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Open software to innovation: the critical success factors of massively multiplayer online role playing games (MMORPG) in China and Ireland.

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**Open Software to Innovation: The
Critical Success Factors of Massively
Multiplayer Online Role Playing Games
(MMORPG) in China and Ireland**

Wei Chen

A dissertation submitted in partial fulfilment of the requirements of
Dublin Institute of Technology for the degree of
M.Sc. in Computing (Knowledge Management)

November 2007

I certify that this dissertation which I now submit for examination for the award of MSc in Computing (Knowledge Management), is entirely my own work and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my work.

This dissertation was prepared according to the regulations for postgraduate study of the Dublin Institute of Technology and has not been submitted in whole or part for an award in any other Institute or University.

The work reported on in this dissertation conforms to the principles and requirements of the Institute's guidelines for ethics in research.

Signed: _____

Date: ***16 November 2007***

ABSTRACT

This project investigates the factors leading to the success of China's Massively Multiplayer Online Role Playing Games (MMORPG) market and gives an analysis of how Open source has contributed to these success factors. It then will look at how the use of open source is mirrored in Ireland's market for example, the software sector to see if the same factors are apparent or there are indicators of these. Knowledge Management plays a very important role for fasten the innovation of Open source software development in China.

Key words: *Open source, MMORPG, Knowledge Management, China's MMOG Market*

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GLOSSARY

ISP: Internet Service Provider is a business or organization that provides to consumers access to the Internet and related services e.g BT/ Eircom.

MMORPG stand for Massive Multiplayer Online Role-Playing Game, in which a large number of players interact with one another in a virtual world through the internet (Anissimov, 2007).

Netizen: A Netizen is a person actively involved in online communities. Netizens use the Internet to engage in activities of the extended social groups of the internet works (i.e., giving and receiving viewpoints, furnishing information, fostering the Internet as an intellectual and a social resource, and making choices for the self-assembled communities).

Online game distributor (online game reseller): A company that is not an online game operator but participates in the distribution of online game.

Online Game: Computer game that enables hundreds or thousands of players to simultaneously interact in one virtual world via the Internet.

Online Gamer: an online gamer is usually someone who participates in online role-playing games or online war games. (Those that have played online game in the past few years.)

OSS (Open source Software): Ueda (2005) combined some definitions of software and conclude the open source as freely, opened, copied, changed and distributed by anyone.

OSS License: An OSS license defines the privileges and restrictions that a user must follow in order to use and modify software. If a developer wants to publish a program as OSS, he/she can distribute the program as an uncopyrighted product (Arne, 2004). Alternatively, OSS license can be called a copyleft license.

OSS RPG: OSS RPG are freely available to the end-users to play, some may or may not require a partial public license. Such games are OSS and contain Open Content.

RPG: Role-playing game is a game in which the participants assume the roles of fictional characters and collaboratively create or follow stories. Participants determine the actions of their characters based on their characterization, and the actions succeed or fail according to a formal system of rules and guidelines. Within the rules, players can improvise freely; their choices shape the direction and outcome of the games.

SWOT analysis: a strategic planning tool used to evaluate the Strengths, Weaknesses, Opportunities, and Threats involved in a project.

The Market size of China's online game industry: the total revenue of China's online game operators plus total revenue of China's online game distributors. Total revenue here refers to total annual revenue generated directly from game operation. Revenues generated directly from game operation include revenue generated from sale of game access, relevant installation software, virtual items in gaming world and so on (Please be reminded that sales revenue of advertisements, peripheral products etc are excluded.)

Total revenue of China's online game distributors: this is the total annual revenue of online game distributors generated from online game distribution. Revenues generated from online game distribution include revenue generated from sale of game access, relevant installation software and so on (Please be reminded that sales revenue of advertisements, peripheral products etc are excluded)

Total revenue of China's online game operators: total revenue of China's online game operators equal to total annual revenue of domestic China's online game operators generated directly from game operation. Revenues of operators generated directly from game operation include revenue generated from sale of game access, relevant installation software, virtual items in gaming world and so on (Please be reminded that sales revenue of advertisements, peripheral products etc are excluded.)

1 PROJECT INTRODUCTION

1.1 About this Project

This project investigates the critical success factors of Massively Multiplayer Online Role Playing Games (MMORPG) in China and gives an analysis of how Open source fastens the On-line game software development. Scacchi (2004) stated in his article *“The free and Open source software (OSS) approach lets communities of like-minded participants develop software systems and related artefacts that are shared freely instead of offered as closed-source commercial products.”* In particular, he looked at the OSS computer game community to provide examples of common development processes and practices.

In China in particular online gaming is becoming one of the most profitable businesses on the Internet.¹ No matter what the package size or the bandwidths requirements of the game, MMORPGs are now attracting millions of users every year. The private servers² for MMORPGs are very popular as well. In many ways online games are on the cutting edge of software development. The server-side development of MMORPGs is the main research area of this project.

The contribution of open source software development process to the online game development is huge. Scacchi (2004) announced that free and open source software development practices give rise to a new view of how complex software systems can be constructed, deployed, and evolved. In Free open source software (FOSS) computer game communities, *“People even get hired for doing these things”* (Hars and Ou, 2002). The career development opportunities for computer game developers via open source game modifications encourage people to do these things. In this project, the issues to Knowledge Management (KM) which plays a very important role for the innovation of the Chinese game market will be addressed to discover the relationship between the OSS and the MMORPG in practice.

¹ “China's Online Game Market Booming”, URL: www.china.org.cn/english/scitech/96972.htm.

² Private server - unofficial servers which have been accredited by game developer or operator

The OSS development lifecycle is not an exact fit with that of the conventional commercial software development lifecycle, it is more likely to adopt the Knowledge Management lifecycle (See figure 1. KM Processes based on Elias & Hassan, 2004).

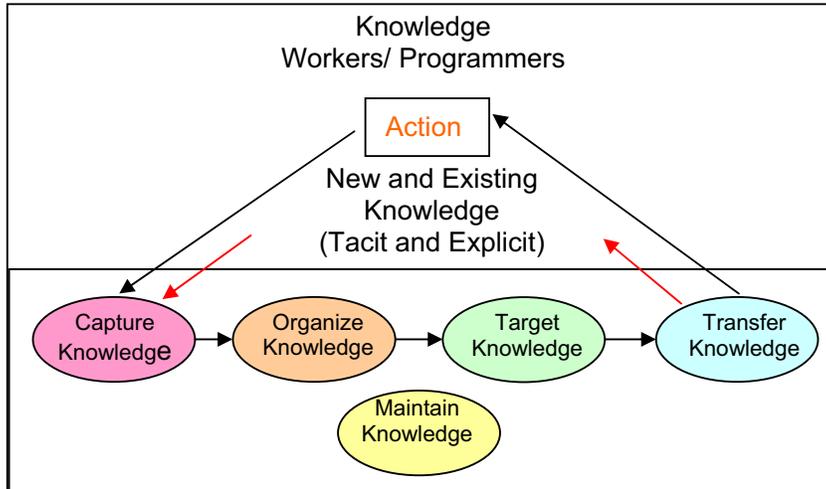


Figure 1: Knowledge Management Processes

OSS communities develop software that's extremely valuable, generally reliable, globally distributed, made available for knowledge acquisition at little or no cost, and readily shared in its associated community. Reinvention / Innovation are aspects of KM.

In contrast to the Chinese market the Irish experience is somewhat different. Games consoles such as Xbox and PS3 games are the preferred choice rather than the PC games. Ireland have the highest per capita ownership of game consoles in the world. The broadband penetration is growing rapidly every year. An experiment of a MMORPG will discover the applicability. This is an interesting contrast to China's experience and this project investigates if some of the lessons from China's experience can be applied to Ireland.

1.2 Background

Having graduated from the IT field, my interest in the information technology and computer science has not waned. This project is inspired from my passion for the computer science / computer games industry.

A huge number of people are playing the same game, in a variety of roles at the same period of time, generating profits for the online game distributor. Current research into the Chinese online game industry shows that China is one of the world's largest online game consumers of online games. A typical example:

In 2001, Ourgame.com had 20 million subscribers and 170,000 users online. This made Ourgame.com the World's largest online game website. *"The good performance of online game websites led by ourgame.com and MUD indicates a huge business opportunities. In addition, it provides wireless gaming services to consumers through mobile phones and also generates advertising revenue"* (Borton, 2004).

By way of encouraging the online game industry, the Chinese government have hosted **The China Digital Entertainment Expo Conference** since 2003. Further support has been provided by both the Ministry of Science and Technology and the Ministry of Education. Such high profile backing demonstrates that the government is committed to developing the local online game industry. *"Entertainment is one of the best applications of the Internet, and online games also largely solve the problem of piracy in China."* Jay Chen - former bond analyst and hedge-fund trader on Wall Street (Borton, 2004).

Raymond (1999) described Open source as producing better quality products because so many "eyeballs" view the source code. Some Free OSS developers create computer game modifications that widely circulate and generate substantial sales revenue for the game's proprietary vendor, and they sometimes share in the profits. While the games industry have embraced OSS, mainstream manufacturing industries have been slow to adopt this practice. European base industries appear to be very slow to adopt the OSS as best practice. The OSS have become widely adopted in the recent 9 years since the Netscape licensed and released their codes as open source under the name of Mozilla in 1998 (Valloppillil's, 1998).

Dr. Skyrme³ (2002) divided the knowledge management processes into 2 cycles:

³ David Skyrme is a strategic analyst and management consultant with extensive knowledge and experience of information and knowledge management.

1. Knowledge Sharing Cycle - shows the processes associated with gathering and disseminating existing knowledge, having a knowledge repository as its focal point.
2. Knowledge Innovation Cycle - represents a progression from idea creation (unstructured knowledge) into more structured and reproducible knowledge, embedded within processes, products or services.

Free OSS development communities don't seem to readily adopt modern software engineering processes, it is more likely to adopt KM processes. Reinvention / Innovation occurs through knowledge sharing, knowledge reprocessing, knowledge modifying, and knowledge redistributing concepts and techniques that have appeared in closed-source systems, research and textbook publications, conferences, and developer-user discourse across multiple OSS projects.

1.3 Research problem

There is a gap in the knowledge, that no one has looked at how open source in particular is driving the MMORPG market. To investigate China's Online MMORPG market and the factors which have contributed to its success. The role that open source software plays and the way in which it is developed, will be investigated in particular.

The outcomes of this research will be used to assess Ireland's online MMORPG market in comparison to China's identifying how open source could impact games in Ireland.

1.4 Research objectives

The following objectives have been achieved throughout the dissertation and contributed to the overall outcome:

- Analyse MMORPG Concept and trends of online game development in China. To this end you must familiarise yourself with the MMORPGs genre (Try some selective MMORPGs particular in Chinese). By examining some of the open source code we will better understand the basic theory.
- Assess the current state of Ireland's MMORPG industry
- Compare the Irish MMORPG experience with China's experience

- To analyse the contribution of Open source to MMORPG, specifically in China. Industry review will give us an overview of the relationship between OSS and MMORPG.
- Derive set of indicators for Open source contribution to knowledge retention and reinvention of MMORPGs (KM Issues) in China.
- To investigate how Open source could impact to the games market in Ireland.

1.5 Research methodology

The project incorporated:

- Primary research – interviews, surveys and mailshots method to gather relevant data.
 - The survey results yield information in respect of most of the main MMORPG products in China and Ireland (The survey has been undertaken during start of June to end of July 2007 and applied a consistent methodology). It was designed to elicit how Open source has contributed to the MMORPG market.
- A SWOT analysis has been carried out on a focus group with some anonymous volunteers who participate in the 2 weeks online gaming session.
 - Literature review – by reading books, journals and white papers. This is one of the main parts of this project and literature review is more central to the project than the survey or case study. This review was more thorough than would normally be required for the others. As the research project is based on multidimensional disciplines.
 - Industry review – by reading the news paper articles and industry reports.
 - Laboratory – Test and practice on more than 3 different types of MMORPGs e.g. commercial MMORPG, Open source MMORPG, English world wide hosted MMORPG. (Details will be discussed for further research)

The work has been carried out stage by stage and the details are as follows:

- Research on MMORPG development (Server-side)
- Research on Open source contribution to the online game market
- Compare and contrast MMORPG market between China and Ireland
- Research on Virtual environment in Broadband Networks applications particular in online entertainment application.

- An experiment has been carried out to explore whether the Open MMORPG can be accepted by the players in the online community. The experiment was considered by a focus group form who were the volunteers from the Open project forum. The website was under construction in order to inform users the events, news and timetable. (<http://www.quistissime.com>)

1.6 Resources

Table 1: Resources

Hardware:	O/S:
Pentium 4 PC - 512Mb RAM (Basic requirement) Printer Internet Access	Windows XP Professional / NT Linux
Software:	References:
Microsoft Outlook Express Adobe Reader 8.0 Adobe Acrobat 7.0 Microsoft Office 2003 Delphi 7 Enterprises MySQL MMORPG games (Selective)	DIT Library IEEE Explore ACM Newspaper Journals Interviews

1.7 Scope and limitations

Chapter outlines are as follows:

This chapter gives a brief the overview of the project. The main focus being the project plan, project aims and objectives. It clearly explained the background, limitation and scope of this project and finally introduced the readers to the dissertation. It was a summary of present phenomenon of China's MMORPG market and a statement of my hypothesis of which Open source contributes to this phenomenon. Although, Knowledge Management (KM) is not the main research area in this project, KM plays an important role throughout the whole project. In this chapter, how KM fitted into the free OSS development lifecycle has been discussed. Thus, KM processes are the framework of this project which contains the knowledge transformation processes while the knowledge / data are captured.

Chapter 2 introduces us to both MMORPG and OSS. It will examine Open source's contribution to innovation in the MMORPG sector in particular. It will assess how

open source has been used in MMORPG community, to exam what kind of Open source software has been adopted in the development of MMORPG, and to quantify how many OSS are used to support the MMORPG in the online game community. This chapter will discover the Open source development techniques which use the KM process as a major development lifecycle. The licensing and legal issues related to the Open source as it applies to the online game community has been taken into account as many Open projects are under the GNU General Public License (GPL).

Chapter 3 examines China's Massive Multiplayer Online Game (MMOG) industry. The key metrics such as market sizing and forecasts, size of MMORPG segment, game operator market share, top titles with concurrent user numbers will be explored to reflect the factors based on the literature review and industry review. It is the review of China's socio-economic grouping, telecommunication infrastructure and business strategy of online game companies to see whether they are the key factors to China's MMOG industry. Internet cafes still represent a flourishing business in China they play an important role in influencing the growth of the games market. The relevant trends, current marketplace conditions for online games and the effect of piracy will be investigated with regards to MMORPG.

Chapter 4 is about Ireland's Gaming market based on literature review and interview notes. The content includes the Irish broadband network development within the recent 5 years. It will also include details about Ireland's online gaming and results of survey/interview in this area. Forecasting the Ireland's MMORPG market and comparing to China's key metrics of MMORPG industry, it presents the potential challenge of Irish MMORPG market in the future.

Chapter 5 presents the experiment based on survey and MMORPG which is supported by Open source so that gives evaluation of how open source has helped with innovation in MMORPG. First, an analysis of MMORPG server architecture has been explained. Second, it discusses the primary configuration of the game server, database and administration. All of the software used in this experiment project were open source software. The previous hypothesis or survey results have been reflected in the database of the experiment game, such as the number of people subscribed into the experiment as volunteers, the hours they spend on the game and so on.

Chapter 6 gives a summary of this project. In this chapter, the evaluation of the entire project is discussed. It gives a critical analyse of the contributions of the work, offering conclusions on the usefulness or otherwise of OSS. It presents open research issues which could be pursued as future work, and offers conclusions on my current findings.

This project builds on the fore mentioned report with the view to providing information to allow the reader to develop strategies for the Irish online gaming market. This project can be a reference for individuals within the online retail sector to create their own strategy in their local markets.

2 MMORPG CONCEPTS & OSS

2.1 Introduction

The chapter will introduce MMORPG concepts for those are not familiar with this emerging field. In some technical terms, an analysis of MMORPG server architecture will be explained. It will discuss the primary configuration of the game server and administration of database.

This chapter also outlines Open source's contribution to innovation in the MMORPG. Some particular case study shows that Open source development uses the KM process as a major development lifecycle (Daffara *et al*, 1999; Hars *et al*, 2002; Elias *et al*, 2004). I discuss the community of practice which includes a focused literature review with critical analysis of how open source has been used in the MMORPG community. Furthermore, we examine what kind of OSS has been adopted in the development of MMORPG. Finally to examine the licensing / legal issues relating to the Open source as applicable to the online game community.

2.2 Classifications & Brief history

2.2.1 Classifications

The Game's industry is a large market. In this project, we are talking about electronic game. To understand the MMORPG, we should first define the classification of Electronic Games. Figure 2 shows a clear picture of the exact position where MMORPG is located. Electronic game can be divided into 4 main market segments: Console game, Single-player PC game, Online game and arcade game. MMORPG is a particular kind of online game, belonging to the role playing genre.

