of External Stimuli, which are perceived from the users (Cognitive response), and this Cognitive response leads to affections among the users (Affective response), which eventually determines the user behaviour. The user behaviour is to accept or decline this new feature.
3 Methodology

This chapter outlines the manner in which the research is conducted. It evaluates and describes the research philosophy, approach, strategy and data collection methods that are applied to the work in this research. It also aims at giving the outline of the thesis structure and to evolve upon issues such as generalizability, reliability and validity. The aim of the overview of the entire research process is to provide the possibility for future validation. Also there will be more clarity upon the achieved results and conclusions of the research.

3.1 Research Outline

The research outline aims at providing the structure of the entire thesis, more specifically it gives the logic according to which the different chapters are related to each other, in order to clarify the following analysis process.

The thesis will rely on Theoretical framework and Empirical Findings chapters to conduct analysis and consequently achieve its objectives. The theoretical framework aims at giving and explaining technical overview from previously conducted studies and suggests issues, which are derived from the application of cloud computing technologies in the new gaming platform. The Empirical Findings chapter aims at providing the data necessary for the analysis, so that the main research questions can be answered. Also these are combined with the types of studies conducted. (See Figure 3.1)

Figure 3.1 – Simple outline of the research - relations between chapters and studies

The research relies on descriptive study, which is mainly within the theoretical framework, as a forerunner to the exploratory study within the data collection chapter. A descriptive study is necessary since it is important to have a full picture of the phenomenon under investigation (Saunders, Lewis and Thornhill, 2007). Also a method used for the analysis and achieving the thesis objective is introduced.
The exploratory study will be finding out the factors perceived by the users which result in an attitude towards the new gaming platform and in order to achieve that an understanding of the phenomenon of cloud gaming is needed as well as the issues it brings up when applied to gaming. The research aims at the user’s perspective regarding the acceptance of cloud gaming, since this is less known phenomenon.

3.2 Research Philosophy

The first step in determining the methodology relies in understanding the research philosophy. It allows the researchers to get a better idea regarding why they approach their work the way they do. It deals with the development of knowledge within the research conducted (Saunders et al., 2007). It clarifies the fundamental assumptions that the researchers hold regarding the world and how it affects the choices they make regarding the research approach, strategy and data collecting techniques.

3.2.1 Epistemology

Epistemology focuses on the field of knowledge. It deals with what is considered acceptable knowledge in a field of study (Saunders et al., 2007). It describes how knowledge is created and how the newly generated knowledge is affected by the researchers’ assumptions.

There are two main sets of assumptions in this philosophical branch, the positivist assumptions and the interpretive assumptions. Positivist treats knowledge as sets of data that can be observed and measured, and the conclusions can be law-like generalizations (Saunders et al., 2007, p 103). Whereas the interpretive suggests that researchers should recognize differences amongst humans in their role as social actors (Saunders et al., 2007, p 106).

The research is conducted from an interpretive viewpoint since each human differentiates from one-another. The research adopts the positivist approach, since the targeted outcomes are factors and conditions that are to be followed when adapting a new technology according to the users’ demands. The research aims at finding out factors in general that affect everyone, the difference between human-beings as social actors are not taken under consideration.

3.2.2 Ontology

Ontology focuses on the nature of the knowledge. It deals with the assumptions of the world and seeks to explain whether it’s our assumptions of the world that establish social entities or is it that entities exist independent of social actors. It consists of objectivism and subjectivism. The first one assumes that “social entities exist in reality external to social actors concerned with their existence”, whereas the latter suggests that “social phenomena are created from the perceptions and consequent actions of those social actors concerned with their existence” (Saunders et al., 2007, p 108).
Objectivism will most likely lead to deep understanding of the reality. Whereas in subjectivism, the knowledge created might be biased, due to the involvement of the researchers with the reality. Therefore, in-order to accurately observe a reality, this research is subjective in nature, since the researchers are in direct contact with the users/gamers. Furthermore, gamers are the one creating their own reality through the choices they make, regarding what they like and dislike. The study is about how gamers perceive the values of the new trend – the new gaming platform.

3.2.3 Axiology

Axiology focuses on judgements associated with values (Saunders et al., 2007). It refers to the researchers’ determination of their personal values. This highlights how the researchers’ judgments influence the outcome of the research and might help in understanding different conclusions, for the same case, by different researchers.

For the purposes of this research, the axiology is not considered in depth, since the research covers the examination of the factors in the decision-making process of the user acceptance of a novelty. The research has to do with opinions, values and perspectives; it is also more of an exploratory one.

3.3 Research Approach

The research approach focuses on the manner in which the research is conducted. It involves the way in which the research is conducted and its underlying processes. There are two main approaches for a research investigation, deductive and inductive (Saunders et al., 2007). The deductive approach aims at testing the validity of an already established theory, through empirical data collection. The inductive approach on the other hand aims at establishing a theory by receiving input from observations, findings (Bryman & Bell, 2007), focus group interviews or in-depth interviews with specialists (Saunders et al., 2007).

- The chosen research approach is **inductive** as the evaluation of empirical findings will derive answers to the problem.

The inductive approach is chosen for this research. The researchers aim at gathering empirical data from the literature review and along with the theoretical framework, evaluate primary and secondary data and present conclusions regarding the factors that affect decision-making process of the user acceptance of cloud gaming. The researchers tend to collect qualitative instead of quantitative data, and in this way it is not concerned with the need to generalize. (Saunders et al., 2007).

The research aims at providing an answer for the future of cloud gaming and is being conducted from a users’ perspective. Information regarding the differentiating factors between conventional and cloud gaming is collected from several sources. By examining these factors in the structured interviews, the users are asked about their opinions regarding them. The respondents are also asked for additional factors that they deem to be important for them.
3.4 Research Strategy

The choice of research strategy is inherently important as it provides the outline of the research, the research tools, data collection techniques and limitation that a research has. It is also needed for research validation purpose. Saunders et al. (2007) argue that any research strategy may be associated with descriptive, exploratory and explanatory research and that some strategies are relevant for both inductive and deductive approaches. The same authors continue that research strategies are not alternative to each other and that there is no one worse than the other. The choice lies between: experiment; survey; case study; action research; grounded theory; ethnography; archival research (Saunders et al., 2007).

The research strategy chosen for the research is a survey. The survey will be conducted through an inductive approach as the researchers look for the reactions towards phenomenon to draw conclusions. This holds true for the theoretical features that appear in the academic literature. According to Saunders et al. (2007), the research objective should guide the research design. The research relies on a mono-method, since it is conducted only through one strategy and the type of data needed is qualitative (Saunders et al., 2007).

- The chosen research strategy is: survey, which makes the project a mono-method research

Saunders et al. (2007) continue that the data collection techniques associated with this strategy is: questionnaire; structured observation and structured interviews. The data collection techniques used in this research paper is a structured interview, which can be associated and used for inductive purpose.

- The chosen data collection technique is: structured interview

3.4.1 Structured interview

This data collection technique, according to Saunders et al. (2007), is based on an interview, which has predetermined questions, with a predetermined order, and the interview is read physically to the respondent by the interviewer. However in order to have more depth, the questions are mostly open-ended, giving a chance to the respondents to evaluate upon their answer. One of the questions requires quantifiable data from the user, however that is just evaluation purposes and the answers were therefrom translated to a qualitative meaning. This concerns question 4 from the interview, where users are given the possibility to rate the importance of the particular issue under investigation, however that importance is then taken qualitatively (the features were rated: important, unimportant or neither important, nor unimportant).

The reason why this is not a semi-structured interview is because the open-ended questions do not have explanation purposes. The questions aim at listing or giving reasons for an opinion, and when an opinion is asked it has more predictable answer (‘Yes/No’, ‘I would/I wouldn’t’, and similar answers, which are more quantifiable). The interview also has a fixed order of questions, which were not changed as the interview goes on and there are no additional questions to come up during the interview. According to Saunders et al. (2007), this type of interview is an interviewer administered questionnaire with the purpose of less respondent bias.
The reason to choose this type of interview over a more in-depth interview is because there is a set of derived features and factors that the new technology offers to the user. Those features that are enabled by the cloud computing will be questioned in the structured interview and the reaction noted. The interview relies on open ended questions.