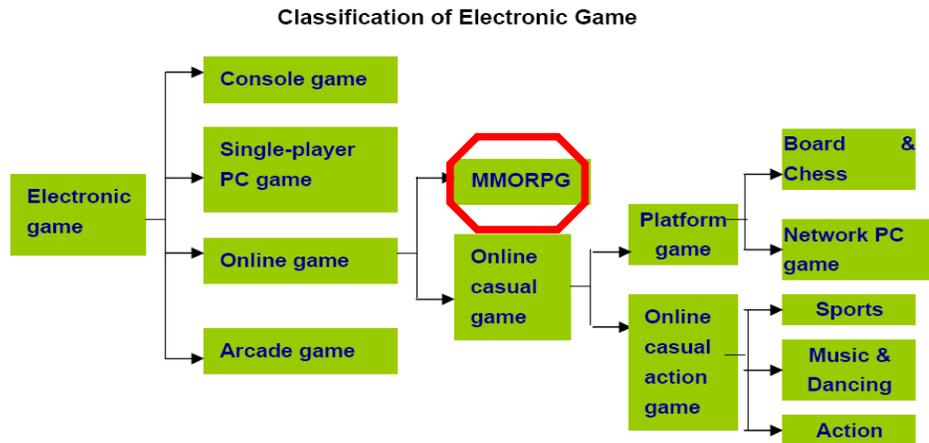


Figure 2: Classification of electronic game

Massive Multiplayer Online game (MMOG) can be divided into two genres: MMORPG & online casual game. A MMORPG can be further divided into sub-categories such as fantasy, historical, horror, real life, sports, martial arts and sci-fi. In this project, we will a look at the MMORPG genre as a whole.

2.2.2 From MUDs to MMOGs – A brief history

In order to understand these factors, a study of the history of China's MMORPG development conditions is essential. The first MUDs (Multi-user dungeons or dimensions) was just called MUD, and was written in spring 1979 by Roy Trubshaw, a student at Essex University in England, originally in the MACRO-10 language for a DECsystem-10 computer (Bartle, 1990). Later in August 1989, a graduate student at Carnegie Mellon University wrote TinyMUD during a weekend. It was a simple, user-extensible multi-user game that was available to anyone on the Internet who knew the address and port number. While TinyMUD wasn't the first MUD, its ease of use and portability to many Unix systems caused an explosion of MUD popularity that hasn't yet waned (Burka, 1995). Now MUD had nearly been abandoned but it is still featured persistent worlds and other elements of MMOGs (Massive Multiplayer Online Games) still seen today. In figure 3 & 4 below, you can see the early MUD is pure text user interface under DOS-mode.

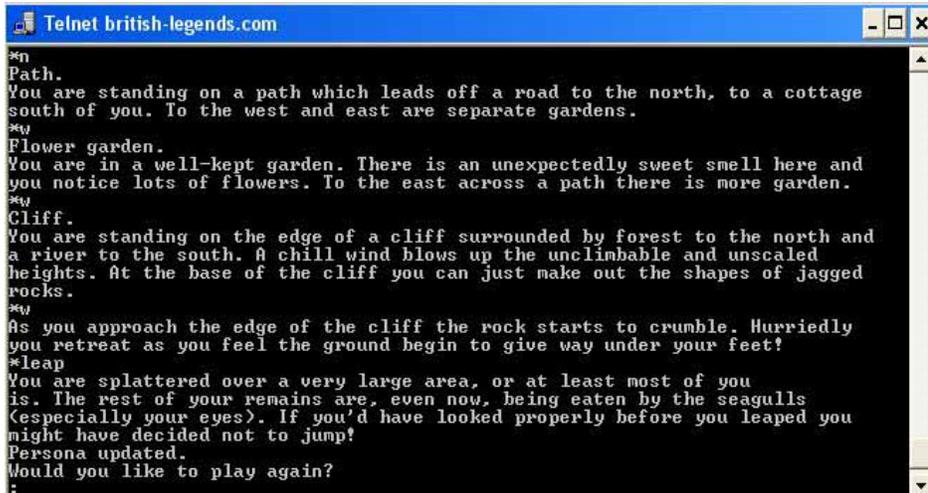


Figure 3: Screenshot of Early MUD

Contrast to figure 3, the new generation MUD2 is developed in Java programming language. (Sources are accessed on 8th August 2007)

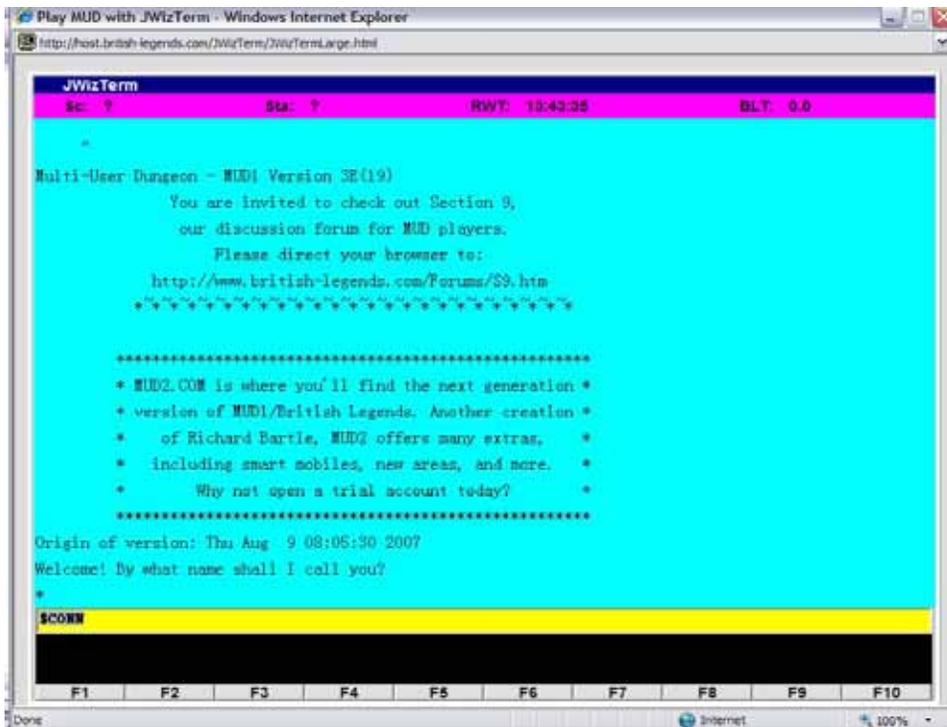


Figure 4: Current MUD developed in Java

Sources from british-legends.com

2.3 System Architecture Design for MMORPG Server

In MMORPG, server plays an important role within the game experience, they need to be able to increase the processing load as more people play online. In this type of game, many players enter into a continuous virtual world while interacting among themselves and the environment. In these games hundreds or even thousands of individual agents interact, each representing a different role within the game (an old man, a horse, a troll, a salesman and so on). In this case, if each role is handled in an independent manner by an instance of an agent class, the processing load on the system can be completely distributed. Thus, virtual worlds can be created of a much greater size and with a greater amount of simultaneous characters.

2.3.1 Development Activities And Cross-Disciplinary Collaboration

Developing a game is not an easy job, requiring the input and integration of many variables – people, business conditions, product goals, and more — to create, implement, and distribute a successful online game. It requires cross-disciplinary collaboration. Figure 5 demonstrates the core activities which would be occurred in an MMORPG.

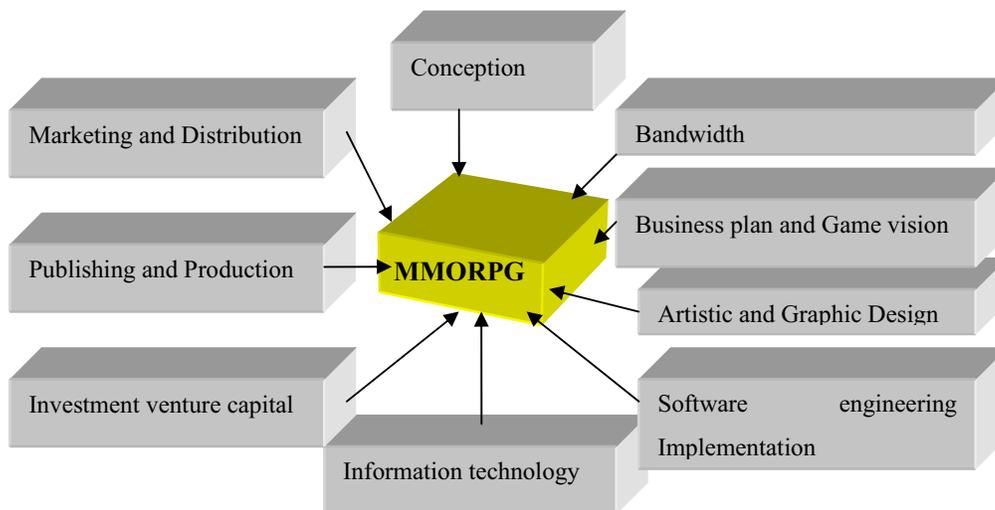


Figure 5: Activities and cross-disciplinary collaboration of MMORPG

- Business elements:
Focus on the marketing and distribution, business plan and game vision, publishing and production, investment venture capital.
- Technology elements:

Bandwidth – the other game issues would not relate to the bandwidth of the internet access, but the MMORPGs are.

Software engineering implementation: the processes of creating an interesting commercial MMORPG require the software engineering which is same as the processes of ordinary software engineering.

Information Technology is the major technology for system architecture design and implementation.

- Arts elements: Conception, Story making, Artistic, Graphic Design

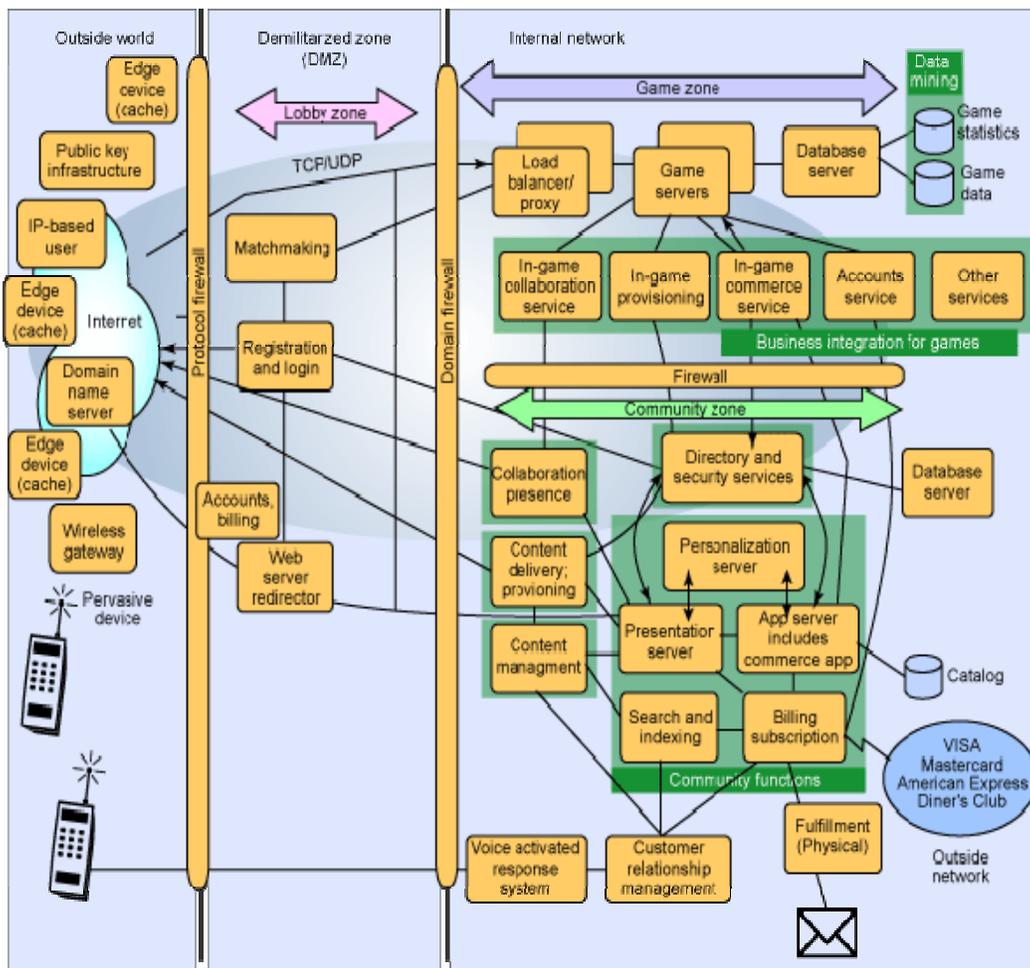


Figure 6: The overview patterns solution

Figure 6 represents a patterns-based solution that Megler (2004) designed for an online game environment. It concludes the online game development activities and the business process with information technology infrastructure. Current game server design is based on this pattern.

2.3.2 P2P Vs. Client / Server

Peer-to-peer (P2P) MMORPG (See figure 7) is a good idea, which can save a lot on server bandwidth. In a MMORPG with just 1000 players on a server, each player will have to send its data to 999 other players, and it will have to receive data from 999 other players. If we had to send 10 KB/sec in client/server architecture, in a P2P architecture we would have to send approximately 10 MB/sec. Server bandwidth does not represent the largest cost centre for an operating MMORPG. Content production, customer service, and other people-related costs are usually much higher. The two main technical challenges of P2P MMORPGs are hard to solve in a satisfactory manner for current game designs (Kawahara *et al*, 2004):

- Cheating/ Securing the game state data such that a user could not hack his client, or data files, or attach to the client with a remote control monitor or Trojan horse when running, and change the simulation to his advantage.
- Searching for the right other peers to interact with sufficiently low latency, and update this mapping when players come and go.

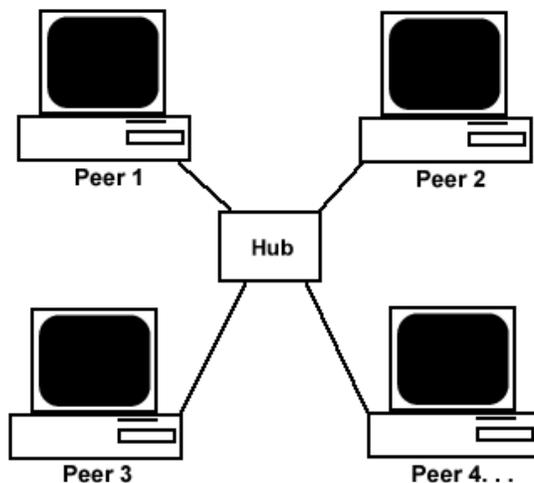


Figure 7: P2P structure

“At present, P2P works best for transfer of large bulk items where you can easily verify correctness, such as content downloads and patches.” – GameDev.net⁴. However, P2P architecture is rarely implemented on MMORPGs, the main Online

⁴ Discussion board. URL: http://www.gamedev.net/community/forums/showfaq.asp?forum_id=15 (accessed on 20th October 2007)

Game system architecture still operate on a Client/ Server bases. Client / Server and P2P seem to be combined. The following figures illustrate the evolution based on the C/S structure (Orfali *et al*, 1999):

1. Basic C/S structure – Client / Server structure (Figure 8)
2. Advanced C/S structure (Figure 9)
3. Distributing Middleware-Oriented C/S structure (Figure 10)

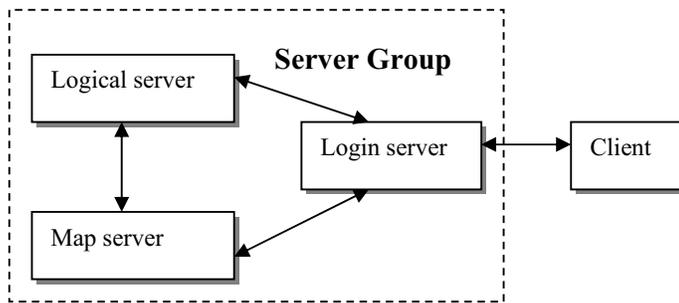


Figure 8: Basic C/S structure of MMORPG

This structure (figure 8) is basic and any game server can be developed under this structure. The advantages are

- a) very easy for the junior developer to be involved in the project
- b) very simple to understand
- c) Easy to maintain this type of C/S MMORPGs.

The disadvantages in developing a complex context MMORPG are

- a) Security issues e.g. user password, cheats detection are not concerned.
- b) Without a database, the logic server will have much more work to do with the data / information. Obviously, the server will run slower as the backup will take longer.

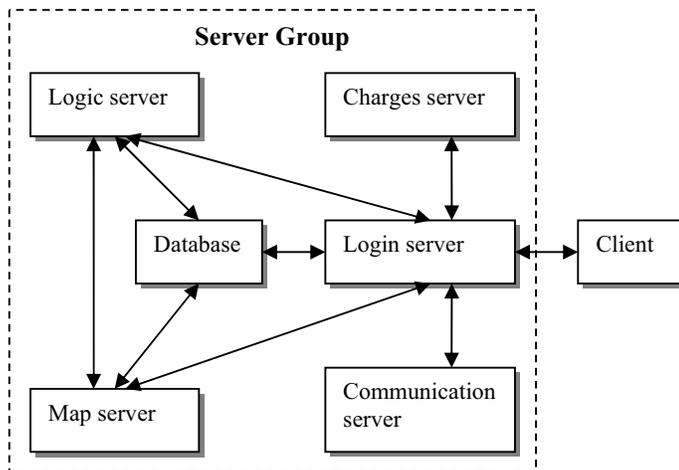


Figure 9: Advanced C/S structure

This advanced C/S structure (figure 9) makes the server group running much faster and reduce the maintenance cost. Tie-in layers such as the communication server and charges server can be adapted by the game operator’s business decision.

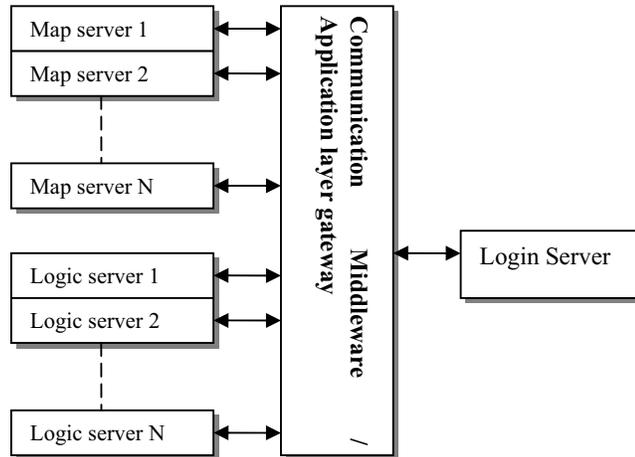


Figure 10: Distributed Middleware-Oriented C/S structure

Figure 10 reflects the present enterprise trend towards Service-Oriented Architecture (SOA). SOA is a standards-based best of breed suite that enables a person to build Service-Oriented Application and deploy them to his or her choice of middleware platform (He, 2003). “Decoupling”⁵ is a word for describing this architecture. Coupling makes software engineering like nails through pieces of wood: they make modification of the system design difficult, expensive, and time-consuming. For the MMORPG development, SOA can be very quickly adapted.

Sun is the typical software Development Company who adapts this new technology. Its Game Server technology logically is divided vertically into 3 layers (see figure 11): Object Store, Simulation Logic, and Communications.

The Object Store layer contains the game states for all games running in the Game Server. It is a highly efficient (tenths of a millisecond per operation), scalable, and fault-tolerant transactional database layer that provides deadlock proof access to the simulation objects, which can either be locked (a write-lock) or peeked (a non-repeatable read).

⁵ Ron Ten-Hove published in his web-blog, [URL:http://blogs.sun.com/rtenhove/entry/why_soa](http://blogs.sun.com/rtenhove/entry/why_soa) (Accessed on 20th October 2007)

The Simulation Logic layer is responsible for executing the actual game code. Here, tasks are created based on incoming events which, in turn, check objects out of the Object Store as needed. When a task is completed, the object is updated and returned to the Object Store.

The Communications layer organizes player communication into channels of grouped communicators. It manages routing of data packets between the players and the Simulation Logic servers, and between the players themselves. It also is responsible for translation to and from other forms of networking (e.g., HTTP communications to and from cell phones).

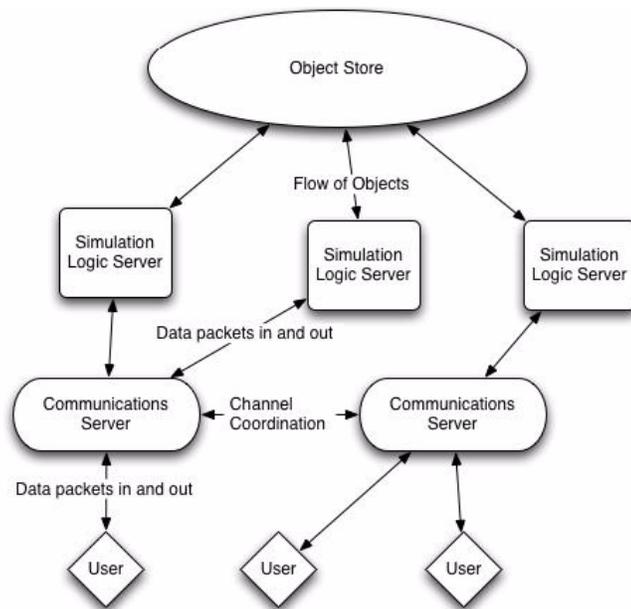


Figure 11: Sun's Game Server Architecture

2.3.3 Database

In an MMOG, the system architecture design is based on Client/ Server databases. Salemi (1995) discovered how Client/ Server systems are implemented depends on the platform the front- and back-ends run on, and the degree to which the processing is split between the two. He also listed the advantages of Client / Server Databases as:

1. Client / Server system arise from splitting the processing between the client system and the database server. Which means the workstation need only be able to run the

front-end software, effectively extending the life of many older or smaller PCs which don't have the horsepower needed to run a complex DBMS.

2. Reduces the load on the network connecting the workstations. Instead of sending the entire database file back and forth on the wire, the network traffic is reduced to queries to and responses from the database server. On a large network with many clients such as MMOG, this reduction in network traffic can more than offset the added cost of switching to a C/S system.
3. Workstation independence. Users aren't limited to one type of system or platform. In a C/S system, the workstations can be IBM-compatible PCs, Macs, Unix or a combination of these, and can run multiple operating system, such MS/PC-DOS, MS Windows, IBM OS/2 or Apple's System 7.
4. C/S system is the preservation of data integrity. Most database servers run a DBMS based on the Relational model, and users are prevented from accessing the data from outside the DBMS. In addition, the DBMS can provide services that protect the data by encryption, backup, disk mirroring and disk duplexing. The DBMS can also provide transaction processing, which tracks changes to the database and helps correct errors in the database in case the server crashes.

On the other hand, client/ Server Databases have disadvantages. Salemi (1995) also listed the major disadvantages:

1. Increased cost of administrative and support personnel who maintain the database server.
2. Increase in hardware costs. To ensure performance and data integrity, a dedicated machine with a high-powered system and large amount of RAM and hard disk space is required. As well as additional support equipment such as an uninterruptible power supply to protect the server from power outages.
3. Complexity. With so many parts comprising the entire C/S system, Murphy's Law can kick in – the more pieces that compose the system, the more pieces that can fail. It's also harder to track down problems when the system crashes. And it can initially take longer to get all the components set up and working together. All this

is compounded by the general lack of experience and expertise of potential support personnel and programmers, due to the relative newness of the technology.

Every Client/ Server type system, such as a MMORPG, is unique; each has its own requirements, quirks and special performance features. To offset the disadvantages of the Client/ Server databases there are some advice and tips:

1. Buy the fastest machine for the database server
2. Get as much memory as the server system supports.
3. Make sure the hard-disk subsystem on the Server is expandable.
4. A Client/Server database is best run on its own dedicated system.

2.4 OSS Development in the MMORPG community

2.4.1 What is in Open source

The main reason for using Open source is it offers companies lower cost/ free software (McDowell *et al*, 2005). However this is not OSS's most attractive feature. While "Free" is indeed an attractive feature, it is not the driving factor. Flexibility and reusability are deemed to be of greater importance. The need for reusability is on a grand scale because the volume of game development will mean a great deal to the organisation. Whether a company is in the process of developing a simple computer application or a complex computer project, the decision to develop a suitable game engine from scratch is an expensive proposition (Bishop *et al*, 1998). The model becomes acceptable when the marginal costs of developing a game engine are in line with the content and not the architecture which is quite practical and cost efficient (Scacchi, 2004; Scacchi *et al*, 2006).

By embracing exiting OSS, the project team can invest more in content by using the existing tools supplied by OSS. But this does not mean that specific tools cannot be built on top of the game engine. Game developers know that it's the tools that actually influence the look and feel of a game more than anything else. By focusing on content and reusability of content and code, the knowledge would be maintained open and flexibly (McDowell *et al*, 2005).

“Software is just the beginning ... open source is doing for mass innovation what the assembly line did for mass production. Get ready for the era when collaboration replaces the corporation.” – by Thomas Goetz who published his opinion on his article “Open source *Everywhere*”. Conventional and modern software engineering lifecycle don’t seem to readily fit into Open source development processes (Scacchi, 2004).

On the SourceForge Web portal, computer games are the fourth most popular category of Open source projects, with more than 19,786 out of the 155,095 total registered projects. Comparable data from the other communities could serve equally well. The economic impact of Open source is more than just source code. It’s about the design, documentation, support, and improvement of the product. Free software is a social movement (Elliott & Scacchi, 2004) in MMOG community, and the OSS are emerging as the times require.

2.4.2 OSS Development Processes

Scacchi (2004)’s study includes the OSS development processes in Games Community, as it occurs concurrently rather than strictly ordered as in a traditional life-cycle model or partially ordered as in a spiral model. One of the significant features of OSS development is the formation and enactment of complex software development processes performed by loosely coordinated software developers and contributors, who may be globally dispersed, figure 12 shows the Open source Development Processes (Scacchi, 2004; Scacchi *et al.*, 2006).

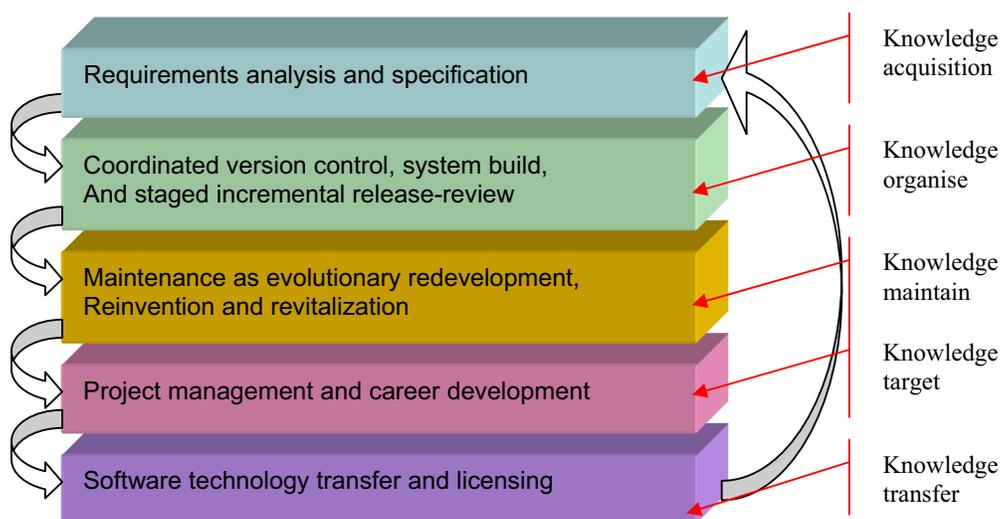


Figure 12: Open source Development Processes

The OSS processes are very close to the figure 1 which has been mentioned in Chapter 1. Skyrme's (2002) knowledge management cycles can apply to this practice as well.

2.4.3 OSS features

The outstanding performance of Linux and the other Open source software make them become important platforms for MMORPGs. The main features are as following:

◆ **Stability**

The study (Hars & Ous, 2002) found that the stability of Linux won the favour of many ISP, for instance, Yahoo!, Amazon and many others' are all using Linux as their networks platforms. The factor that is favourable for network computing is the availability of open-source software. Google is preparing its own distribution of Linux for the desktop, in a possible bid to take on Microsoft in its core business - desktop software. Google has confirmed it is working on a desktop Linux project called Goobuntu (Wagner, 2000). On 15,000 desktop computers installing the Linux application, now Google is processing over 3 billion interconnections the index of homepages and bearing the weight of 150 million searching requests every day. Thus, these big companies use "*Internet-scale platforms which have demonstrated the use of open-source software to build a massive digital infrastructure for their services*" (Emergic, 2004).

◆ **Low Cost**

Expensive commercial Unix and Windows are unable to compete with OSS on cost. In a survey of 2000 global enterprises, the results indicated that by using Linux over Microsoft Windows can yield a cost saving of up to 50%. By using Solaris over Microsoft Windows the savings were less impressive, representing a 14% cost saving. Open source databases can save enterprises up to 60% over proprietary products, according to data collected by Forrester Research⁶. That was because "*Open source databases such as Enterprise DB, Ingres and MySQL do not carry license fees, and management tools tend to be less expensive than for proprietary databases from Oracle, Microsoft and IBM*" by Noel Yuhanna - a senior analyst at Forrester (Sanders, 2006).

⁶ Forrester Research Ltd, URL: <http://www.forrester.com/rb/research>

OSS is more valuable to small and medium size companies as a way to cut IT costs. According to a study conducted by *InformationWeek* Research in September 2005, open-source service provider Optaros Inc. The study found that 81% look to open-source software to reduce the cost of using commercial packaged software.

◆ Support by hardware providers

Many of the large computer manufactures, IBM, Sun, Dell and some other large-scale hardware merchants on seeing the possible applications of Linux were quick to make their products compatible with this OSS. A few vendors, such as VA Linux, also began to provide complete integration, with software pre-installed on hardware selected for compatibility and suitability to the operating system. They have entered the market in a big way, offering Linux on its entire line of hardware (Stallman & Richard, 1999; Karels, 2003)

Database software, the typical OSS is MySQL, which is under GPL license. With the unceasing improvement of MySQL, more and more companies are considering using such free OSS. MySQL Corporation provide the software for free, however they charge for training and the technical support services. 2006 estimated revenue is \$4.9 million US dollars.

MySQL is deemed to be a superiority product. Figure 13 compares MySQL and the multitudinous database software performance. MySQL keeps pace with Oracle 9i, and may win by the outstanding performance and the expansibility.

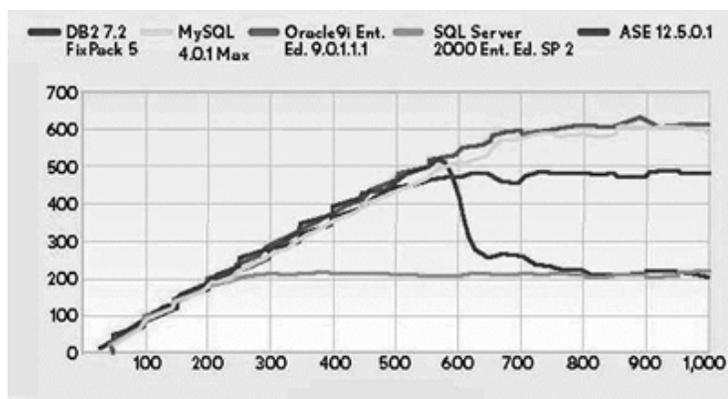


Figure 13: Comparison of MySQL and other mainstream database systems

Note: Source from *cqvip.com*

◆ Effect and trends

The superiority of OSS enables widespread application in the MMOGs. Along with the MMOG development, more and more MMOGs have been born in recent years. OSS will play the major role in the online game industry. The reason of migration towards open source from the back end (the servers are currently run on open source software) to the software comprising the fabric of “*Second Life*⁷” virtual reality to the client software in beginning of 2006. “...It's going to be open standard long before it's open source...,” says Cory Ondrejka, Linden Lab's VP of product development.

From a business perspective, commercializing OSS is the future trend. Karels (2003) stated in his study that many company tried, a few had being succeeding, but challenges abound. He emphasize some features of OSS and traditional commercial software and theoretical analysis that OSS could provide equivalent value to traditional commercial software at lower cost to the end user use the following models (Figure 14):

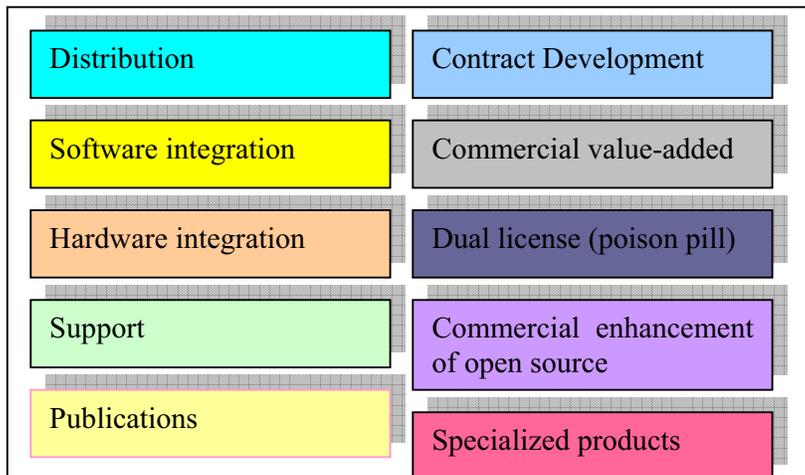


Figure 14: Commercial Models for OSS

Not all emerging companies have the luxury of building their business on open source from the ground up. Instead of trying to hype the company artificially, most of MMOG companies decided to rely on word of mouth, people started playing the game, using the official site, and those people invited others into the game. Then quotes from their

⁷ Second Life is a 3-D virtual world entirely built and owned by its Residents. URL: <http://secondlife.com/>

numbers and information about projects started appearing in other places, and slowly they will build a very solid following. Thus, the online community play a very important role for the game operator to get information.