### 3.4.1.1 Structured Interview Design and Validation

The structured interview consists of three main parts: 1) factors derived from the theoretical framework; 2) factors derived from the literature review, but those not being raised as issues and documented in academic literature and 3) questions, seeking for new insights among the gamers. For the first purpose, the variables that are derived from the theoretical framework are explained as what they would appear to the user under “Explanation” (see below table 3.1). Under “Purpose”, the reason of the questions asked is stated, so that they can verify the variable as a factor. Finally under “Method” connection to questionnaire is shown (See Appendix 1 and the Swedish translation Appendix 2). For all of the variables the main idea behind the interview is the reveal the user’s perspective of those. The questions are asked with the aim to understand how users perceive the issues associated with cloud gaming.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Explanation</th>
<th>Purpose</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandwidth</td>
<td>Due to limitations on bandwidth, sometimes playing games results in lagging (the game is visibly slow to play)</td>
<td>To find out whether lagging is an issue for the gamers and what is the impact on the user</td>
<td>Q1 Q2</td>
</tr>
<tr>
<td>Latency</td>
<td>Because of infrastructural issues (distance to server, type of cable) there is visible to the user amount of time to play a game and may result in lag, or collapse of the game</td>
<td>To find out what is the impact on the user, when there is latency (connected to the previous one due to same lag issues), the game is not played in real time</td>
<td>Q1 Q2 Q3</td>
</tr>
<tr>
<td>Automatic upgrades and updates</td>
<td>The gamer does not have to take care of the upgrading or updating the application and will always play in a compatibility mode with everyone else</td>
<td>To find out whether this has an impact on the users to make them play a game, or make them feel better when using the services (what is the impact on the consumer)</td>
<td>Q4.1 Q4.2</td>
</tr>
<tr>
<td>Less risk of viruses</td>
<td>There is always risk of viruses, but the user is aware that cloud gaming is safer</td>
<td>To find out whether this is affecting the user in some way (knowing that it is safer on the cloud)</td>
<td>Q4.3</td>
</tr>
<tr>
<td>Thin client benefits</td>
<td>Platform independent access Unlimited storage of games (limit of number of games available) Access at any time Low requirement from the device No need to install the game</td>
<td>To see the extent of the impact of these issues on the user (the gamers)</td>
<td>Q4.4 Q4.5 Q4.6 Q4.7 Q4.8 Q5 Q6</td>
</tr>
</tbody>
</table>
With regards to the second part, the factors that emerged from the literature review for this research, those are not verified in the academic literature as issues, however they seem as they are credible. In Table 3.2 (see below) the features that are established are listed under “Variables”. This table has got the same design and purpose as the previous one (Table 3.1, see above). There is an issue concerning costs, which is the first variable in the table. Costs may have different angles to look at, so what is aimed with the questions concerning costs, is how the users tend to perceive costs. The three sub-variables listed in the table below (Table 3.2) are the ones that form the total cost. These will be backed up with concrete number within secondary data. The issue for the interview is to find out whether users find it relieving to pay as they go, or just see it as a price sum and other perspectives that this issue may be seen with. Those variables are later considered as features in the analysis.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Explanation</th>
<th>Purpose</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Costs</td>
<td>Cost is floating issue, which depends on time in the new platform, as well as hardware, subscription and the game itself.</td>
<td>How does the user see game-related costs?</td>
<td>Q7</td>
</tr>
<tr>
<td>Hardware</td>
<td></td>
<td></td>
<td>Q8</td>
</tr>
<tr>
<td>Subscription</td>
<td></td>
<td></td>
<td>Q9</td>
</tr>
<tr>
<td>Software (games)</td>
<td></td>
<td></td>
<td>Q10</td>
</tr>
<tr>
<td>Limited choice of games</td>
<td>There is a limited number of games adapted to cloud gaming</td>
<td>To see if it affects users; users might also want to try out new games; they also might want to play definite games</td>
<td>Q11</td>
</tr>
<tr>
<td>Internet (availability)</td>
<td>Internet is required in order for cloud gaming to work</td>
<td>To see if the user think of the availability of internet as a limitation</td>
<td>Q12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Q13</td>
</tr>
</tbody>
</table>

The last part of the interview consists of open-ended question that may require some elaboration, as well as precise questions. This part seeks at providing the users the ability to say if they are attracted by the new technology and what they think about when making their decision.

With regards to validation, the structured interview is pilot-tested and revealed to meet its objectives. The questions are easy to understand, some require elaboration from the interviewers. The interview is not limited for people who have experienced cloud gaming or any other sort of gaming. The structured interview takes around 5 minutes to complete, it may vary from respondent to respondent. None of the questions appear to make respondents uneasy and some questions need further clarification, which is provided to the interviewees. The overall design is clear and understandable, neither interviewees, nor interviewers seem to get lost in the interview. Interviewees observe the recording of the answers in order to make sure that there is no bias.
3.4.2 Secondary Data

The research also relies on secondary data. According to Saunders et al. (2007), this data may be raw or compiled and the research relies on both. Saunders et al. (2007) continue and outline three types of secondary data collection: documentary; survey-based and multiple source data. Documentary data can be either written or non-written materials and this research contains examples of both, such as journals, newspapers reports and minutes of committees, pictures (Saunders et al., 2007). The research also includes examples of survey-based secondary data: Reports on gamers’ behaviour in Europe and the USA. Therefore this research makes use of the multiple source method, which is a combination of both (Saunders et al., 2007).

- The secondary data type is multiple-source

Listed below are the most frequently used data sources within the research

- Articles
- Magazines
- Books
- Blogs
- Journals
- Reports

Below are listed the most commonly used locations and search engines for the secondary data sources:

- Google Scholar
- Diva
- Google
- Jönköping University Library Database

The findings from the empirical data are then utilized as the basis for the structured interviews, with the aim of verifying and adding to the existing knowledge. This leads the researchers on to determining the future of cloud gaming, by deriving the attitude towards cloud gaming among the gamers.

3.5 Credibility

In order for a research to be credible, it needs to maintain high quality and have a good design. The three concerns regarding credibility are within the domain of reliability, validity and, generalizability. However, in order to get the correct answers to the research, validity and reliability are the two main issues that need to be paid attention to (Saunders et al. 2007).

3.5.1 Reliability

Reliability is the extent to which the data collection techniques or analysis procedures will yield consistent findings (Saunders et al., 2007). Saunders et al. (2007) suggest three main questions in regard to determining how reliable the research is:
Will the outcome of the research be the same, if other researchers attempted to undertake this study with the same characteristics?

Will the outcome of the research be the same is it is conducted on a different occasion?

Are the conclusions from the results transparent?

The four main issues with reliability are associated with: **subject or participant error; subject or participant bias; observer error; observer bias.** There is no threat concerning a subject or participant error, since participants are not affected by anyway from their environment when comes to the subject investigated, moreover the interview is conducted in private and anonymity is guaranteed. With regards to subject or participant bias, the interviewees have no incentive to answer in other way than their own opinion, since the issue is not related and does not affect any part of their lives. Preventing observer error is also assured by structuring the interview and having less possibility of varying in the interpretation of the replies, which leads to observer bias prevention (Saunders et al., 2007).

Data has been collected from several sources and has been cross checked for verification with other sources. The outcome of the research will remain the same as long as the status-quo remains the same.

### 3.5.2 Validity

Validity is concerned with whether the findings really reflect what the research is about (Saunders et al., 2007). Validity is about proving the extent to which the findings provide accurate representation of the things they are supposed to be describing (Easterby-Smit et al., 2008). There are two types of validity that can pose a threat to the credibility of the research, internal and external.