Nowadays, the use of Internet for business purposes among consumers and developers is spreading at an impressive rate. Most Open source project team use the internet and online forums for a lot of different activities, for example, tutorial, access the source code, discussion and gather user requirements. Practical experience shows that online forums are very suitable for developing Open source projects, to gain a continuous development approach. The innovation and the knowledge sharing within the whole procedure of software development for long-term success and the growth of a successful OSS project cannot be denied (DiBona *et al*, 1999).

2.4.4 Open source and online community

Online community can be alternatively called virtual community, Porter (2004) states that a virtual community is “*an aggregation of individuals or business partners who interact around a shared interest, where the interaction is at least partially supported and/ or mediated by technology and guided by some protocols or norms*”.

The open source movement has been analysed to a great extend (Lakhani and von Hippel, 2000; Raymond, 2001; Lerner, 2002; von Hippel, 2002; Open source Initiative, 2004). OSS is typically created in collaboration by a development community rather than by a single software development company. Open source signifies the development of software in a community of users. This means users are able to modify the software themselves and thus improve it and make the improved version available to others. As companies usually intend to sell the products they develop this approach is only applicable to a limited extend. OSS projects require feedback from online communities. This sharing of knowledge helps the development of OSS technologies. Without user feedback, they will not be able to succeed.

Armstrong & Hagel III (1995) have defined three different types of communities: communities of relationship, of fantasy and of interest. Open source project are developed under these three types of users. It gathers people who have different knowledge of IT disciplines, are enthused with the project and have a desire to develop

a great software project. These people are private users or commercial team members who do not know each other from around the globe.

2.5 Licensing And Legal Issues

2.5.1 Licensing

Open source software can increase profits by reducing licence fees and manpower depending on the application requirement. Dr. Kerr (2003) investigated the games software industry in Ireland. His report titled “**It Is Child’s Play**” highlights the current games software industry in Ireland.

The most obvious difference between open source and commercial software development is licensing (Fitzgerald & Bassett, 2001; Lerner & Tirole, 2002; Karels, 2003, Scacchi *et al*, 2006). A study of OSS license has been taken by Beard & Kim (2007) and in their study they found four well-known and classic licenses already published. As Berkeley Software Distribution (BSD), GNU Public License (GPL), Lesser General Public License (LGPL), Massachusetts Institute of Technology (MIT), and Mozilla Public License (MLP). Table 2 is the comparison and main features of these OSS license published by Beard & Kim (2007).

Table 2: OSS License Features (Beard & Kim, 2007)

	Notice of modification	Redistribution of the modified work	Original source code attached to the modification	Linking to closed source code	Liability notice
BSD	YES	YES	NO	YES	YES
GPL	YES	Only under GPL or LGPL	YES	No	YES
LGPL	YES	Only under GPL or LGPL	YES	YES	YES
MIT	YES	YES	YES	YES	YES
MLP	YES	Only under MLP	YES	YES	YES

Scacchi (2004)’s study on OSS in game community illustration is valuable. He pointed that the GNU General Public License preserves and reiterates the beliefs and practices of sharing, examining, modifying and redistributing OSS systems and assets as property rights for collective freedom. OSS projects that commingle assets that weren’t created as free property have instead adopted variants that relax or strengthen the rights and conditions the GPL lays out. From the statistic analyses from

sourceForge.net (Figure 15), 71% open source projects are under GPL license, which means GPL is effective enough for standardisation of contract and it can be the defacto standard for open source licence (Ueda, 2005).

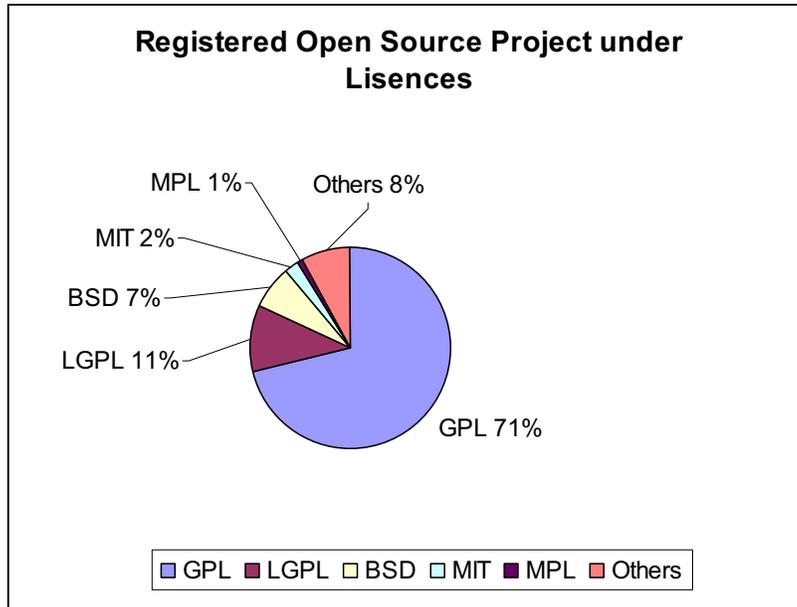


Figure 15: Registered Open source Projects

– source from SourceForge.net

Some features of OSS under these licences show some potential gaps between the commercial software, thus, a number of business strategies in which companies add features or services to open source software, which they can then sell (Karels, 2003). In the sourceforge.net, most of the projects under GPL license are game projects, in which 362 MMORPG projects are active and under developed.

2.5.2 Copyright and Copyleft

Copyright is the most usual method of protection for software products (Oxford, 1998). Metzger & Jaeger (2001) believe that Open source licenses are enforceable because they use, in one form or another, copyright law. The rationale for OSS licenses work is: Although copyright law do not allow for redistribution (not even use) of software, redistribution can be done in another way is by granting specific permission in a license. And that license can force the redistributors to fulfill certain conditions, For example, BSD licenses to enforce different conditions, ranging from

attribution of authorship; GPL licenses to obligation of redistribution of any derived work under the same terms of the original license (Fitzgerald & Bassett, 2001; Ueda *et al*, 2004).

Open source licenses were designed originally according to the United States law. Nowadays, some research has been done about the applicability of some of them in particular countries (Metzger & Jaeger, 2001; Patel, 2005). These studies are essential for the open source movement, since all the open source models depend, in a large proportion, on the validity of open source licenses, in case they are at some point challenged in courts. For instance, preliminary results seem to conclude that Open source license such as GPL and BSD license are enforceable in at least some European countries, and particularly in German.

Open source projects always connect with the copyright of interface specifications of a game project. This is a quite interesting issue which affects the interoperability of open source programs with proprietary ones. The rationale is that the header contains only information about the access points to the routines, and provides no information on the inner workings of the software. This allows open source developers to recreate a compatible version of any library or component for which a header file is available (Peter, 1996; Daffara *et al*, 1999; Kennedy, 2001).

Therefore, copyleft becomes a novel licensing scheme to facilitate open and decentralized software development. Its key feature is that once a program is licensed by the author, the subsequent programs based on the original must also be licensed in a similar manner (Mustonen, 2003). Copyleft may be characterized as a copyright licensing scheme in which an author surrenders some but not all rights under copyright law. It allows an author to impose some but not all copyright restrictions on those who want to engage in activities that would otherwise be considered copyright infringement (Kennedy, 2001). Under copyleft, copyright infringement may be avoided if the would-be infringer perpetuates the same copyleft scheme.

2.6 Networks & Online Games

2.6.1 Network Quality Relate To Online Gamers

Despite its best efforts the Internet does not provide Quality of Service (QoS) guarantees, however the popularity of online gaming is still increasing. Players are accustomed to struggling with and playing through unfavorable network conditions. Thus the network QoS may not be a must-have characteristic, but current high-speed networks have to support applications which have no way of predicting their traffic requirements in advance, but have stringent loss requirements and can tolerate variations in transfer delays. These performance characteristics mean that the sources can be made to modify their data transfer rates according to network conditions (Yaiche *et al*, 2000). Chen *et al* (2006a, 2006b, 2006c) stated that game-playing time is strongly related to network QoS, helping determine user satisfaction and deliver better service quality to online gamers. In particular the quality of the network is critical to real-time, interactive, MMORPG play.

Chen *et al* (2006a) was satirizing the gamers in their study, the gamers complaint about high “ping times” and “lags” continue to surge in the game-player forums but still enjoy suffer from the network latency and loss as a major hindrance to their infatuated MMORPGs. However, they continue to forecasting and study players’ reaction in online games according to the network QoS. The prediction could provide us with some useful information for a game system performance optimisation and resource allocation in the future. Their study show the unchangeable fact of non-guaranteed Internet QoS can be improved by exploiting players sensitivity to network QoS.

Chen *et al* (2006c) advised first that resource allocation could simultaneously maintain a reasonable level of player satisfaction, although it could be deliberately biased toward high-risk sessions characterized by poor network quality. Second they suggest optimising of network infrastructure. For instance, as their model indicates that players are less tolerant of large delay variations than they are of high latency, providing a smoothing buffer at the client side in which it incurs additional latency but smoothes the pace of game play would improve the overall game experience. Finally, the most

important matters for the online game clients and service providers are the network troubleshooting. In order to provide continuous high-quality game service, providers must monitor network conditions between servers and customer networks, detecting problems in real time before customer complaints flood the customer service enter. For example, game operators can track user gaming time, which is much more cost-effective. Since online gamers are sensitive to network conditions, a series of unusual departures over a short period might indicate abnormal network conditions and thus automatically trigger appropriate remedial action.

2.6.2 Latency And Player Actions In MMORPG

MMORPG are different from the other casual online games, the type of play, MMORPGs require a large time investment to learn the game and even more time to advance in it. On average, players were playing more than twenty hours a week in a popular MMORPG (Landau, 2006). According to BBC (2005) news, in the Asia/Pacific region, roughly 40% of online gamers prefer MMORPGs (in PRC MMOPRGs are preferred by over 50% of online gamers).

The players' actions are not effected by the connection lags. The term connection lag is when the Internet connection that between the client and the server has become congested and data is taking an inordinately long time to get between the client and the server. For example, the player lags, and all the data he sent in the last 10 seconds comes at once. In general MMOGs, the players' actions' speeds are enforced on the server, not on the client. The server keeps track of the time (in milliseconds) when a client last moved, and if a move request comes faster than the normal threshold, this request should be discarded. These requests can result in network latency (Privantu, 2004).

The main problem is even with the best code for connecting client and server together, there is always going to be times where the Internet connection will be slower than expected. This is quite easy to explain, for instance, when a new patch from Microsoft or the latest virus blocking e-mail servers with hundreds of thousands of messages, the "lag" happens. When the flow of information from the server to the client is temporarily stopped or partially restricted, the client is unable to perform its normal actions. In a MMORPG there are numerous scenarios being played out in real-time.

Imagine a battle scene where the gamer's character is under threat from a monster. Just as the gamer decides to quit the game, his character is killed. The delay between when the gamer tried to leave the battle / game and when the server actually received the command (lag time) resulted in death of the online character. Current technology is yet to remedy such latency problems. But some researches have been taken placed and given valuable knowledge (Chen *et al.*, 2006a, 2006b, 2006c).

A users Internet connection can range between a 33K modem to a 100 megabit optical fiber cable connection, as such MMOGs must be designed to be able to take full advantage of a fast connection without disadvantaging the users of slower modem connections.

2.7 Conclusion

This chapter examines the multi-dimension aspects relating to the Open source in the game community. Because of the copyleft license of OSS, online game companies can produce their product using OSS as their toolkits or supporting platform as well as database systems. We believe that the OSS development community will continue to develop and perfect itself. OSS is a valuable component in the development of the software industry. However OSS must integrate with mainstream programmes if it is to be used to its full potential. Linux represents the poster boy for such integration. OSS strives to reduce costs relating to software development and encourages knowledge transfer. Open source will force some game companies to drop their prices or cease to be commercial viability. For the business models, OSS will continue to follow the commercial model. This chapter attempts to simplify the terms and concepts of MMORPG. Current research reports suggest that China's MMORPG market is under developed. In the next chapter, we will discover the success factors of China's MMORPG.

3 CHINA'S SUCCESS OF MMORPG

3.1 Introduction

Before discovering these factors, this chapter will include the basic terms and the history of China's Internet usage and MMORPG. In this chapter the current state of China's MMOG industry is presented. From a literature review and interview, it presents an overview of China's key metrics such as market sizing and forecasts, size of MMORP segment, game operator market share, top titles with concurrent user numbers. In order to explain the success factors of China's MMORPGs, this chapter uses PESTLE⁸ analysis. We look at the different aspects in China. It contains three major elements, socio-economic, telecommunications infrastructure and concludes with relevant trends in China's MMOG industry. There are some negative aspects to the industry such as piracy and internet addiction issues. These will be discussed later.

3.1.1 History of China's MUDs

MMOGs grew from the text-based Multi-User Dungeons (MUDs) devised in the late 1970's, prevalent on the early World Wide Web (Krotoski, 2005). Krotoski (2004) gives us his finding on his unpublished thesis. From 1992 to 1996, this was the "Prehistoric Civilization era" of China's online game. MUDs first appear in China as a non-graphical form. In 1995, Taiwan, China, introduced a game called "East Story 2" (ES2). This was the first step of China's MUD and it was a very important step.

At the beginning, ES2 is a standard LPMUD, LPMUD was the most complex MUD, and it belongs to a massive multiplayer role playing game. The only system, which supports LPMUD, was MUDOS. The development of MUD was based on MUDOS which supports LPC in mainland China. ES2 differentiate itself from the other kind of MUD games which were from Eastern European countries. These other games used European history and folklore as background. ES2 used traditional Chinese martial arts and Chinese legends thus making ES2 more readily acceptable domestically.

Later in 1998, some MUD players began erecting UO (Genesis Network) virtual server, gamers first contacted with a graphics online RPG. The emerging of Ourgame games

⁸ PESTLE stands for Political, Economic, Social, Technological, Legal, Environmental.

and Xiao Ao Jiang Hu UO virtual server fasten the development of online game. This period was called "product of the times" of China's online game market.

The year 2000 saw a worldwide expansion of the Internet era. For example, in May 2001, Ourgame.com had 20 million registered users, 17 million people of whom were online. This made Ourgame.com the market leader ahead of such competitors as Microsoft Game Zone and Yahoo gaming community. This period in time became known as China's online game "Rush Hour".

3.1.2 The Emerging of MMORPGs - History of Chinese MMOPRG

The term MMORPG was first coined in China in earlier 2000. The MUD era would be consigned to history, gamers had voted by flooding these new MMORPG sites with millions of electronic hits. MMORPG had emerged as an interactive network access era, it is the latest evolution of the current form development of the online game.

With the rapid growth of Internet access during the period of 2002-2003, more and more players join the mighty tide of online games. Gamers and online games increased as the geometric volume level rose. China's online gamers were experiencing a massive growth. Table 3 shows an overview of different genres entry into Chinese market and their features since 1998.

Table 3: Features of Various Online Game Genres

	MMORP G	Casual Action	Network PC game	Board & Chess game
Year of China market entry	2000	2002	2002	1998
Popularity	Relatively high	Medium	Relatively high	High
Gamer stickiness	High	Medium	Medium	Low
Time spent for each game session	Long	Medium	Short	Short
Difficulty for beginners	High	Medium	Medium	Low (for gamers who familiar with the similar games) Medium (for that have no idea)
Percentage of paid gamers	High	Medium	Low	Low
R&D cost	High	Medium	Low	Low
Business model (methods to make profit)	Mature	Almost set	Almost set	Almost set

– Source from iResearch.com

Due to its relatively low R&D cost, board games such as chess were the first games to enter the Chinese online game market. These first games had limited success.

Improved technology led to the development of more advanced gaming platforms which in turn allowed game developers to produce more advanced games. Reduced cost and improved playability of these games soon hooked customers. The gaming market was about to experience unprecedented growth.

Network PC game platform users are prepared to pay service providers for access to the game. The quality of the service provided i.e. access speed and internet connection is vital to the gamers' enjoyment of the gaming experience. Online casual action games bear much higher R&D costs than console games. In most cases, time spent on each online casual action games session is of longer duration than that for each console game session.

3.2 Key Metrics to investigate:

“Market metrics are used in business planning and marketing monitoring to keep the marketing programme on track...The most common market metrics that companies use are: Market size, Market share, Market penetration, Installed base, Product usage, Customer attitudes, Brand awareness, Advertising awareness, Brand image, Customer satisfaction...” – by dobney.com⁹(Amber, 2000; Amber *et al*, 2001). Each metrics can be used for different purpose for the organisation/ company. In this project, in order to explore the success of China's MMORPG. The impact of China's Online Game operators' revenue contribution is huge. The key metrics in MMORPG market of market size, market segment size and game distributor market share have to be focused on.

Many factors including government policy orientation, increase of China Netizens, improvement of Internet access, prosperity of online casual game and its popularity among home Netizens, worked together to push the development and growth of China's online game industry.

⁹ dobney.com is a specialist market research and choice consultancy.

3.2.1 Market Sizing And Forecasts

The size of the market in China is seen as a significant factor influencing many organisations to do business in China. For MMORPG the size of the market has grown significantly over the last number of years see figure 16.

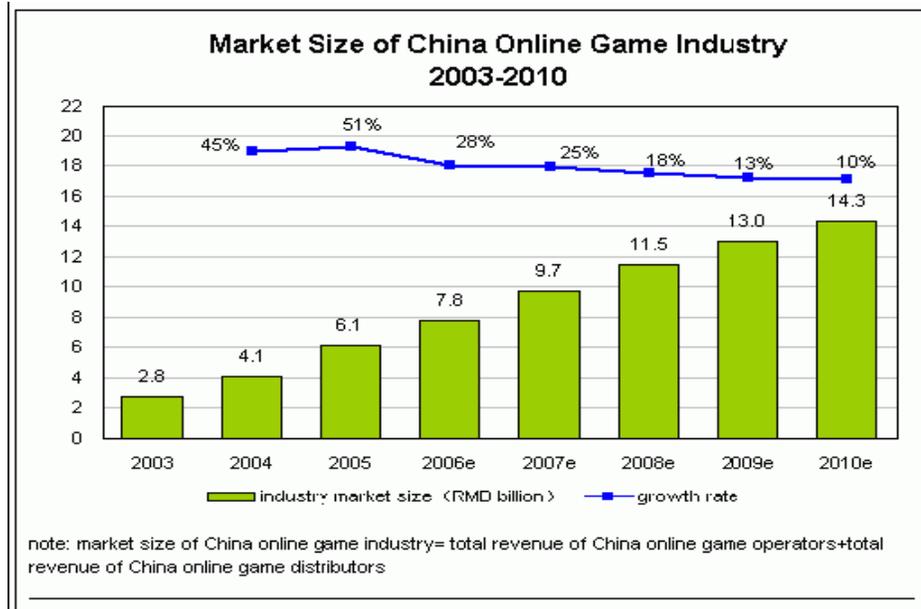


Figure 16: Market size of China Online Game Industry

– Source from *iResearch.com*

The percentage growth has decreased since 2005, however the market is still growing but at a much slower rate. Percentage growth figures often hide the real story. As a market reaches the saturation point profits are maintained however extra income can be difficult to generate. Profits can be increased by reducing costs at this stage in a product lifecycle. Economies of scale play a big role in reducing operating costs.

According to CCID Consulting (2006), the growth rate has gone down since year 2006 (estimated) since the restructuring of the industries (both IT industry & online game industry) will be ongoing over the next few years. The main drag on the overall growth rate of the market size is the market is going to be saturated until the late 2010. Another reason is lack of products' innovation in the market. Despite that most of game development companies inherit the S. Korea's technology, but few have improved or made evolution.

3.2.2 Size Of MMORPG Segment

Top 5 MMORPGs during 2000-2003 have been reviewed in order to understand the current state of the MMORPG market. It is helpful to consider the games which are the most popular in the market. By reviewing these games, it shows commonality and identifies the aspects of these games which make them popular:

Top 1 <Stone Age>

In 2000, domestic online game market has not matured yet, and the risks and opportunities have not emerged. The commercial operation of official online games can be counted on one's fingers, such as "Master" and "Darkness". In order to stimulate development, it is necessary to have a couple of MMORPGs to promote a MMORPG craze. "Stone Age" precisely filled this gap.

Top 2 <Magic Baby >

"Magic Baby" was launched in early 2002. Since issuing the official version, just within a few months time, it was quickly ranked as the second popular MMORPG in China.

Top3 <Legend Of MIR 2>

In 2001, Shanda Ltd outsourced this Korean MMORPG into Chinese market. Since then, domestic developers have taken over the lead and the market has matured and segmented into MMORPGs. "Legend of MIR2" is a very popular MMORPG in South Korea. From the initial test version to the official version, every single update attracted the hearts of countless players, and the registrations number and the online number was always soared.

Top 4 <MU>

MU Online is a 3D medieval fantasy MMORPG, produced by Webzen¹⁰. This game was developed under OpenGL¹¹. MU Online is the perfect combination of real-time 3D imaging engine and the magnificent backdrop of the game which is developed by three famous game engineers in Korea.

¹⁰ Webzen is a Korean electronic game development company.

¹¹ OpenGL (Open Graphics Library) is a standard specification defining a cross-language cross-platform API for writing applications that produce 2D and 3D computer graphics.

Top 5 <EverQuest>

Currently EverQuest is distributed by Ubi-soft Ltd¹². The design and concept of EverQuest is heavily indebted to text-based MUDs, in particular DikuMUD, and as such EverQuest is considered a 3D evolution of the text MUD genre like some of the MMOs that preceded it such as Meridian 59 and The Realm Online.

In 2006, iResearch ranked the top 10 MMORPG in China. Legend of MIR II is still holding the top China's market share since 2001. In the MMORPG market, the highest market share MMORPG is Legend of MIR II, World of Warcraft and Re Xue Jiang Hu Online. Table 4 is the detailed list of Top 10 MMORPGs. Accordingly, the Legend of MIR II was chosen to be the experiment for this project.

Table 4: Top 10 MMORPGs in Chinese market in 2006

Top 10	MMORPGs	Developer Country
1	Legend of Mir II: Three Heros	S. Korea
2	World of Warcraft (WOW)	Canada
3	Re Xue Jiang Hu Online	China
4	QQ Fantasy	China
5	Westward Journey Online	China
6	World War 2 Online	USA
7	Zheng Tu	China
8	World of Legend	China
9	Audition	S. Korea
10	Adventure Island Online	S. Korea
Sample Description : N=119591 ; Above is from iresearch.com online survey in October 2006		

The top 1 and top 2 games are originally outsourced from S. Korea and Canada. In table 4, there are 50% of the games outsourced from other countries.

3.2.3 Game Distributors Market Share

Figure 17 is the Game distributors' market share in China according to iResearch.com annual report about the Online Game industry. In 2007, there are some changes in the market share compare to 2005. But those game distributors have contributed huge revenue to the industry. Some companies' profiles are listed in table 5.

¹² Ubi-soft Ltd is an entertainment company which is a developer and publisher of fast-paced action and platform games for PC and console systems.

Table 5: Top 5 market share online game distributors in 2005

Top 5	Game distributor	Company Profile	Products	Official Website
1	Shanda Network	Founded in 1999, Shanda develops and operates MMORPGs and Casual games in China. The company reported \$212 million in revenue in 2006 and it is one of the top online game companies in China.	Legend of MIR II™	www.shanda.com.cn
2	The9	The9 is an online game operator and developer in China. The9's also provide game operating support, Website solutions and advertisement services, and game-related short messaging services.	MU® WOW®	www.the9.com/en
3	Perfect World	Perfect World was established in 2004. The company engages in the development and operation of MMOGs. The company's in-house developed 3D MMORPG Perfect World is one of the most popular online titles in China and Taiwan. The company is planning to complete an IPO this year.	Perfect World	http://www.pwrd.com
4	9you.com	Nineyou (Shanghai Everstar Online Entertainment Co. Ltd.) is the global's biggest music online game operator, China's biggest casual game operator, one of biggest interactive entertainment portal sites in China, which is the first to integrate online game services (MMORPG, massive and medium size casual games, mobile game, and so on), fashionable digital entertainment contents, a variety of chatting and community services equipped with Avatar System, wireless value-added services and other premiere services to the Chinese language internet users all over the world.	Audition – Season 3	www.9you.com
5	Tencent	Established in 1998, Tencent operates China's most popular IM service with more than 220 million active user accounts. In 2003 the company launched its QQ Game portal and released its first in-house developed MMOG QQ Fantasy in the following year. In addition to QQ Fantasy, the company also operates other MMOG and casual games such as R2 Beat and QQ Tang.	QQ Tang™ QQ Fantasy	www.tencent.com

Note: Above is based on iResearch.com



Figure 17: 2007 Q1 China Game Distributors market share

3.3 Success factor 1. Socio-Economic Overview

3.3.1 Population

According to China's Population Information and Research Centre¹³, the total population on the mainland of China is currently 1.32 billion. Statistics from the commission show that China's population has been brought under control in the past 6 years. This is related to the one child policy which was introduced in 1981 (Bongaarts & Greenhalgh, 1985). Such demographics represent a potential gold mine for China's online game industry. Table 5 represents the Number of China Online Gamers statistic from 2003 to 2010 estimated.

Table 6: Number of China Online Gamers 2003-2010

	2003	2004	2005	2006	2007e	2008e	2009e	2010e
Number of Netizens (million)	79.5	94	111	137	162	185	210	232
Growth rate		18.2%	18.1%	23.4%	18.2%	14.2%	13.5%	10.5%
Number of online gamers (million)	16.8	21	29	40	53	63.5	73.6	81
Growth rate		25.0%	38.1%	37.9%	32.5%	19.8%	15.9%	10.1%
Online gamer/ Netizen (%)	21.1%	22.3%	26.1%	29.2%	32.7%	34.3%	35.0%	34.9%
Note: resource is from CNNIC statistics report & iResearch report.								

The growth of China's Netizens and the increase of available products in China's online game market led to the growth in China's online gamers. According to statistics from CNNIC (Table 6), China Netizens reached 111 million in 2005, 18.2% more than that in 2004. According to iResearch report, the number of China online gamers in 2005 was 29 million, or 26% of China Netizens. Online gaming has become an indispensable service for Netizens (Barraclough & Ollier, 2007).

3.3.2 Online Game Community Economy

In 2003, China's Internet game industry had revenues of RMB ¥ 1.32 billion (EUR €132 million, EUR €1 = RMB ¥10), an increase of 45.8% over the year 2002, and the industry generated another RMB ¥ 8.71 billion (EUR €871 million) for the telecommunication industry and RMB ¥ 3.5 billion (EUR €350 million) for the IT industry. By the end of 2007, the industry is expected to reach a market valuation of

¹³ CPIRC, URL: www.cpirc.org.cn/en/eindex.htm

RMB ¥ 6.7 billion (EUR €670 million) with approx 53 million online game players, of whom about 10% are minors and 65.3% play for less than three hours a day (IDC report, 2004). Online gaming competition was fierce in all categories since 2000, however, research shows the online game market will experience steady growth in China over the coming years. By the end of 2005, more than approx 200 online game products were available on the market, of which less than 10 percent of products were profitable. Nevertheless, online game market share continues to grow as due its profits. The actual sales revenue of China's online game market reached RMB ¥ 3.77 billion (approx EUR €0.377 billion) in 2005, up by 52.6 percent over the year of 2004 (China Online Game Industry Report 2005-2006).

The development of China's online game industry also promotes the development of related industries. The sales revenues of telecom operation generated by online game totaled RMB ¥17.34 billion (approx EUR €1.734 billion) in 2005, as high as 4.6 times of the actual revenue of online game. Moreover, the sales revenue of IT industry generated by online game also reached RMB ¥7.16 billion (approx EUR €0.716 billion), 1.9 times of that of online game.

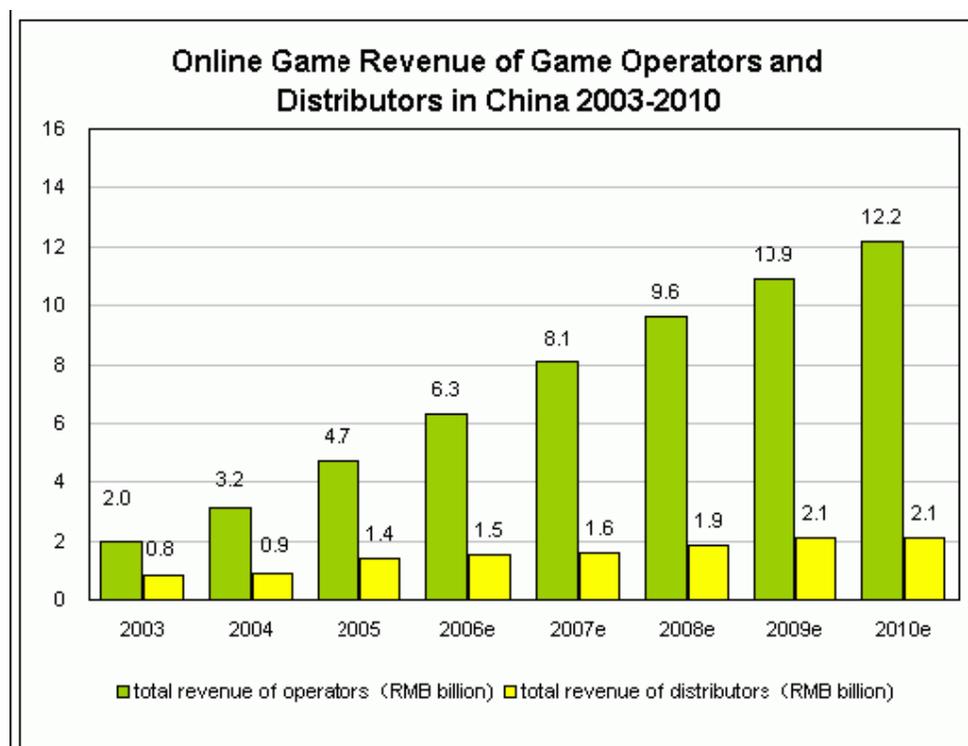


Figure 18: Online game revenue of Game Operators and distributors in China 2003-2010

Figure 18 reflects the healthy activities of China’s online game industry as the revenue growth is predictable and foreseeable. “*China's economy is unlikely to slow ‘sharply’ in 2007 because rising consumer spending and industrial production will underpin growth*”, said Yao Jingyuan - chief economist of the National Bureau of Statistics.

3.4 Success factor 2. Telecommunications infrastructure

3.4.1 From Dial-up to Broadband

The Virtual World’s industry in China has been undergoing exponential growth while stimulating other industries such as telecommunication, information technology, and media through closely related as well as newly expanded value chain connections. One of the biggest drivers of the online game industry is the expansion of broadband in China (Kullman, 2000; MacInnes & Hu, 2005).

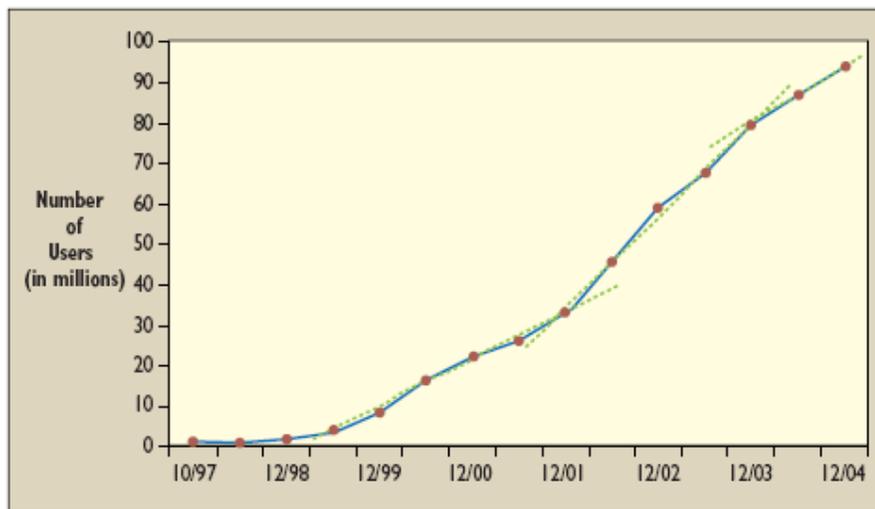


Figure 19: Diffusion of the Internet in China, 1997–2004;

- source: CNNIC.cn

Figure 19 illustrates the number of internet users increasing from 1997 to 2004 which is based on China Internet Network Information Centre CNNIC.cn. Zhu & Wang (2005) give us a brief guide about the internet use in China: “*Until December 2004, 56% of Chinese users still relied on telephone dialup to connect to the Internet. Broadband connections have become increasingly popular, with 37% of users having it at home and 40% having it at their workplace/school or Internet café.*” The main reason of DSL broadband connection increasing is because most of the ISP dropped

the initial installation and equipment fee as well as the monthly charges (MacInnes & Hu, 2005)

According to the CNNIC whom released its 20th "Statistical Survey Report on Internet Development in China" on July 2007, which shows an estimated 100 new Internet users every minute: "As of June 2007, China has had 162 million Internet users, only second to the United States, 211 million. Comparing to the end of 2006, it has 25 million new Internet users, which means the country reports nearly 100 new Internet users every minute."