Internal validity is concerned with the individuals that are being interviewed. In this research, it is the users/gamers that can pose a threat to the validity of the research. There are several factors that can cause this. For example, there can be biased opinions, individuals might not be aware of cloud gaming, un-awareness of other factors, etc. The researchers have tried to overcome these threats by conducting short and straightforward interviews. External validity is concerned with the application of the research findings in other situations.

With regards to **history** there are no major events related to the research phenomenon as it is new in its nature. The interviewees are not affected by any way of the research findings and therefore **testing** is not an issue. The interview regards opinions and it is conducted at one occasion, therefore there is no room for **instrumentation, mortality and maturation** as threats (the research is not conducted over a period of time with regards to the interviewees) (Saunders et al., 2007).
3.6 Method of Analysis

The logic behind the performed analysis within the research is based on the logic of applying TAM. The features of the new gaming platform are derived from the theoretical framework, verified throughout the empirical findings, combined with the features found from the empirical data collection and are used as a basis of determining the factors that affect the user and users attitude towards accepting the new gaming platform.

The research utilizes TAM in order to achieve its objectives. According to TAM the external stimuli are the ones that affect the user. These stimuli are referred to as the platform features of cloud gaming. These are gathered from the suggested cloud gaming attributes from the theoretical framework as well as those discovered from the literature review (presented in the secondary data). The interviewees are questioned concerning those attributes (from the theoretical framework and the secondary data). The interview furthe questions for features.

The external stimuli provoke a response in the users. Different features provoke different factors. The relationship between those is retrieved from the interviews. Furthermore the interview reveals how the users perceive cloud gaming through each factor (what is their attitude of acceptance). Based on the interview the different conditions that determine the users’ attitude towards acceptance are also noted down.

Thus the objectives are being achieved: 1) finding out the features that affect the users and provide the technologies that affect the particular feature (if such); 2) finding out the factors into which these feature evolve in the users’ mind; 3) finding out the conditions from those factors which will determine the users’ attitude towards accepting cloud gaming.
4 Empirical Findings

4.1 Primary Data

Within this section the answers that we have collected from the structure interviews are presented in the form of direct quotations. Some answers are repeating and the number of repetitions is neglected. For question 7,8 and 16 the answers are paraphrased.

Q1: When playing a game over the internet and if there is lagging, but the game can still be played, will that make you stop playing the game? Why?

"I will continue playing for the sake of playing, if it is in multiplayer", "I will continue playing, but that will make me really angry", "I will quit as soon as I notice, because if I play FPS this totally ruins the game", "I will check and if the lag is more than 100ms I will just quit", "If that lag is too much I will quit, because I will not be able to control the games", "I will quit if it is in single player, because the whole point of the game is quality", "I will not stop if I like the game", "If the lag is too much, I will try to fix it somehow and if I can't I will just leave it"

Q2: Will you try playing again?

"I will try again”, “I will see how bad it is”, “I won’t quit, if it is not that bad”, “If I like the game, I will continue”, “I definitely try at least a few times”, “I will try playing again but will stop after a while and wont probably try again since it didn’t work the previous time”, “I will keep on trying till it gets fixed”, “If I really like the game then I’ll try several different things to fix the problem”, “I won’t try again, since it didn’t work the previous time”.

Q3: If you are playing a game in real time over the internet, would the change in game (induced by a simulation) make you quit? Why?

“I would keep on trying if the simulations do not occur often”, “I will continue playing if the induced simulation is not far from reality”, “I don’t mind as long as I don’t notice them”, “I don’t like simulations”, “Simulation ruins the point of the game, since it’s away from the reality”, “If I like the game, I will still continue”, “I won’t stop playing the game if the induced simulations does not create difficulties for me, by changing the path of the game”, “I will see how bad it is and then quit”.

Q4: Please rate from 1 to 5, where 1 is very important and 5 is not important, the following benefits of online gaming, the way they seem to you (e.g. all can be 1 at the same time):

1. Automatic updates and upgrades
2. Playing a compatible version in multiplayer
3. Lower risks of viruses
4. Play on any device with internet connection
5. Unlimited storage of games
6. Play the game at any time
7. Low requirements for you device
8. No need to install the game
1. Automatic updates and upgrades – important
2. Playing a compatible version in multiplayer – important
3. Lower risks of viruses – important
4. Play on any device with internet – neither important, nor unimportant
5. Unlimited storage of games – important
6. Play the game at any time – important
7. Low requirement for your device – important
8. No need to install the game - neither important, nor unimportant

Q5: What hardware performance problems do you usually have with your gaming hardware? (Please mark the ones you have)
- Storage
- RAM
- Frequency (Processor)
- Graphics card
- other (specify):

Most of the users suggested storage, RAM, frequency (processor) and graphics card as the major performance problems in regards to their gaming hardware. There were no additional problems that the users suggested.

Q6: What do you think about the idea of instantly accessing the game on the internet rather downloading it or buying it in store?

“It is very convenient”, “It depends on the game if I really want to buy it”, “for me this convenience is not important”, “It is a convenient way for cheap games”, “I don’t always want to buy it online”, “I prefer to have the original package and possibly extra things such as a poster and guide along with it”, “It seems convenient but is not usable”, “It can be used to try out games”, “It is a great idea”, “It’s a good idea if the website is trusted”, “I don’t see any downside to it”

Q7 & Q8: Have you in the last 3 years, upgraded your computer or bought a new one so that you can play a game that you couldn’t play on your old configuration? If previous yes, than how much money did you spend?

Responses here show that a bigger percentage of the users prefer to upgrade their gaming platform, in-order to play the latest games. Moreover, they either update a specific component or buy an entire computer.

Yes responses: “I don’t remember how much I spent on the upgrades”, “I bought RAM for 600 SEK”, “I bought 1 Terabyte of hard disk for 800 SEK”, “I spent around 800 SEK on upgrades”, “I spent something like 1000 SEK for upgrading my hardware for gaming”, “I upgraded my computer’s RAM for 1250 SEK”, “I bought a new graphics card for 2500 SEK last year”, “I had to pay 2200 SEK for a nVidia graphics card so that my pc could run Crisis on it”, “A couple of years back I got my system upgraded for 2700 SEK”, “I changed my computer for 3100 SEK”, “I bought a new computer for 4200 SEK”.
Q9: What do you think about playing online games on a pay-per-use basis?

"I would play if it is cheaper than in the stores", "I would not play those games if there is subscription", "I would play if it is free of charge", "As long as the price is reasonable, I would like to play those games", "I would play only if I really like the game, because if there is a subscription, this would require determination to play the game"

Q10: What do you think about the idea of trying out demo versions of games online for free, without the need of downloading them?

"It is really good idea, because downloads take memory and if I don't like it I have to delete after that" "I don't like the idea of demo versions of a game, because they don't have all the features of the game and have a different experience", "Demo versions are not really important for me, but it is good that this feature is available" "I like the idea of demo versions, if it represents the entire game properly"

Q11: Do you like "Assassin's Creed 2"? If you had the possibility of trying out the game for free online and you liked the quality, would you buy it for $29.90? (This is an option on OnLive, where you get unlimited access to it, but it is available only online and you can play it online only)

"I haven't played it before, but it sounds like a good idea." "That I think is really cheap, I would definitely like to try it out", "Yes, if I liked the quality and the gaming experience and the game as well, I would definitely buy it", "No, I would not like to play the game, I am not into games so much", "I don't know the price in the stores, but if it is cheaper I would go for it", "I have the game already, but I still wouldn't go for it even if I didn't have it, I don't like the game that much", "I am not interested in the game and I am not interested in buying it"

Q12: What games do usually play? Do you have preference for (a) specific genre and game-mode?

When stating their preferences some users clarified that they would either aim for a specific game, when they want to play. Others stated that they aim for the game mode, which is multiplayer (less wanted single player) and most of the users answered that they look for specific game genres.

Q13: What do you think about the fact that you need internet to play your games? Is it limiting for you?