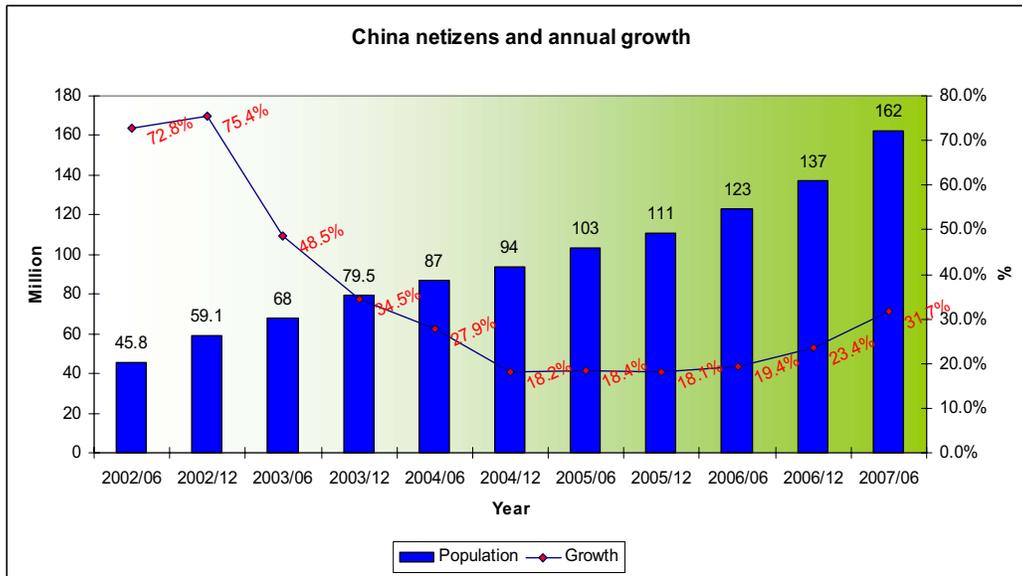


Figure 20: China's Netizens and annual growth

According to Internet World Stats¹⁴ in Asia Pacific, 122 million broadband subscribers as of Jun/07 (Figure 20), 162 million Internet users as of June/07, 12.3% penetration and. Because of the limitation of bandwidth and the price of broadband, the growth rate has gone down since 2002. In 2004, the most ISPs have changed their policies and price and provided more services to the customers. Thus the growth rate was going up smoothly every year.

¹⁴ Internet World Stats, URL: <http://www.internetworldstats.com/asia.htm>

3.4.2 Internet Cafes and Their Role in Influencing the Growth of the Games Market.

Internet Cafes are the main outlet for gaming in China by providing access to computers coupled with low internet charges (Ren & Yang, 2005). Internet cafes are big business in China. They play a far more important role than in other Western countries. First of all, millions of people depend on Internet cafes to get online. Since Internet was introduced into China in 1997, relatively few Chinese owned PCs at home. The only place they can go and access to the World Wide Web is the Internet Cafes. *“Nowadays, some of the Internet Cafes are huge, with 300-400 PCs per café. Some of them in China that had a no-frills section, a nicer area that cost a bit more and a first-class section decked out with decorations from a popular online game. Service providers such as Intel and AMD see Internet cafe owners as important customers and have been designing systems with them in mind”* (Einhorn, 2007). In addition, the Internet Cafe Culture has emerged as many people in China go to Internet cafes not only because they don't have a computer at home, but to socialise with friends while playing games online.

In March 2007 the Chinese government announced new restrictions relating to Internet Cafes. In an attempt to regulate the industry the government have put a freeze on any new Internet Cafes been opened in the year 2007. At present, there are approximately 113,000 licensed Internet cafes operating in China (according to “Survey of China Internet Cafe Industry” by the Ministry of Information Industry in 2007). Most of them are very busy, an Internet Cafe provides Internet access to web, email, Chat rooms, online gaming with the additional service for drinks and food. Figure 21 is the picture of a typical Internet Cafe in China. It is very common that people stay in the Internet Café over 12 hours a day playing online games.



Figure 21: A scene of an Internet Cafe in China

3.4.3 Online game addiction

According to Xinhua Agency¹⁵, the problem is that Internet cafes are dens of iniquity. “China has seen an alarming rise in the number of teenagers addicted to Internet cafes and gaming,” the official news agency reports. The online gaming addiction is not an occasional phenomenon happened in China (Murali & George, 2007). China Daily published an article¹⁶ on 28th Feb 2007 in China Daily about an obese 20-year-old online gamer who died after a marathon online gaming session during the Chinese New Year holiday.

An announcement had been given by eight government departments on 9th April 2007 in which all online game distributors/ online game operators must install the anti-addiction system which has been defined and it must be in operation. Therefore, online gamers are required to register with their real names and identity card numbers to show if they are under or over the age of 18.

¹⁵ Xinhua News Agency, the state and worldwide news agency in China

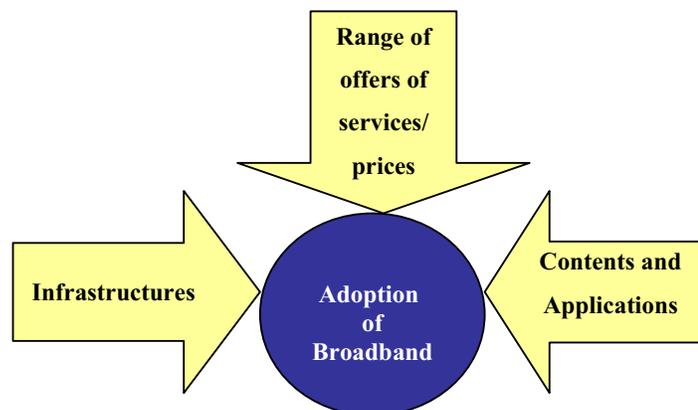
¹⁶ China Daily, URL: http://www.chinadaily.com.cn/china/2007-02/28/content_815396.htm

The internet cafe ban¹⁷ stated that *“Internet bars must not admit anyone under the age of 18. Internet bars that are found to have twice allowed minors on their premises will be forced to close for 15 days and fined. A third offence can lead to their business license being revoked.”* The government is trying to consolidate the industry. The aim is to drive the illegal cafes out of business and force smaller legally owned outlets to merge, thus making it easier to regulate the sector.

Games like World of Warcraft (WoW) have installed their anti-addiction and real-name systems on 15th July 2007. Dibbel (2007) reported a document on New York Times who stated that *“... thousands of businesses like it all over China... they employ an estimated 100,000 workers, who produce the bulk of all the goods in what has become a \$1.8 billion worldwide trade in virtual items.”* Zhao Yurun, public relations director of the The9, which runs WoW in China, said, *‘We have installed the anti-addiction system on all games....’* An officer with General Administration of Press and Publications said *“Officials were still discussing penalties for firms that had failed to install the anti-addiction system. ... If the player hangs in there for more than five hours a day, all their gaming credits will be lost.”*(Xinhua News Agency, 17th July 2007).

3.4.4 Broadband Network Technologies

As discussed in earlier in this chapter, China’s broadband success is based on the infrastructures, prices/ services and techniques development. Irish broadband success can not occur without these elements. Figure 22 is a framework that illustrates the Key factors from broadband success in the world.



¹⁷The internet cafe ban, http://news.xinhuanet.com/english/2007-03/06/content_5806467.htm

Figure 22: Key factors for Broadband Success

3.5 Success factor 3. Business Strategy

The relevant trends, current marketplace conditions online games and the effect of piracy issues have driven the Chinese online game operators to change their business strategy to “Free to play option”. This is another key success factor which China’s MMORPG market adopted from the OSS community.

3.5.1 Outsourcing & Piracy

Chinese software companies have yet to develop the expertise required to create and develop new games with global appeal, but this is changing. Most Chinese gaming software companies modify existing game titles under licensing agreements mainly with Korean owned companies. This practise requires good communication between the developers and operators as misinterpretation can decide the fate of a game. Prohibitive licensing costs are forcing Chinese companies to invest heavily in R&D to create their own online games. Under licensing agreements the technology of the game belong to the Korean company. Korean companies block most technology communication channels, which lead to the serious problems. A large proportion of the profits also go to South Korean companies. Shanda Ltd, the most successful online game distributor in China, has spent US\$ 5 million in developing its first online game after the break up of a short and uneven partnership with a Korean Company. Other major players such as Kingsoft and Object Software released their online games in 2003.

For many years, the most visible issue in China’s software market has been the high rates of illegal software in use. This situation has not changed much, according to the Business Software Alliance, which reports a 94% piracy rate in China for 2000. However new developments are taking place that may reduce the level of piracy and also lead to the growth of a more dynamic software industry in China. China has specifically identified software as a strategic sector for development. India had been very successful in the development of computer software. China hopes to develop a similar model to that of India. To this end several reports have been commissioned in order to learn from India’s success in the software industry. Some projects involve

promotion of Linux applications (Open source) for the development, production and adoption of secure MMOGs software.

3.5.2 Private Server / Cheats Vs. Play for free option

China’s online game industry is very profitable. However the industry is often under mind by computer fraud, piracy and intense competition. Private servers (unofficial servers which have been accredited by game developers or operators) which allow players enjoy online gaming without paying any credits. Due to bugs or design flaws occurring while playing MMORPGs, in order to get a higher grades or more virtual money; cheats and cheating software have become popular. Yan & Choi (2002) stated that *“Cheating by exploiting bugs or design flaws some online cheats exploit bugs or design flaws found in game software to get an unfair advantage...”* in their paper, they classified few categorisations of cheats (Table 7):

Table 7: Categorisation of cheats

Categorisation of Cheats	
1) Collusion	2) Abusing Procedure or Policy
3) Related with Virtual Assets	4) Compromising Passwords
5) Denying Service from Peer Players	6) Due to Lack of Secrecy
7) Due to Lack of Authentication	8) Related with Internal Misuse
9) Social Engineering	10) Modifying Game Software/Data
11) Exploiting Bug or Design Flaw	

These practises which are illegal in China; still occur and have a negative impact on the profit margins of the games operators. Pirate software generates no income for the developer of the original game. The producers of “World of Warcraft”, “Lineage 2” believe that software piracy has reduced their revenue by as much as 35%.

In an attempt to combat software piracy, some game operators have developed the “play for free option”. Gamers log onto the official site where they sample the genuine article and enjoy the gaming experience. To continue this experience virtual money must change hands. Only when the gamer purchases credits will he get to experience the full benefits of the licensed product. The computer industry mirrors reality in that there is no such thing as a “free lunch”.

This strategy proved to be so successful that most of the popular Chinese MMORPG operators have adopted their free game policy. Clever spyware attached to the software triggers a warning when illegal software is discovered. By back tracking user identity can be discovered. Legal proceedings can be taken for any copyright infringements. According to China Online Game Industry Report 2005-2006 (official report), it stated “...year of 2005 to 2006...Traditional profit model (point-card charges) has already been stricken by new models (Free playtime and game value-added charges). ... Online games are becoming popular gradually.”

3.6 Conclusion

The population, revenue and market size reflect the evolution of China’s MMOGs market. This chapter has briefly discussed the key factors which are population, infrastructure and the business strategies. The different negative elements such as software piracy, online game addition which effect MMORPG market growth have been outlined. Game operators/ distributors believe China’s online gamers will contribute more revenue under the free-to-play model than what went before. The new emerging MMORPG products continue to represent the largest growing segment in the market. China’s MMOGs market will continue to generate large profits once new business models have been implemented to combat software piracy.

The factors which influence the successful business strategies which online game operators/ distributors have adopted are primarily the indraught of IT technology and the growth of Internet popularity. It is worth noting that the anti-addiction policy outlined by the Chinese government represents a potential threat to MMORPGs market grow/ development. The play for free model is a product of market competition, it attempts to counterattack software piracy. It also creates more opportunities to increase MMOG market and attract more customers.

4 MMORPGS IN IRELAND

4.1 Introduction

This chapter is about Ireland's Online Gaming market. Therefore, an online questionnaire survey was used to examine various factors of online computer game players (n¹⁸=45) who played the most popular MMORPGs. An interview from a senior network developer from a game company is included. The content includes the Irish broadband network development within the recent 5 years. It also includes details about Ireland's online gaming and results of survey/ interview in this area. Forecasting the Ireland's MMORPG market and comparing to China's key metrics of MMORPG industry, it presents the potential challenge of Irish MMORPG market in the future.

4.2 The Games Industry In Ireland

Gaming is a hobby with immense diversity and wide-open arms, the scene in Ireland is a perfect example of this. The government has encouraged developing a Digital Content Industry in Ireland. Tánaiste and Minister for Enterprise, Trade & Employment Mary Harney (TD, 2002) highlighted that Digital Content Industry is one of the new emerging high potential sectors in Ireland. Ireland has been successful in developing a software industry. The challenge is to build on this strength and to identify niche opportunities within the Digital Content Industry where Ireland can aspire to establishing a significant global presence (Forfás¹⁹, 2002). Games Industry has been identified as one of the sectors within this broad area with high potential growth. ROI (Return on Investment) are very high for successful games developers despite the high risk involved in producing games.

“...I couldn't tell you when the first gaming societies started in Ireland, but I do know the oldest running convention started in Trinity College roughly twenty-five years ago. In 2004 there will be ten conventions and countless other more specialised gaming events running all across the country...” by Brian Nisbet – a senior network engineer published on his article “*Gaming in Ireland*”

¹⁸ n – The number of people who anticipated in the survey questionnaire.

¹⁹ The national policy and advisory board for enterprise, trade, science, technology and innovation.

4.2.1 Irish software industry

Ireland has become one of the largest exporters of computer software in the world. The games software development sector has received more and more attention from industrial development agencies, academia and financiers in recent years. The global games software industry market is worth an estimated US\$31.6 billion in 2006 (PwC, 2007). The Irish software industry exports over 94% of all software produced. According to the Organisation for Economic and Co-Operation and Development (OECD), in 2002 Ireland was the largest exporter of software products in the world with over 90 companies developing software. In 2004, OECD highlighted Top 30 economies' shares of total reported exports of computer and information services and other business services; Ireland is in the list of top 5 countries.

Forfás report on the digital content sector in Ireland identified the games industry as an area of high-growth and opportunity across the entire value chain. It comprises both software and hardware platforms for the games industry. The emerging MMOGs market brings the broadband and mobile communication technology a great opportunity. Online games are expected to experience large growth when broadband penetration increases, and it is likely to potentially change the economics of the industry, with subscription based services.

4.2.2 Online Game sector

The existing strengths of Game software in Ireland lie in the development, design and conversion/ packaging of games. The R&D strengths in both game design and game enablers (those are core technologies that are developed to enable the production, management and distribution of game) are very valuable opportunity for Ireland (Forfás, 2002). The enablers, content publishing, marketing and distribution represent further opportunities as growth is set to continue. This is directly related to the telecommunication and broadband performance in Ireland.

According to the survey result, 56.82% people in Ireland play online game (figure 23), despite 64.29% of them play them less than 1 hour a day (figure 24).



Figure 23: Survey result Q8

The attitude of the players can be changed when they meet a game which they do not like or the fees are too expensive to pay.

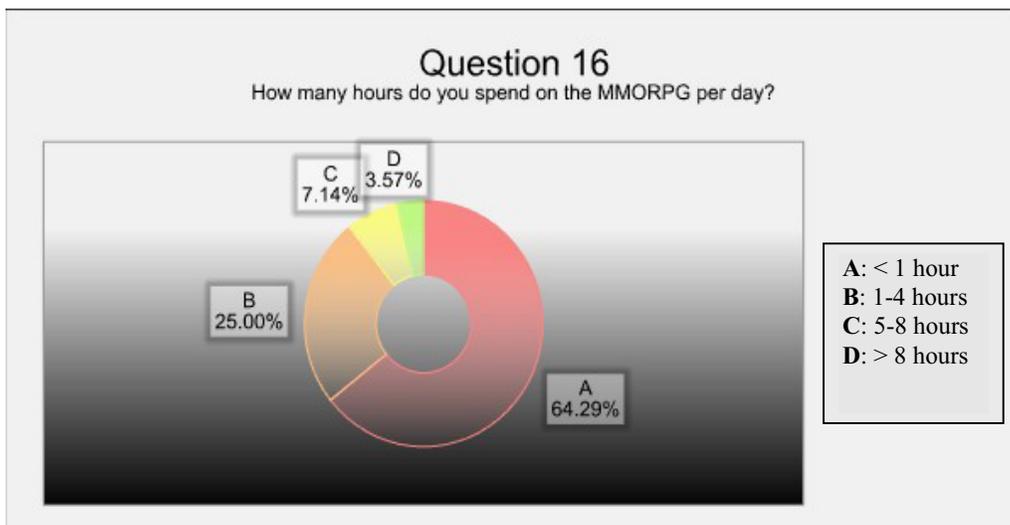


Figure 24: Survey result Q16

Forfás (2002) stated, “A key issue to be addressed is the very limited number of training and education courses currently available for the games sector in Ireland.” However in recent years there are a number of undergraduate and postgraduate courses (in games) on offer in Ireland in a range of institutions, from Institutes of Technology to Colleges. Table 8 shows the current game education and training course available all over Ireland and Northern Ireland in 2007. These supplement the more general courses in computer science, multimedia, art and design on offer in the Universities.

Table 8: 2007 Educational course of game development in Ireland

Certificate	Computer Games and Interactive Entertainment Dev., BCFE
	HNC in Interactive Computer Entert., NWIFE
	Computer Game Design & Development, St. John's College, Cork
Diploma	HND in Animation and 3D Modeling, BCFE
	National Diploma in Computing (Multimedia) at DLIADT
	HND in Computer Games Design, BCFE
Degree	BTEC National Diploma in Media Production (Games Dev), Causeway Institute
	BA in Animation at DLIADT
	BSc. in Multimedia at DCU
	BSc in Computing (Multimedia) at DLIADT
	BSc Hons Computing (Digital Games Development), UU
	BSc. in Computer Games Development, LYIT
	BSc in Multimedia and Computer Games Development, UL
Postgraduate	BA (Hons) in Multimedia, CIT
	BSc. in Computer Games Development Carlow IT
	Postgraduate Diploma/MSc in Computer Games Development, LYIT
	MSc. in Multimedia at DCU
	MSc. in Multimedia Technology at TCD
	MSc in Computer Interactive Entertainment, TCD

Both the Irish government and many leading academies acknowledge the need for further investment to develop the computer game industry in Ireland. PwC (2007) and Forfás (2002) report also conclude that Ireland has the potential to build a strong indigenous games industry and could be attractive for the development of a strong overseas base of companies, in both games development and publishing and also for distribution and hosting. Despite only 5.7% of Online Game developer in the survey result (Table 9). We believe that as broadband penetration continues to grow the MMOGs market will flourish and the game industry will experience real growth.