“Depends, if I play football I want it. Generally bad thing”, “Yes, I prefer playing online”, “No, I play offline”, “No, I have access to the internet wherever I go”, “No, It is not limiting”, “Yes, I like to play multiplayer and internet is needed”.

Q14: What reasons would make you play a cloud game?

“If it doesn’t take me a lot of time it sounds interesting”, “Simplicity”, “Easier connection to the game”, “If my computer is too bad for the game and price is reasonable”, “Quick access”, “Easy access but have to have latest games too”, “My computer is bad, no install requirement”, “If my other friends play it (multiplayer)”, “Lower price than in the store”

Q15: What would your reasons not to play cloud games be?

“Quality of the game is to low”, “Lag issues”, “High prices”, “The normal game play is better”, “Have computer for games”, “Don’t like to subscribe and pay”, “Don’t want to
be limited because of the internet”, “Want to play normally with hard copies, risk for problems”, “Lagging is enjoying if present”

Q16: Which is your favourite game and would you want to play on the cloud?

Some people say that they would not like to use the cloud service. Others confirmed that they want to play; provided that the quality is good (graphics and performance) and that their computer has limited performance capabilities.

People answered in general that they play “Counter Strike”, “World of Warcraft”, “FIFA” and “Call of Duty”.

4.2 Secondary Data

Secondary data highlights the features of cloud gaming from a user’s perspective, which have emerged from the literature review but are not verified by the academic literature. There are three main variables that have been suggested as playing an important role in developing users perspective regarding cloud gaming. There is also data supporting other features (such as those from the theoretical framework).

4.2.1 Automatic updates and upgrades

Players in a multiplayer mode game are required to run the same version of the game software. Game developers are releasing patches in order to keep the game up to date. The patches can be applied automatically or manually. The user has to make sure the game is in accurate version in order to join a specific multiplayer game. The Activision’s support website is informing about the need of software update and is redirecting to the location of a required patch that makes it possible to join game servers (PC, Call of Duty: World at War) (Activision, 2010).

4.2.2 Overall Costs

Cloud gaming is economical in comparison to conventional gaming. It not just allows the users to keep their current hardware configuration but also lets them purchase cheaper games. Besides, cloud gaming allows multiple price plans based on the requirements of the users.

The users no longer need to have the most expensive and up-to-date hardware at their disposal (Knipp, 2010). Hardware, such as memory, processor, graphics card, etc., tends to get out-dated as years go by and the users have to upgrade. With cloud gaming, the users can use their old computer, to run the most advanced and graphic intensive games on the cloud. They no longer need to worry about a certain game not being able to run on their computer. Since all the processing is done on the cloud servers rather than on the user’s computers, the user doesn’t need to spend hundreds of dollars on hardware upgrades (Hope, 2010). The input from the user is received over the internet, the process of implementing the controls in the game is done on the cloud servers and the result of that is sent back to the user over his/her internet connection (Schuster, 2011). As compared to this traditional gaming requires the possession or upgrading of expensive hardware to assure that the latest and processor intensive games seamlessly run on the users’ device. For example, users possessing a 3-4 year old computer won’t be able to run a graphically intensive game such as Crysis 2 on their computer without upgrading the processor, memory, graphics card, etc… (Upside, 2011).
The games on the cloud servers are cheaper and offer flexible purchasing/renting plans for the users. OnLive, a leading cloud gaming company (OnLive, 2011), is used as an example in-order to elaborate on this important feature. OnLive offers several ways for users to play the games. Users can try the free demo of any game on the cloud and can go on to make the purchase. They can also rent the game based on the 3 or 5 day renting package. OnLive also offers a subscription package, which involves over 50 games for a standard rate of $10 per month (OnLive, 2011). Users are free to play whichever game they want and they are not restricted by time or the amount of titles. This is a great subscription plan that gives users unrestricted access to several games without having to download or install them. Besides the subscription package, the individual games for cloud gaming are cheaper on the cloud as compared to conventional gaming. A table (table 4.1) has been provided below, which provides the prices for 5 popular titles on the cloud (on OnLive) and on other platforms (Xbox 360, PS3, WII, and PC). The prices are as of 27th April 2010 and have been taken from OnLive and Cdon respectively. The prices from US dollars have been converted in to Swedish Kroner using xe.com, in-order to have a fair comparison of prices for the different platforms.

Table 4.1 - Game pricing (SEK) on the cloud and conventional platform

<table>
<thead>
<tr>
<th>Game</th>
<th>OnLive</th>
<th>Xbox 360</th>
<th>PS3</th>
<th>WII</th>
<th>PC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lego Batman</td>
<td>122</td>
<td>199</td>
<td>199</td>
<td>199</td>
<td>199</td>
</tr>
<tr>
<td>NBA 2k11</td>
<td>122</td>
<td>449</td>
<td>299</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Prince of Persia: The Forgotten Sands</td>
<td>122</td>
<td>199</td>
<td>199</td>
<td>199</td>
<td>399</td>
</tr>
<tr>
<td>Shaun White Skate Boarding</td>
<td>122</td>
<td>349</td>
<td>349</td>
<td>199</td>
<td>-</td>
</tr>
<tr>
<td>Homefront</td>
<td>304</td>
<td>499</td>
<td>499</td>
<td>-</td>
<td>399</td>
</tr>
</tbody>
</table>

Figure 4.1 - Game pricing for different platforms
4.2.3 Limited Choice of Games

The number of game titles available on the cloud is significantly less as compared to titles available for conventional gaming. Although this is due to the fact that the phenomenon of cloud gaming has just recently started booming, this does affect the users opinion regarding cloud gaming. Conventional gaming has several hundreds of gaming titles available for its users to choose from. However, in the case of cloud gaming, the title pool for the users is significantly small. For example, OnLive only offers a total of 85 games (OnLive, 2011), however as the firm expands its business it is expected to add several more.

4.2.4 Internet (Availability)

The only thing required is a working internet connection to access the cloud. This points-out a very crucial feature, which is core to cloud gaming, the internet. Cloud gaming requires constant availability of internet, so that the user can access the games from the cloud server (Webster, 2010). Without the availability of internet, cloud gaming is rendered useless. This is a big limiting feature for users, since they are constantly required to be connected to the internet in-order for their games to work. Conventional gaming in comparison does not require the availability of internet and hence has an edge over cloud gaming in this regard. John Riccitiello, the CEO of Electronic Arts in an interview with industrygamers.com supported this point of view by suggesting that sometimes it is in-efficient to deliver the game to a user via streaming. He further elaborated on the fact that the users don’t really care about the underlying technology, as long as it works (Brightman, 2011).
5 Analysis

This chapter is divided into three main sections that follow the first three stage of the TAM, (Davis, 1993). The first stage summarizes and describes the whole set of features of cloud gaming that affect the users’ decision-making process. The second part summarizes the factors that emerge from the features and the last part provides cases from different factors that affect the users’ attitude positively or negatively. The analysis uses as an input the features derived from the theoretical framework as well as the literature review (which is section 4.2 Secondary Data) and the data from the structured interview (section 4.1 Primary Data).

5.1 Features

The features discussed in the theoretical framework (See table 2.1, Theoretical framework chapter) and used in the interview (See table 3.1, Methodology chapter) are the user features that are tested, by being presented to the users and getting their opinions on the matter. These features, according to TAM, Davis (1993), are the external stimuli that affect the user and provoke a cognitive response from the user side. Besides those some other features emerge from the secondary data. No new features that affect the decision-making process of the user have appeared from the interview.

5.1.1 Bandwidth and Latency

The first two questions of the interview deal with bandwidth and latency. Both of them may result in poor gaming experience for the user, provided that their requirements are not met. Latency also has an additional effect on the gameplay, which is the induced simulations, in-order to ensure the continuous running of the game. Hence a third question regarding latency is asked, with the intention to investigate this additional effect of latency. The main aim of the interview was to verify that the users perceived these features as important and investigate the manner in which they affect them.

The interview responses presented in the Empirical findings confirm that the users perceive lagging as an issue for them (the gaming disturbances are referred to as lagging for the simplicity purposes in the interview). They signify that if they are well motivated to play the game, then this disturbance can be ignored temporarily. However, if it persists, then the users will eventually give-up on the game. The interviews confirm that the effect of latency, which results in the induced simulations, remains important. Inconsistencies in the game are an important issue for the users. One of the reasons for playing is playing in a group, where real-time actions and synchronization of actions are important to the user. Also gaming experience is a significant reason for the users’ to play games.

- **Bandwidth** and **Latency** are features of cloud gaming that have a profound effect on the user perception of this new gaming platform

Hence the users group those features according to the way they perceive it. According to the Empirical findings, bandwidth and latency are associated with **quality** (that is how users perceive their gaming experience) and **ease of use**. Some users refer to lagging as having direct impact on the quality of the game, which suggests that it has an effect on their gaming performance. Other users state that they will continue playing if the induced simulations do not put them in difficulties.
Two factors (Cognitive Response) emerge from these features (External Stimuli) – perceived quality and perceived ease of use.

5.1.2 Automatic updates and upgrades

Automatic updates and upgrades are considered to be one of the most useful benefits of cloud gaming, according to the interviews conducted in this research. Users do see the need of having updated versions of their games. This feature of cloud computing is being derived from the fact that cloud games are basically the SaaS layer of cloud computing, which is offering software as a service. In SaaS the provider takes care of the application itself together with the infrastructure. (Weinhardt et al., 2009)

- Automatic updates and upgrades is a valid feature of the new gaming platform as perceived by the users.

Additionally this feature allows the users to play multiplayer online without the need for installing new updates/patches of the game, making it useful for them. Conventionally the users need to have the same version/patch of the game in-order to play multiplayer online; otherwise it becomes incompatible as discussed in the secondary data. An example is given, where there is the need for users to apply a patch in order to update their game version and thus play online in multiplayer.

Users perceive the automatic updates and upgrades as a useful feature since it eliminates any upgrade action from their side and hence proves to be very relevant for the user attitude of accepting the new gaming platform. In TAM, this external feature results in a factor in the cognitive process by the user. Users perceive it as useful since it allows them to utilize the technology of cloud computing in playing the games, without ever worrying about the version they have installed.

- The feature automatic updates and upgrades, is important and the user associates it with perceived usefulness, which is a factor in the Cognitive response stage of the TAM model.

5.1.3 Risk of Viruses

The respondents perceived the low risk of viruses as another important benefit of cloud gaming. On this platform, the games are installed and processed on the cloud servers and hence does not expose users to the risk of getting infected with viruses. The server receives the input from the users, does the processing and streams the response via the users’ internet connection (Schuster, 2011). This, according to Hoogvliet (2008), is a safer way to play games.

- The feature risk of viruses is perceived to be important by the users, as it affects them.

Through this feature the user perceives this new technology as being secure. This phenomenon holds true, when the users are aware of the cloud service provider. However, if the cloud service provider is not known by the users, chances are that they would not perceive this technology to be that secure.
This feature raises a factor of the Cognition Response when applying TAM (Davis, 1993) and that factor is **perceived security**, meaning the way the users see the website.

### 5.1.4 Thin Client Benefits

Other features of this new technology that are considered highly beneficial by the users involve the unlimited storage of games that it allows for the users, its ability to let the users play games at any time and the low requirements for the users’ device. All these factors enhance the users’ perception regarding the usability of this new technology. The fact that the users do not need to have the best hardware available for playing games is one of the top rated feature suggested by the respondents, closely followed by the remaining two. Amongst the hardware problems, users’ have cited storage, processor and graphical issues as their main concerns. This technology eliminates the need for users to have high processing power, good graphics card and ample storage space. These benefits are derived from the thin client feature and its enablers, such as streaming, the service oriented architecture (SOA) and SaaS respectively.

The unlimited storage of the games is derived from the very basic of cloud computing – IaaS. One of the features of IaaS is the data storage part, where the resources are being shared and therefore appear to be unlimited to the user. The maintenance of the network, which is the other advantage of IaaS, results in the ability of the user to play at any time. In this manner the respondents were asked how they perceive these features. As for hardware requirements they are result of the web-browser based thin client and the concept of SOA.

- Features, such as **unlimited storage of games**, **the ability to play at any time** and **hardware requirements** are considered important by the user.

There are a few additional features of cloud gaming such as being able to play the games on any device with internet access and the lack of need to install the game before playing which according to the interview results are perceived as neither important, nor unimportant. All of the thin client features are related to perceived usefulness, except for low hardware requirements, which is associated with boosting the performance of the old computers and therefore emerges as a perceived quality factor.

- Thin client benefit features are associated with **perceived usefulness** and **perceived quality**.
Table 5.1 - Factors emerging from the features, suggested in the theoretical framework

<table>
<thead>
<tr>
<th>Reason</th>
<th>Features</th>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ Distributed system</td>
<td>Bandwidth</td>
<td>➢ perceived quality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➢ perceived ease of use</td>
</tr>
<tr>
<td>➢ Distributed system</td>
<td>Latency</td>
<td>➢ perceived quality</td>
</tr>
<tr>
<td>➢ Streaming</td>
<td>Simulations (inconsistencies)</td>
<td>➢ perceived ease of use</td>
</tr>
<tr>
<td>➢ SaaS</td>
<td>Automatic Updates and Upgrades</td>
<td>➢ perceived usefulness</td>
</tr>
<tr>
<td>➢ SaaS</td>
<td>Risk of viruses</td>
<td>➢ perceived security</td>
</tr>
<tr>
<td>➢ SOA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>➢ Thin Client</td>
<td></td>
<td></td>
</tr>
<tr>
<td>➢ SaaS, IaaS</td>
<td>Thin client benefits:</td>
<td>➢ perceived quality</td>
</tr>
<tr>
<td>➢ SOA</td>
<td>➢ storage of games</td>
<td>➢ perceived usefulness</td>
</tr>
<tr>
<td>➢ Thin Client</td>
<td>➢ ability to play at any time</td>
<td></td>
</tr>
<tr>
<td>➢ Streaming</td>
<td>➢ hardware requirements</td>
<td></td>
</tr>
</tbody>
</table>

5.1.5 Costs

The research distinguishes between three sources of costs: software (cost of the game), subscription and hardware costs (costs for upgrading, updating gaming hardware, or buying a new computer for the purpose of playing games). Cost is an unavoidable feature when analysing the acceptance of a new technology in a voluntary, market environment. The empirical findings (see Primary Data) suggest that cost is influencing the consumers’ behaviour. A negative relationship emerges between the motivation to play the games and the costs that it incurs. This means that users who are more willing to play would consider less the costs of doing that (upgrading hardware). Here two factors emerge as a cognitive response from the user to the external stimuli of the new gaming platform, according to TAM (Davis, 1993). Those factors are monetary and motivation.

➢ Cost is an important feature of the new gaming platform and raises two factors as a cognitive response by the users: interest in playing games and monetary.
➢ There is a negative relationship between those two factors, when motivation is more influencing, monetary is less influencing.

Users reject the idea of a subscription fee (when it is applied). Users do not like the idea of committing to a game, since they find it as an obligation to play, however some stated that they like playing games in general and as long as the price is reasonable for them, they would play it. Again there is a relationship to the motivation. However subscription fee proves to be an influencing feature, when applied to the new gaming platform. There are cases where there is and where there isn’t a subscription fee applied.

With regards to the cost of playing a game on the cloud, users suggested that they will play the game if it is cheaper than acquiring the game from store. Thus all three parts of cost proves the importance this feature.
5.1.6 Range of games

This also proves to be an important feature since users have their preferences for playing particular games, or game genres which affects their intention to either play or not. This raises the cognition factor of the perceived availability of games, as this determines the users’ intentions to either play or not on the cloud. If a game is not available on the cloud, it cannot simply be offered by the cloud service to the users, reducing their intentions of embracing this new platform.