Table 9: Survey result Q10

Q10. Suppose you play online games, what's your knowledge about MMORPG (Massive Multiplayer Online Role-Playing Game)?	%
Don't have any clue.	51.4
Player	42.9
Developer	5.7

4.3 Telecommunication Infrastructure

4.3.1 Irish Broadband Growth

Internet and broadband development is relatively new in Ireland. The speed of Internet accessing has dramatically increased as figure 25 illustrating (Source from Jupiter Research, UK, 2006).

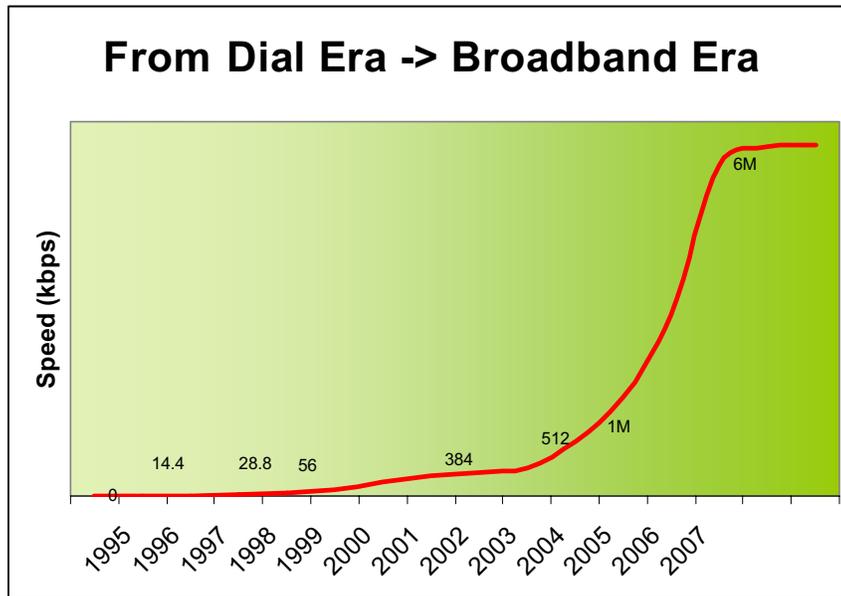


Figure 25: Internet speed changes from 1995 - 2007

Eircom's one time monopoly of the telecommunication of the industry has been ended. Along with new entrance into the market e.g. BT, Vodafone, Perlico, New products have also been introduced to the Irish consumer of which broadband is the jewel in the crown. Increased competition has led to reduced costs. Broadband has become affordable to a greater audience. Lowering the cost of broadband has also grown the market. As figure 25 shows, before 2002, most of companies and households in Ireland were using dial-up to access the Internet. With numerous ways to communicate and to deal with internet content, low speed internet can only access the web pages and email systems. Loading ActiveX controls, high resolution JPEGs, viewing iTVs and playing MMOGs all require high speed Internet access.

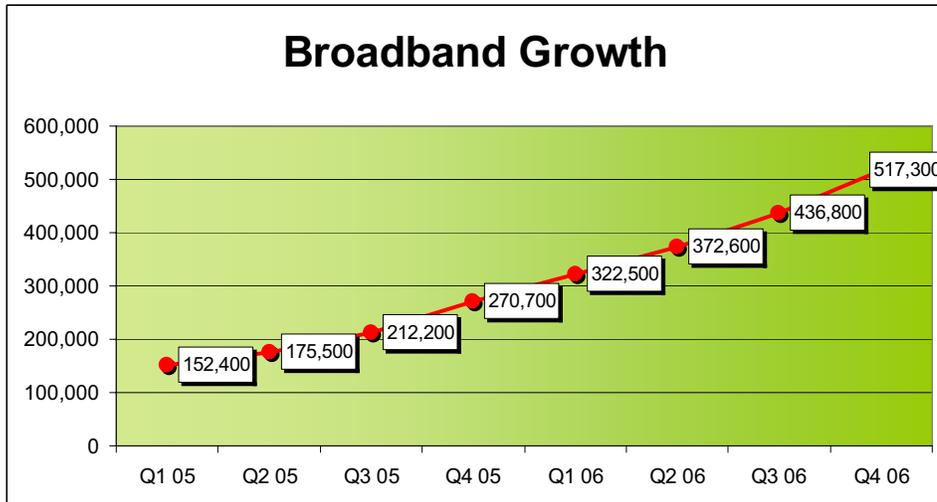


Figure 26: Broadband growth in Ireland 2005-2006

Figure 26 is the ComReg report illustrates Broadband growth in Ireland from 2005 to 2006 has risen from 152K to 517K. Compare to China 11.863 million broadband users in China in 2004; it is just a small amount. But the growth rate of 70% is faster than the rate of 15% in China. The reason of this rapid growth is the broadband entry price has dropped in recent 5 years. As we have discussed in Chapter 3, the success of broadband adoption based on the technology, contents / applications and the services / prices (see figure 22). Figure 27 shows the prices of DSL continuously fall from EUR €144 estimated to EUR €33 estimated during 2002 and 2007.

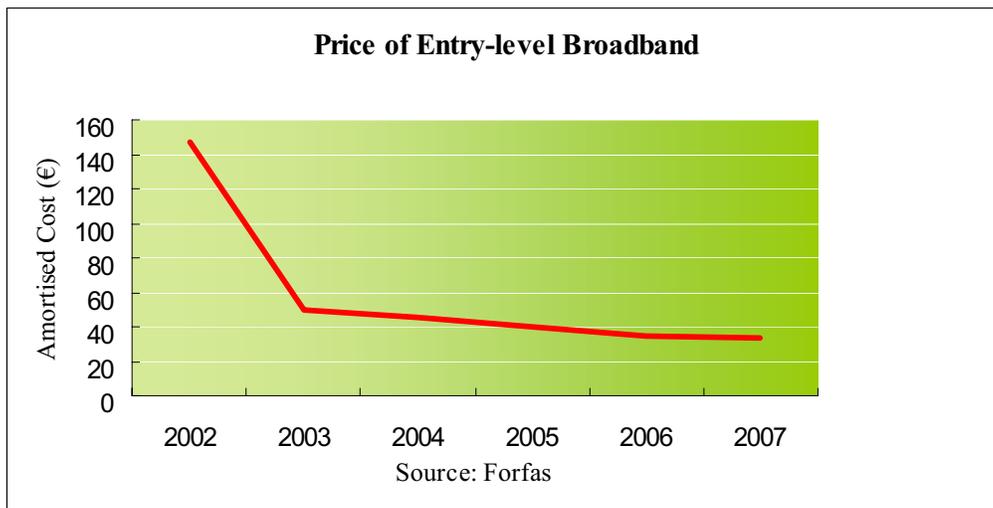


Figure 27: Broadband entry level price

4.3.2 Internet access using broadband

Broadband has replaced LAN as the master of the digital world. “*In the Asia Pacific region, where broadband has been around for a lot longer, online gaming is insanely popular. Figures show that in China and Malaysia online games now outnumber online retail buyers by two to one. Not only that, but more and more women are taking part as well*” (Sunday Independent, 2007a). An array of opportunities has been opened for the digital content in Ireland. Table 10 presents that 41.2% of Irish citizen use internet to check emails and read news, the second highest performance shows 28.4% for entertainment and gaming. As ComReg’s report (Table 11) 32% of doing entertaining, they are consistent.

Table 10: Survey result Q7

Q 7. What do you do when you are online?	%
Checking emails and reading news	41.2
Entertaining and gaming	28.4
Studying and administrating	26.5
Other	3.9

Table 11: Home Internet use

Home internet use	%
Communication via email	65
General browsing	64
Looking for information/ research	58
Educational purposes	35
General entertainment	32
Shopping	29
Getting news updates	27
Downloading online material	18

Source: ComReg Trends Series Q4 2006. research by Amarach published march 2007

Ireland’s broadband penetration levels is still lower than the European average, however penetration levels are improving all the time. Figure 28 & 29 show where Ireland is still in the bottom level among EU & Worldwide countries. In order to

change this situation, the digital content industry in Ireland should continuously grow as well as the education of multimedia technology based on the Internet. In time Ireland may reclaim its position as a digital hub with high-speed connection to the net. This period of time allows some game companies to consider future opportunities, as facilitating online gaming will be one of potential revenue generating services for them. The online gaming era has arrived...

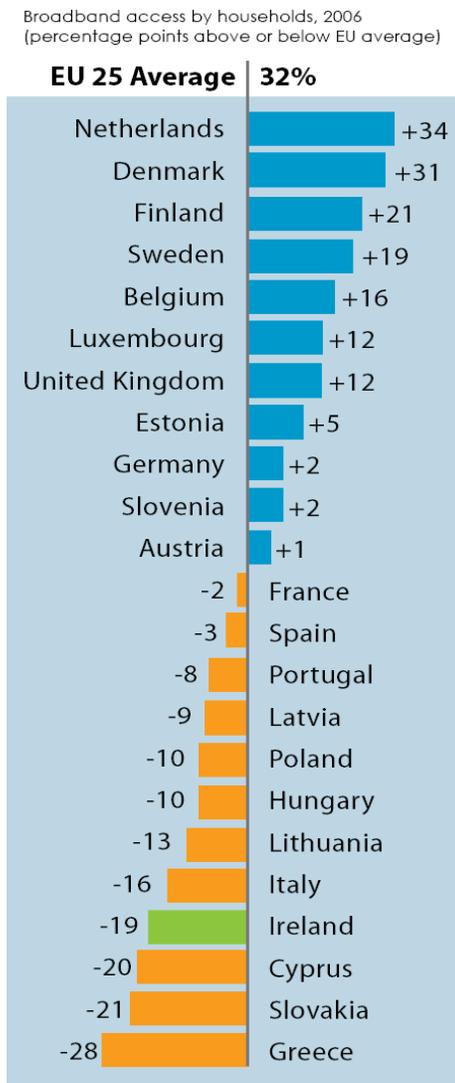


Figure 28: EU Households broadband access 2006



Figure 29: Worldwide broadband access 2006

4.4 Irish Eyes Are Smiling On Open source

The Irish software industry has built its success largely on the basis of applying imported technologies, rather than by creating its own. Some see this as a lack of innovation, and, in the longer term, a weakness. The recent allocation of significant sums of money for basic research by the Irish government (through the Science Foundation of Ireland and the HEA) is aimed at addressing this weakness, and may result in the development of some original technologies. This would give the industry a new dimension, and lead to even more opportunities for growth (Sterne, 2005). Encouraging open source can enhance the weakness, and OSS coming of age can enhance the Irish software industry innovation “*cross the chasm*” (Moore, 1991).

“The open source environment is growing rapidly worldwide. Revenues for 2005 are expected show a 48 percent increase over those of 2004. As Ireland is a significant location for software internationally, Irish Independent Software Vendors (ISVs) and Higher Education Institutions (HEIs) cannot afford to ignore the increased importance of OSS...” – Martin Cronin – CEO of Forfás.

Irish start-up software companies need to access outside markets at an earlier stage in their product development in order to survive. The strategy of developing products with a universal appeal lends itself well to the computer games industry. The open source model can provide a simple, fast and efficient way to build a client base for these companies and enable them gain market share quicker. As we have already discussed the commercialisation models in Chapter 3. Irish ISVs and HEIs are most likely to adopt 3 models as follows:

- 1) Support based commercialisation
- 2) Service integration
- 3) Commercial enhancement of open source

For example, OpenIreland²⁰ is an OSS advocacy group in Ireland. They aim to provide a portal site to promote and support the implementation of OSS technologies and solutions in business in all over Ireland. There are many organisations like OpenIreland, they all trying to use OSS as a stepping-stone to success in their business.

On the other hand, according to Forfás (2002), the Copyright Act in Ireland provides for a complex licensing scheme. It is slow and cumbersome, resulting in the parties having to make unnecessary recourse to the courts. One form of Civil Law limits that online game distributors and the other game software companies must rely on the Law of Confidential Information to protect their know-how. Open source may represent a potential opportunity for them to make a big impression on this issue.

An innovation of software development needs ideas, knowledge and skills, in terms of Knowledge Management, Open source are well done on knowledge sharing and knowledge retrieving. Re-engineering on the source code can maintain the existing knowledge and may have knowledge elicitation. OSS can address both funding and development issues and to tackle the legacy of entrenched boundaries.

4.5 Online Games Models In Ireland

Although Forfás (2002) recommended State intervention in funding for digital media companies, to-date little progress has been made in setting up a fund specifically for the online game development sector. Forfás (2002) also recommends that the definition of R&D and innovation should be reviewed to include games content development and a directory of funding sources and case studies be developed specifically for Irish games companies. The main issue has been addressed by Delaney *et al.* (2004) that were the lack of awareness of the industry, particularly in the financial and education sectors as well as in government. Therefore, with the slow changes in recent year in this sector, knowledge of games industry in public industrial development agencies is limited. Knowledge sharing only takes place in minority communities e.g. <http://www.gamedevelopers.ie> and <http://www.gamingireland.net/>

²⁰ An industry body which seeks to develop and support an open standard and open source based ICT sector in Ireland through the promotion of standards, research, member networking and educational activities. URL: www.openireland.com

In 2006, the World Cyber Games (WCG), which is the world's largest games festival, was held in Ireland. This event and really put Ireland on the map. These events bring hundreds of people who are all interested in computer games together. The 2007 Irish qualifiers for the World Cyber Games take place in The Digital Hub in Dublin 8 on the September 2007. *“There has been significant interest in the World Cyber Games since they came to Ireland last year ... compete for the honour of representing Ireland at the grand final World Cyber Games in October.”* according to Mr. Philip Flynn, Chief Executive Officer (CEO) of the Digital Hub Development Agency²¹ (DHDA) *“The games industry is hugely important to the digital media sector. There are now over 80 companies operating from The Digital Hub, including a number of major game studios. Hosting the World Cyber Games is an opportunity for us to showcase the scale and quality of Irish computer gaming.”*

Mr. Flynn also emphasized that Trinity College have opened a new course, which focuses on the science and technology behind the games industry and will help to ensure a highly skilled workforce for games companies such as those located in the Digital Hub. And they are ensuring Ireland’s gaming industry can reach its full potential. *“Eircom has been selected as one of the local operators to take part in the Irish segment of an eight-country European broadband launch of the new XBOX Live online gaming service”* (Sunday Independent, 2007b).

4.6 Conclusion

By Chinese standards, Irish software industry has a radically different cost structure and operates in a high cost economy. Although its young, highly skilled workforce and low cost corporate taxation policies are attractive, Ireland is increasingly losing its competitive edge. OSS can help a company that operates within a high cost economy by reducing development costs. The government are encouraging the development of digital content. Ireland can focus on technical and engineering training and high level of PhDs and commercial university research have both created perfect environments for innovation and research. There is broad agreement across the industry that Ireland’s online gaming industry has not been developed to its full potential (EI, IDA, ISA and

²¹ DHDA’s focus on developing Ireland’s digital media sector

Forfás). Technological advances including broadband development will see the online game industry mushroom in the near future. Faster access to the web enhances game playing and heightens the appeal for the MMORPGs.

5 EXPERIMENTATION & EVALUATION

5.1 Introduction

This chapter presents my findings based on an experimentation in the form of a focus group which was carried out on several online gamers using a selected MMORPG (quistissMIR). The game is supported by Open source so that gives evaluation of how open source helped with innovation in MMORPG. The purpose to have this experiment is first survey game developers in Ireland and find out their attitudes to MMORPG and to gather some expertise from some Open source community members. So we can contrast this with similar feedback from China. Then provide game players in Ireland an opportunity to experience MMORPG by using a popular game from China. Using an online brainstorm to re-survey the audience to find out whether the attitude has changed. Number of people subscribed into the game and the hours they spend on the game as indicates.

5.2 Community Of Practice

MMORPGs have rapidly developed not only in China but globally. Due to the outstanding performance of open source software, many MMORPGs are adopting open-source software as their platform and database systems. The community of practice have to be studied and mentioned before doing this experiment.

5.2.1 Open-source software support virtual world

The high penetration of domestic broadband helped propel Korea to the top of MMOGs market. With yearly online game revenue in excess of 300 million US dollars, Korea's gaming industry is in very healthy shape (Lee *et al*, 2003; Lee & Lee, 2003).

With the popularity of broadband in China, many ICPs (Internet Content Provider) are aware of that broadband can bring potential opportunities. The online game industry in China has grown rapidly since 1998.

At present, many MMORPGs have adopted open-source software as their operating systems (such as Linux, FreeBSD, and so on) and databases (such as MySQL, and so

on). Table 12 performs the platforms and databases systems that the famous MMORPGs are using and the maximum online number of users.