- **Range of games** is an important feature of the new gaming platform
- It is related to the factor of **perceived availability of games**.

5.1.7 Necessity of Internet

This feature of the new gaming platform, which requires internet to work, also proves to be important to the users. Some users associate it with the type of games they play. Sometimes it is perceived as a given feature to the gaming platform, which if not fulfilled, limits the users in their actions. Other users see it as an enabler to their gaming platform and perceive it as an addition, which fulfils their gaming demands. For those users, who prefer single player games, this fact is rather limiting, as normally (when the game is installed on the users’ computers) internet is not required. Other users do not find it limiting, since they see the availability of internet everywhere. Thus we can conclude that users associate this feature with their perception of the availability of internet. Users make their judgments according to how they perceive the availability of internet.

- The feature **necessity of internet** influences the users and is important in their decision-making process.
- This feature is related to the factor of **perceived availability of internet**.

5.1.8 Features & Factors from open-ended question

Here we combine the answers of questions 14 and 15, where users were asked to state the reasons why they would and won’t play games on the cloud. At this point of the interview the users become well aware of the existing features of the new gaming platform. Users make their judgment based on their assumptions on the current technological development of the gaming platform. However, these are certainly the most important features that affect their decision of playing.

These features are: price; free of charge or not; graphics and performance, latency and lagging, preference to own their game, necessity of thin client benefits: if they possess hardware with good performance they don’t perceive the benefits of a thin client in the same way as the users that do not own hardware with good performance, time-efficiency, easy to use, availability of interesting games (range of games), if there is a multiplayer option on the preferred games, automatic updates and availability of the games on multiple devices. These features relate to some previously described factors. However, there was one new factor suggested which is the ownership factor.
The new preference that the users have shown is whether they own a physical copy of the game or not. This suggests a deeper issue that influences their decision-making process, which can be defined as the ownership factor. The ownership factor is how the users perceive and think of ownership. This factor proves to have a significant influence on the users' attitude since users pointed out this issue when asked why they would not play cloud games. It can also be considered to have great importance for the users, since this question asks for an overall estimation from the respondents for what would stop them from playing cloud games and this response came out as the very first reaction.

- **monetary factor**: free of charge; price;
- **perceived quality factor**: graphics and performance, latency and lagging;
- **ownership factor**: preference to own the game;
- **perceived usefulness factor**: necessity of thin client benefits; time-efficiency; automatic updates; availability on any device;
- **perceived ease of use**: easy to use;
- **perceived availability of games**: availability of interesting games (range of games); if there is a multiplayer option on the preferred games;

In the bullet points above are listed the factors perceived as important issues that the respondents raised and respectively grouped to each other. All the factors are backed up with the answers from the respondents. The relation between those is made completely inductively by grouping different answers into those categories.

### 5.2 Factors

The factors that have emerged from the users are their cognitive response to the features of cloud gaming, which are in essence the manner in which users perceive the external environment. These factors are: monetary, perceived quality, perceived ownership, perceived usefulness, perceived ease of use, perceived availability of games, perceived availability of internet, interest in playing games and perceived security (Figure 5.1).

Furthermore the factors are examined in order to determine the manner in which they influence the users. This means that the research provides conditions which determine whether the users have positive or negative attitude towards using cloud gaming. Those conditions emerge from the empirical findings and their relationships to the factors are analysed.

Respondents have also raised issues in their answers. Whether their attitude towards using the new technology is positive or negative depends on conditions, which means that the factors may raise positive or negative attitude.
5.2.1 Perceived quality

Users associate quality of the gaming experience with the following signs as taken from the empirical findings: latency, performance and graphics. As discussed previously, latency and bandwidth requirements are the features that affect quality in the new gaming platform. Bandwidth and latency are related due to the fact that both result in poor gaming performance. However, poor performance can result from poor hardware capabilities as well. The quality of the graphics suggested by the users is also vital for their gaming experience and is inevitably associated with quality.

- The factor, perceived quality, represents the user perception of the gaming experience they have. Perceived quality determines the attitude of usage, if it is being perceived as good or bad quality. The external stimuli of quality are: bandwidth, latency, performance (related to hardware capabilities, including graphics of the game).

With regards to bandwidth, the new platform has increased requirements. According to OnLive (2010), the recommended bandwidth for seamless gaming is 3-5 Mbps. It is possible nowadays for internet providers to deliver up to 100 Mbps to their customers. However, the bandwidth requirements have to be fulfilled, otherwise this factor will lead to a negative attitude towards using cloud gaming.
With regards to latency, according to OnLive (a) (2010), the limitation is the speed of light, which limits the plausible range to play on cloud servers to 1,600 km from a server. Therefore if the users are close enough to the server then this will result in a positive attitude among the users.

Gaming performance with a relation to the hardware capabilities is perceived as an enhancer of the capabilities of the users’ hardware. Users who do not have the needed hardware capabilities accept this feature as a strong motivator to use cloud gaming. The interview results suggest that there is an assumption amongst some respondents that the new gaming platform cannot provide the same performance as the conventional gaming platform, especially when considering the graphics as compared to a locally installed game. This feature will lead to a negative attitude of the users if they don’t have hardware with good performance capabilities, otherwise it is a strong reason for the users to use cloud gaming.

5.2.2 Perceived availability of internet

This factor derives from the users’ perception of the availability of the internet. The reason for this reaction from the users is the feature of the new gaming platform, which is the necessity of internet connection in order to play games. With the perception of the availability of internet, users state that this is an important issue and it is decisive on their attitude towards playing the games on the new platform. This factor is also a general evaluation from the users’ side on whether they have available internet or not. With regards to the technology, it has been developed sufficiently, including the introduction of the 4G technology, to meet this requirement by the users. However, the internet infrastructure is not fully developed globally yet, therefore the condition for a positive user attitude is the availability of internet.

5.2.3 Perceived usefulness

Perceived usefulness is the level to which the users perceive a particular system to enhance their job performance (Davis, 1989). Automatic updates and upgrades along with the thin client benefits such as unlimited storage of games, the ability to play games at any time and the low device requirements are the top features that the users associate perceived usefulness with. Cloud gaming does not require the users to update or upgrade their games with new patches or to new versions, saving the user great amount of time. Users can have as many games as they like on the cloud without ever worrying about the storage problems. It allows them to play games instantly on the cloud, saving them from the hassle of downloading or installing the game before playing. It enables the users to enjoy the latest games without ever worrying about their current hardware configuration.

The user acceptance of cloud gaming can be judged by the users attitude towards using this technology. Davis (1993) suggests that the users’ perceived usefulness has a direct impact on the attitude the user develops regarding the product. Users with latest hardware upgrades and ample storage space did not see unlimited storage of games and low device requirements as major features of cloud gaming and hence did not play that big of a role at shaping their positive attitude towards the acceptance of cloud gaming as compared to other thin client benefits. Overall users see the thin client benefits as a useful feature, thus shaping their positive attitude towards using cloud gaming.
5.2.4 Perceived ease of use

Perceived ease of use is the level to which the users believe that using a particular system would be effortless (Davis, 1989). In this research, bandwidth and latency are the two features that the users associate perceived ease of use with. Low bandwidth and high latency both result in poor gaming performance, which is a major issue for the users (as shown in the empirical findings). In the interviews, the respondents suggested that high motivation of playing the games can temporarily result in neglecting this issue. However, persistent lagging will result in quitting the game.

Whether users will accept this new technology or not can be judged by their attitudes towards using it. Davis (1993) suggests that the users’ perceived ease of use has an indirect impact on the attitude of the users regarding the acceptance of the new product, by directly influencing their perceived usefulness.

Overall users with a good internet connection, which offers high bandwidth, and usually experience low latency while gaming, perceive cloud gaming as easy to use and have a positive attitude towards its acceptance. However those users that have limited bandwidth and frequently experience high latency while gaming generally do not perceive cloud gaming as easy to use and have a negative attitude towards its acceptance.

5.2.5 Perceived security

Perceived security is the level to which the user feels safe while using a particular system. Cloud gaming’s lower risk of viruses is derived to be a feature that the users associate perceived security with. Another issue that emerges from the empirical findings is that users do not know whether the cloud providers’ website is trusted or not (this holds true for those cases where the cloud provider is not known). This means that if the users are aware of the cloud service providers’ positive reputation, they feel more secure while using their service, as compared to if they did not know or never heard about the service provider.

According to Hoogvliet (2008), there is less risk of viruses when having the executable file of the game stored on the cloud. Security remains an important issue in the manner in which it is seen by the user. This relies on whether the cloud game provider is known by the user, or known as reliable by the user. If the cloud service providers are renowned, then the users perceive them as safe which results in the development of positive attitudes towards the use of it. However, if the service provider is unknown by the users, then they tend to become sceptical about it, which results in the formation of negative attitudes towards the use of cloud gaming.

5.2.6 Perceived ownership

The perceived ownership factor has been derived from the open-ended question number 15 in the interview. The factor emerged as the users were looking for possible negative aspects of a cloud gaming service. Some users feel that the act of owning a game in non-material version is not satisfactory. The feeling of owning a game is less present when the game is only connected to an online account. Some players prefer hard copies of games bought over digital copies. There are also groups of people who are collectors and specially buy limited editions of specific game releases.
The interviews are not designed in a way that would allow the researchers to calculate the percentage of users who consider the ownership factor important in stimulating the usage of cloud gaming. If the users do not object on having the game ownership virtually then this factor will not be influential in regards to their usage. However, in case of a negative perception of virtual ownership of a game, the users will form a negative attitude towards using cloud game services.

5.2.7 Interest in playing games & monetary factor

As it emerges from the responses to the structured interview, the factor of interest in playing games is important to the user’s decision-making process. This is the general motivation and interest of the user to play games. This factor can be associated with the desire of the user to play in general, or just playing a specific, targeted game, or just even the game mode. This factor is decisive in general for users to play on the new gaming platform, as it is decisive to play games in general.

The interest in playing games shows a strong relation to the monetary factor, and especially the way users tend to perceive costs. The monetary factor is the way users perceive and evaluate the costs. The research previously distinguished between three sources of costs, hardware, software and subscription. Users who have positive attitude towards using the new gaming platform, state as a reason for their attitude to be the condition of reasonable prices, or even whether the games provided as cloud services are cheaper than the same games offered through the conventional platform. Users who are motivated in playing games in general, would prefer using the new gaming platform.

The interest of playing games has a negative relation to the way users perceive costs. Those users who are less motivated in playing games, would look into more detail when evaluating the costs and some users would prefer to play only cloud games that are free of charge. The more users are interested in playing games, the more they will disregards the costs associated in doing so. Other users who prefer no charge at all are also not very stimulated in playing games and therefore might not find the games that are designed to be played for free for interesting. Those users, if they play, will target well-known games that they have heard of and like. Those games are usually massively played games and those do not come for free.

Thus the interest of playing games factor brings a positive attitude towards using the new gaming platform, as users will consider less the monetary factor. On the other hand, if the users have less interest in playing games, a strong motivation for them are the lower prices (they judge by comparing) or the fact that the new platform enables them to play games that their device cannot handle (therefore saving them the cost of acquiring the new device). The monetary factor is important and considering the fact that games are cheaper in the new gaming platform (see Table 4.4), and there are many emerging free games in different game genres, these factors will result in a positive attitude of the user towards using the new gaming platform.
5.2.8 Perceived availability of games

The perceived availability of games is the range of games that the user perceives available on the cloud. Some users might be interested in a particular game, whereas other in particular genres or game modes. Furthermore some respondents suggest that the availability of their favourite game or games on the cloud is decisive in forming their opinion on whether to accept the new platform or not. There are other users who are clearly after the act of playing games and those perceive the quantity of the games available as a positive feature.

Question 16 of the interview specifically asked for the respondents to state their favourite game and the responses are summarised in table 4.3 of the empirical findings. The results suggest that counter-strike, world-of-warcraft, FIFA and call-of-duty, are the top games that the users like. However these results cannot be generalized since those are not the intentions of the structured interview, or the research, however the above examples are of games that are very popular and the fact that they are not available on the new gaming platform might bring a negative attitude towards using the new gaming platform. The interview responses also prove that if the games are available on the cloud, then people will have a positive attitude of using the new gaming platform.

5.3 Attitude towards using

The attitude towards using the new gaming platform is determined according to the factors that the users perceive as important in their decision-making process. Regarding the purpose of the research, which is to find out what influences the decision-making process of the users, the conditions that determine the user attitude from the different factors were additionally considered. These conditions are summarized in Table 5.2 (see below).

According to Davis (1993), in his research concerning TAM, he noticed that there is a strong relation between the users’ attitude of using a new system and their behaviour. Tseng and Lo (2011) come to the conclusion that there is a strong bond between attitude and behaviour, when users have to upgrade from the 2G/3G to 3G/4G technology.
<table>
<thead>
<tr>
<th>Factor(s)</th>
<th>Condition(s)</th>
<th>Attitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Quality</td>
<td>1. Fulfilment of bandwidth requirements</td>
<td>1. Positive, if sufficient bandwidth</td>
</tr>
<tr>
<td></td>
<td>2. Distance to the server</td>
<td>2. Positive, if distance is smaller than the maximum range</td>
</tr>
<tr>
<td></td>
<td>3. Hardware capabilities</td>
<td>3. Positive, if the users’ hardware capabilities are insufficient for conventional games</td>
</tr>
<tr>
<td>Perceived availability of internet</td>
<td>Availability of internet to the users</td>
<td>Positive, if there is a well-established internet infrastructure</td>
</tr>
<tr>
<td>Perceived usefulness</td>
<td>No major conditions emerge</td>
<td>Generally positive attitude</td>
</tr>
<tr>
<td>Perceived ease of use</td>
<td>1. Fulfilment of bandwidth requirements</td>
<td>1. Positive, if sufficient bandwidth</td>
</tr>
<tr>
<td></td>
<td>2. Distance to the server</td>
<td>2. Positive, if distance is smaller than the maximum range</td>
</tr>
<tr>
<td>Perceived security</td>
<td>Awareness of the provider</td>
<td>Positive, if users know that they can trust the cloud game providers.</td>
</tr>
<tr>
<td>Perceived ownership</td>
<td>Physical possession of the game</td>
<td>Negative, if users perceive owning something as having it locally installed or have copy on portable hard media</td>
</tr>
<tr>
<td>Interest in playing games &amp; monetary</td>
<td>1. Price comparison</td>
<td>1. Positive, if the users find the games on the cloud cheaper than those in the store</td>
</tr>
<tr>
<td></td>
<td>2. Price availability</td>
<td>2. Negative, if users do not want to pay at all and have low interest in playing games</td>
</tr>
<tr>
<td>Perceived availability of games</td>
<td>Availability of the desired games</td>
<td>Negative, if the users want to play particular games that are not available on the cloud yet</td>
</tr>
</tbody>
</table>
6 Conclusions

This research paper highlights the factors that influence the users’ decision making process regarding their acceptance of cloud gaming. These factors are the issues that the users perceive as important in determining the use of this new platform. The factors are derived from the features which are the different qualities of cloud gaming.

TAM is used as the basis for achieving the objectives of this research. The logic behind the performed analysis is based on the logic of applying TAM. According to TAM the external stimuli are the ones that affect the users, which are the platform features of cloud gaming. These features of the new gaming platform are derived from both the theoretical framework and from the empirical findings and are used as a basis for determining the factors that affect the user’s attitude towards accepting the new gaming platform. The external stimuli provokes’ responses in the users, which are the user factors. Different features provoke different user factors. The relationship between these is retrieved from the structured interviews. Furthermore the interview highlights how the users perceive cloud gaming through each factor.

The thesis successfully achieved its objectives by addressing the research questions. A summary of the research findings for each question is presented below:

- What platform features of cloud gaming influence the users’ acceptance of the new gaming platform?

The prominent platform features of cloud gaming that are highlighted in this research include bandwidth, latency, automatic updates and upgrades, risk of viruses, thin client benefits, costs, range of games, necessity of internet and ownership of games.

- What are the user factors that influence the decision-making process of the users?

The platform features presented above provoke the user factors which directly influence the users acceptance of cloud gaming. The resulting factors involve: perceived quality, perceived availability of internet, perceived usefulness, perceived ease of use, perceived security, perceived ownership, interest in playing games, monetary and perceived availability of games.

- How do the user factors influence the users’ attitude towards the new gaming platform?

The factors that the users perceive as important in their decision making process determines their attitude towards using the new gaming platform. Additionally, the research presents the different conditions that determine the user attitude from the different factors. A summary of the user attitudes that arise from the user factors are summarized in Table 5.2. For example, for the perceived quality factor; the users will have a positive attitude towards using cloud gaming if they have sufficient bandwidth, their distance to the server is smaller than the maximum range, and if the users’ hardware capabilities are insufficient for conventional games. Similarly, user attitudes are presented for all the factors highlighted in this research.
6.1 Contribution of the thesis

Gaming has a growing importance within the field of informatics, therefore its management, especially combined with the application of cloud computing technologies makes the field relatively new and little known about. The future is developing in that direction as companies are intending to invest within the industry, therefore knowing about the proper management of information technology in the field is of an increasing importance.

Having the different factors and conditions that affect the user’s attitude towards using cloud games, allows cloud game service providers to follow up and study the market properly. Having the different user factors and conditions, companies will be able to adapt their products to the market.

Besides that the thesis provides a background of the different set of technologies (and their limitations respectively) to the developers who seek new insights for improvement. This was done, by binding technical issues with different user factors. Thus developers and engineers within the gaming industry may have direction for future development, which on its own may be used for gaining competitive advantage within the industry.

6.2 Lessons Learned

TAM does not prove to be optimal for providing the framework for analysis. It is not optimal for inductive approach. However it gives a general orientation of the analysis in the inductive approach, which is useful. It is better for deductive research where the relationships between all features and factors need to be verified. For example, in the case of the 3G/4G (Tseng and Lo, 2011), all the factors were given as hypothesis and the relationship between the components were also given as hypothesis where they were tested and conclusive results came out.

6.3 Further research

The objective of the research is achieved, however, there is still more knowledge needed to fully understand the user’s decision-making process. An area that needs further investigation is the relationships between each of the factors. The research has found out such relationship between the interest of playing games and the monetary factor. In order to achieve that a deductive research is needed where a relationship between each factor is taken as hypothesis and then tested in the real world.

A major point that also needs validation is the model itself. The relationships between the features factors, attitude and behaviour need to be taken as hypotheses and tested on a representative sample.

This research has provided a good basis for understanding the factor affecting the users’ decision-making process and provides an understanding on the conditions that drive the users’ towards accepting and using cloud gaming.
List of references


Appendix

Appendix 1 – Structured Interview in English

Cloud Gaming
Marketing Survey

Q1 - When playing a game over the internet and if there is lagging, but the game can still be played, will that make you stop playing the game? Why?
______________________________________________________________________
______________________________________________________________________

Q2 - Will you try playing again? ______________

Q3 - If you are playing a game in real time over the internet, would the change in game (induced by a simulation) make you quit? Why?
______________________________________________________________________
_______________________________________
_______________________________

Q4 – Please rate from 1 to 5, where 1 is very important and 5 is not important, the following benefits of online gaming, the way they seem to you (e.g. all can be 1 at the same time):

9. Automatic updates and upgrades ____
10. Playing a compatible version in multiplayer ____
11. Lower risks of viruses ____
12. Play on any device with internet connection ____
13. Unlimited storage of games ____
14. Play the game at any time ____
15. Low requirements for your device ____
16. No need to install the game ____

Q5: What hardware performance problems do you usually have with your gaming hardware? (Please mark the ones you have)

- Storage □
- RAM □
- Frequency (Processor) □
- Graphics card □
- other (specify):__________________________
Q6: What do you think about the idea of instantly accessing the game on the internet rather downloading it or buying it in store?

Q7: Have you in the last 3 years, upgraded your computer or bought a new one so that you can play a game that you couldn’t play on your old configuration?

Q8: If previous yes, than how much money did you spend?

Q9: What do you think about playing online games on a pay-per-use basis?

Q10: What do you think about the idea of trying out demo versions of games online for free, without the need of downloading them?

Q11: Do you like “Assassin’s Creed 2”? If you had the possibility of trying out the game for free online and you liked the quality, would you buy it for $29.90?

(This is an option on OnLive, where you get unlimited access to it, but it is available only online and you can play it online only)

Q12: What games do usually play? Do you have preference for (a) specific genre and game-mode?

Q13: What do you think about the fact that you need internet to play your games? Is it limiting for you?

Q14: What reasons would make you play a cloud game?

Q15: What would your reasons not to play cloud games be?

Q16: Which is your favourite game and would you want to play on the cloud?

Thank you for your help!
Appendix 2 – Structured Interview in Swedish

Cloud Spel
Marknadsundersökning

Q1: Om du spelar spel på nätet och det laggar men det fortfarande går att spela, kommer du sluta spela? Varför?

____________________________________________________________________

Q2: Kommer du att försöka spela det igen senare?

____________________________________________________________________

Q3: Kommer den visuella fördröjningen i spelet få dig att sluta spela? Varför?

____________________________________________________________________

____________________________________________________________________

Q4: Betygsätt (1 viktigast, 5 minst viktigt) följande aspekter av spelande på nätet (notera: alla kan vara 1):
   Automatiska uppdateringar
   Spela kompatibel version vid multiplayer spelande
   Mindre risk för virus
   Spela på vilken enhet som helst som har internet uppkoppling
   Obegränsad diskutrymme för spel
   Spela spelet vilken tid som helst
   Låga hårdvaro krav
   Inget behov av instalering

   Automatiska uppdateringar
   Spela kompatibel version vid multiplayer spelande
   Mindre risk för virus
   Spela på vilken enhet som helst som har internet uppkoppling
   Obegränsad diskutrymme för spel
   Spela spelet vilken tid som helst
   Låga hårdvaro krav
   Inget behov av instalering

Q5: Har du haft problem med någon av nedanstående hårdvara i ditt system?
   Utrymme □
   RAM □
   Frekvens (Processor) □
   Grafik kort □
   Annat (specifera):_____

Q6: Vad tycker du om iden om att direkt spela spelet på nätet istället för att ladda ned det eller köpa i affären?

____________________________________________________________________

Q7: Har du dem senaste 3 åren uppgraderat din dator eller köpta ny spelkonsol pga. att du inte kunde spela spelet du ville spela?___________
Q8: Om ja på föregående fråga - hur mycket pengar har du spenderat?________\

Q9: Vad tycker du om pay-per-use konceptet för spel?   

_________________________   

Q10: Vad tycker du om att spela demos utan kostnad och att behöva ladda ned det?   

_________________________   

Q11: Tycker du om “Assassin’s Creed 2”? Om du hade möjlighet att prova det spelet gratis och tyckte att spel kvaliten är godkänd, skulle du köpa det för $29,90 (~183SEK)? (Ett erbjudande från OnLive, spelandet kräver internet uppkoppling och är tillgängligt omedelbart.)   

_________________________   

Q12: Vad för slags spel brukar du spela? Föredrar du ett specifikt typ eller genre av spel?   

_________________________   

Q13: Vad tycker du om ett krav att vara uppkopplat mot internet för att kunna spela spel? Kommer det att limitera dig?   

_________________________   

Q14: Vilka anledningar får dig att välja cloud spel?   

_________________________   

Q15: Vilka anledningar får dig att avstå från cloud spel?   

_________________________   

Q16: Vad heter ditt favorit spel och skulle du tänka dig spela det i cloud?   

_________________________

Tack för din hjälp!