Table 12: Open-source software in several well-known online games

MMORPG	Max Online	Platform	Language	Database
Fortress II	40K	Linux	C#/ Java	Other OS Database
MIR II online	2 Million	Linux	Delphi 7	MySQL
Journey to the West	1.5 Million	FreeBSD	C++	MySQL
Priston tale	50K	Linux	Disclosed	MySQL
EverQuest 2	Open Testing	Linux	Disclosed	Other OS Databases
Darkeden	15K	Linux	Disclosed	MySQL
WOW	3.5 Million	NT/ Linux/ Mac	C++	MySQL
MU Online	2 Million	Linux/ OpenGL	OpenGL	MS SQL
Acorn	Open Testing	Other	C++	Other OS Database
RO	200K	NT/ Linux	C++	MySQL
<i>Note: Source from interviewing NingDoing – Network engineer (Online Game Company)</i>				

These games operators use OSS to reduce both the development cost and the supporting cost. By using the OSS, the integrity of the games is in no way compromised. The game development companies can allocate more funds to develop their contents and services to the customers.

5.3 Experimentation

5.3.1 Survey Questionnaire

The survey questionnaire is aimed at 2 different types of people who make up the online game community - Players and developers. The purpose of this survey is

- To help with my MSc dissertation project about the China's MMORPG market,
- To find out how Open source has contributed to the MMORPG.

Game developers in particular who familiar with Open source software will be asked to provide more in depth feedback.

The first section is a general section; the questions attempt to outline the parameter of broadband network usage. To segment the market on the basis of age and usage.

The second section attempts to answer questions of a more technical nature:

1. What are popular MMORPGs currently in the world?
2. What are Standard Toolkit and network used for the MMORPG?
3. What are the requirements for game upgrading?

This information can be used as a point of reference to allow developers to improve the current game functions by better understanding their customer attitudes.

The 3rd section outlines the responses of MMORPG Developers who are currently using Open source / Commercial toolkits, in an attempt to determine their level of preference for using OSS over commercial applications. This will highlight the trends behind the online game development movement. To find out how many popular MMORPG are developed using Open source, and the reasons.

5.3.2 Virtual world environment

The MMORPG online forum mainly serves as a user-to-user communication. In the forum, the players can post questions, suggestions and any other comments in connection to the game development or its usability. The MMORPG Online forum has been described as a development silkroad.

As well as normal MMOGs, MMORPGs represent social environments to the audience. The extent and nature of the players' social activities differ significantly from the other MMOGs (Ducheneaut *et al.*, 2006). Although in the early stages of the game, joint activities are not very prevalent. Over time most of the players enjoy interacting with other gamers. They make friendships while perusing a common goal, advancing in a virtual world.

On RaGEZONE²², with 202,495 registered users (up-to 28th October 2007), currently 49 open source MMORPG projects are under development. The source of this experiment is from this website. To ensure a healthy response, we have designed the questionnaire to be user friendly. Both the surveys and questions can be responded to quite easily by both developers and gamers who participated in the experiment.

²² RaGEZONE is an online forum which gathers some open source MMORPG projects developers and users. URL: <http://www.ragezone.com/>

5.3.3 Methods to achieve

The motivation of this experimentation is to first survey game players in Ireland and find out their attitudes to MMORPG, contrast this with similar feedback from China. Then provide the Irish netizens an opportunity to experience Open MMORPG which is very popular in China. And then gather their feedback from the forum and the survey to see:

- 1) How open source worked for them.
- 2) What improvement can this project make in the future.
- 3) Whether Ireland is ready for introducing MMORPGs.

The experiment was taken placed on my personal website <http://www.quistissime.com> hosted by Digiweb Student hosting service. I used my laptop as a server the IP address for external access is based on my home IP address. It is not too difficult for the people living in Ireland to play the game for a short period (1st October 2007 to 17th October 2007). The MMORPG was setup as clients / users. The server is open during certain time everyday published on the website during these 2 weeks.

The default game was called “Legend of Mir 2: Three Heroes” and the server was found on the sourceforge.net as Legend of Mir2 Diamond Emulator. It was a fantastic genre of the MMORPG in which users play their roles as warriors, wizards and Taoists. The core story is on the official website of <http://www.legendofmir.net/>.

In order to get a focus group to test my experiment game server, I registered in a forum named as RaGEZONE. This forum attracts many MMORPG fans, volunteer developers and students to discuss and create their own thoughts. The focus group is formed using the volunteers in the forum (anonymous). The participants have been schooled in the basic playing of the game, e.g. how to travel from the city to another. Some instructions were provided in the website prior to play the game session. Several players were familiar with the game already which helped to speed up the process...

5.4 Evaluation

The game server design and the databases are based on previous sections. All of the software used in this experiment is OSS. A 2 week test period was monitored, and the feedback from the users gathered. Table 13 listed the server configuration during the test period. Both commercial software system and OSS system have been used without effecting users. Due to the narrow bandwidth, the limitation of access has to be set as 50 people otherwise the gaming session will be difficult to the groups.

Table 13 Experiment comparison

Period	Running Platform	Database System	Access Limit	Programming Language	Actual Max submits
01/10/2007 to 7/10/2007	Windows XP	MS SQL	50 people	Delphi 7	50
08/10/2007 to 17/10/2007	Linux	MySQL	50 people	Delphi 7	50

The web traffic analysis from 1st October to 17th October is as depicted in figure 30. It seems people are more interested in the game download and playing than web contents. As table 13 shows, the numbers of max submits in the OSS platform are as same as the ones in the commercial platform.

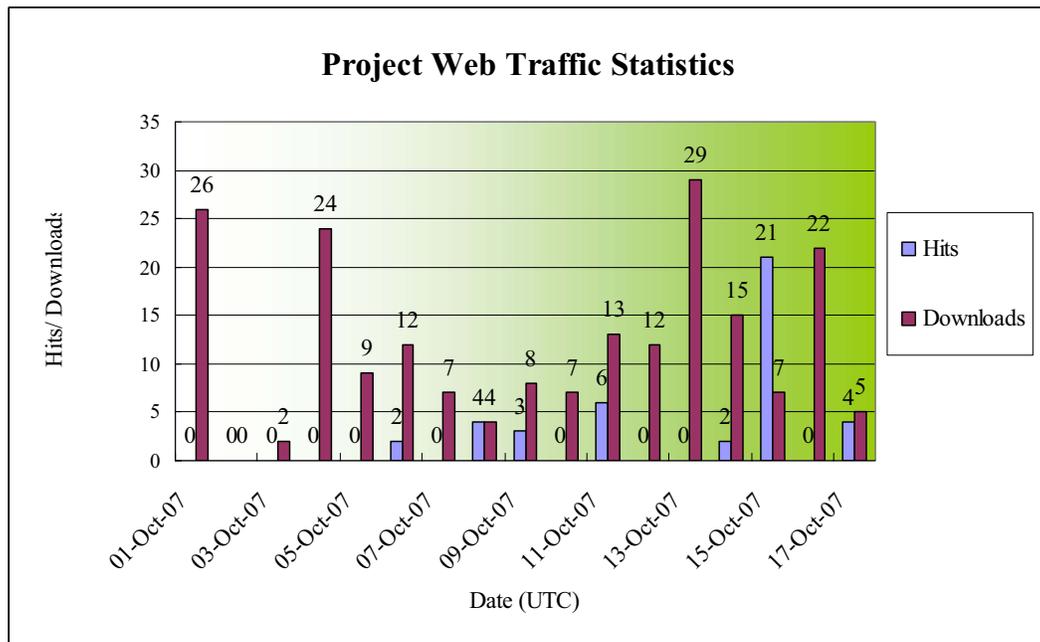


Figure 30: Project web traffic statistics

The data collection process proved to be very efficient and the data collected was very revealing. A SWOT analysis (table 14) has been used to outline my results (the project's strength, weakness, opportunities and threats). It concentrates on the issues that potentially have the most impact and is useful to outline any short comings such as the time constraints imposed upon my research due to lack of finance.

Table 14: SWOT analysis on Open MMORPG (based on Survey results Q 28)

<p>Strengths</p> <ul style="list-style-type: none"> - Massive Programming Expertise - R&D Covered by Volunteer Labour - Accepted Leadership Structure - Quick Release Rate - Parallel Development and Debugging - Maturity of Code - Culture of Sharing - Long Term Accessibility - Free source code. Strong multinational company (MNC) support 	<p>Weaknesses</p> <ul style="list-style-type: none"> - Lack of "Ownership" - Hard to Originate - Less User-Friendly - Require self knowledge acquisition - Shortage of applications.
<p>Opportunities</p> <ul style="list-style-type: none"> - Internet Connectivity - Plenty of players - Competitive Support Structure - Free to play - Garnering Support - Importance to Many - Improve software development - Competition - Opportunities to develop value-added software on top of OSS. 	<p>Threats</p> <ul style="list-style-type: none"> - Risk of Fragmentation - Lack of Compatible Applications - Need for Version Control - Competition with incumbent software and infrastructure. - Lack of funding

5.4.1 Strength

On the RaGEZONE and sourceforge.net, there are lots of programmers engaged in technical debate. Brainstorming is encouraged, open project exist whereby volunteers exchange ideas and source code in the ultimate pursuit of excellence. Volunteers share knowledge and create OSS project at will. Each project is led by the originator of the idea. In my survey of a population of 45 people, there are only 9 out of 45 who do not want to join in the Open source Community. 2 /45 of them have already joined. 14/ 45 people are willing to join and rest of them do not give any response. The other strengths such as quick release rate, parallel development and debugging, maturity of code, long term accessibility are the common benefits of Open source.

5.4.2 Weakness

It is very difficult to originate the project from scratch. The experiment requires some planning. To create a website, to encourage participants to give proper feedback. In this quistissMIR project, the server was based on the open project called “LOMCNM2”. The prototype of the project was called “Legend of Mir2 Diamond Emulator”. The server name, contents and the IP address was changed from the source code. From this lack of “Ownership”, we can see this weakness applies to any open projects because the source codes are available to everyone in the community. Without some knowledge of programming language and design it is impossible for the user to generate his game software. A common weakness of open projects is a lack of user-friendly system, as some players complained the server log-in problems or interface became bizarre.

5.4.3 Opportunities

In this quistissMIR in particular, the internet connectivity in the house is reasonably good. The limit of users was 200 which did not require a huge bandwidth. Free to play is the prior to those players. According to Forrester Research, Linux continues to gather momentum as more vendors add product and service support. It creates the opportunities to garner the support of experts to improve software development. According to DingDing Shi – technical support in Microsoft, he pointed out that *open source is important to many, for example, student can improve their programming skills by viewing the codes and sharing their knowledge.*

5.4.4 Threats

The team leader has accessed to the project forum. Cross pollination of ideas (brainstorming), yields valuable information. The optimal solution can be implemented. Version control can become an issue if the system requires integration and development. The developer must make sure that the versions to be integrated are compatible. Many typically select the applications that meet their requirements and then select the operating system that best supports those applications. The more popular the application, the more users will be accessed for that application, and the development will be

quicker. However not all open project are successful. Lack of response is often an issue if the project does not catch the imagination of others.

The SWOT analysis is based on the survey (see Appendix C) and some forum threads on the RaGEZONE. The group of volunteers gave valuable feedbacks on both MMORPG and OSS. It shows that once Ireland's broadband penetration achieved, Ireland can make a great progress in introducing online game into its market.

5.5 Conclusion

The experiment shows that whether the game is based on commercial software or OSS, its popularity is determined by its ability to entertain and its accessibility on the internet. OSS offers substantial cost savings to any game operator as initial start-up costs associated with Online Game Servers maintenance and management can be prohibitive. While carrying out my experiment, as an OSS user I had great difficulty with the maintenance and management of the server. If Online Game can play without Game Server, it becomes unnecessary to consider difficulties of server installation. The current online game server technology has not been developed without C/S structure. We believe in the near future OSS volunteers can bring this issue to the innovation.

6 PROJECT CONCLUSION

6.1 Introduction

This chapter is the evaluation of the entire project. It is the summary of each chapter. A critical analyse of the contributions of the work, the conclusions on the usefulness or otherwise are being discussed, present open research issues which could be pursued as future work are given in the end.

6.2 Research overview

The plan of the entire project was introduced in the first chapter. Project background, project aims and objectives were explained. The scope of the dissertation was introduced to the readers. The relationship between OSS and KM has been discussed. By using the KM processes as a framework of OSS development, which contains knowledge capture, organise, target, transfer and maintain. It contains a summary of the present phenomenon that is China's MMORPG market. A statement of my hypothesis of which Open source contributes to the game community.

The basic concepts of MMORPG and OSS were explained in Chapter 2. An overview of electronic game was presented. Some definitions of terms were made to make this paper easier to understand. The relationship between MMORPG and OSS development was discussed. The OSS's contribution to the game market has been explored. The licensing and legal issues related to the Open source as it applies to the online game community has been taken into account as many Open projects are not under the GNU General Public License (GPL)

Chapter 3 was the analysis of factors in China's Massive Multiplayer Online Game (MMOG) industry which lead the MMORPG to success. Key metrics such as market sizing and forecasts, size of MMORPG segment, game operator market share and top titles with concurrent user numbers were discussed to reflect the factors. We also review underline issues relating to China's socio-economic grouping, telecommunication infrastructure and business strategy which reflect upon the success factors of China's MMORPG market. In the previous chapter, multiple elements, such as OSS

development, IT technology development, network quality as the scope of the basic condition in an MMORPG have been discussed. Internet and broadband adoption have been shown as the scope of the basic condition in China's MMOG industry.

Based on literature review, survey results and industry reports, chapter 4 examined Ireland's Gaming. Ireland's telecommunication infrastructure has improved in recent years. Ireland's OSS community is growing. A comparison to China's key metrics of MMOG industry, the potential opportunities of Irish MMORPG market in the future has emerged.

Chapter 5 presented the experiment design and the experiment evaluation. According to chapter 3, the most popular MMORPG was explored and the open project on sourceforge.net was found. To provide players in Ireland with an opportunity to experience an online game is vital to the project. An analysis of MMORPG server architecture was explained. It outlined the primary configuration of the game server, database and administration. With the survey results and interview contents, the analysis of whether Ireland is ready for developing the online game market had been discussed.

Having studied the online gaming market in particular open source software, I relate my findings with regard to the contribution made by OSS to the online game market. I executed an experiment and attempt to highlight how open source software can both support platform and the databases.

This dissertation academically and technically explored the critical factors relating to the success of China's MMORPG. Due to my limited resources, my inability to develop my own game, I have reviewed 5 of the top titles of the MMORPG genre. This project contains both primary and secondary research. A literature review helps to determine the development of the MMORPG market. Industry best practises have been examined to determine the changes which the industry is undergoing. The project is not intended to be an advocated of OSS, but to present the possible uses of this technology in the market places.

6.3 Contributions to the body of knowledge

Secondary research plays a large role in supporting this project. This dissertation is a scholarly research which report on original research reports or experimentation in order to investigate the success factor of China's MMORPG market and give an analysis of how Open source fastens the On-line game software development.

- ✓ The contribution of OSS to MMORPG by reviewing the industry and holding a survey in Campus and certain community were proposed.
- ✓ Set of indicators for OSS contribution to knowledge retention and reinvention of MMORPGs were derived.
- ✓ OSS MMORPG compares favorably with the commercial MMORPGs.
- ✓ Techniques for the infrastructure of Online Game were presented.
- ✓ MMORPG concept and trends of online game development by examining OSS MMORPG server code were carefully analyzed.
- ✓ The critical factors of how China's MMORPGs success was demonstrated.
- ✓ The Irish Online game market was assessed and compared with China's experience.

When planning and implementing an online game infrastructure, we can apply unlimited creativity. The infrastructure of the game server is unique, some may have various contents. Base on those theory and standards, we can build up a complex, rich and fantastic MMORPG.

6.4 Future work & research

Political: We will continue to see a merging of free, open source, and proprietary game software projects. Ireland is a key player in the software industry and has gained global recognition. Technological innovation of which OSS is a key component will continue to evolve with the support of individuals and organisations as well as the online game market.

Economic: Less competitive than consoles games, MMORPGs' future might find it necessary to integrate ads (Anarchy Online²³ is already doing this on an experimental

²³Anarchy Online is a science fiction MMORPG released in June 2001. URL: <http://www.anarchy-online.com>

basis) into their systems to lower the initial and monthly costs of their games. Of course, users might pay more to keep their games ad-free, but should ads become more subtle, integration would be less discernible. Product placement can be found in many modern games. For better or worse, MMORPGs could become the most important research tools of the future.

Social: The biggest surprise to us was the level of involvement that people engage in within Open source community forms on software development and standard setting in general. It is interesting to watch how individuals with limited power and resources negotiate and collaborate with their own interests in mind. Community may not be exactly the right word to describe these forms, as the term denotes more consensus than reality might dictate. MMORPG will not only entertain the player with its content, but also allows for social interaction e.g. making friends, interacting with each other and trading virtual goods/ items and so on. Some future work on these issues will be continued.

Technological: Current MMOGs' architecture has not been changed without Client/ Server framework. Middleware will play an important role in the development of next-generation MMOG middleware should serve the varying needs of game developers. Some middleware provides PC client libraries for interacting with servers, whereas other middleware is aimed at game-console (PlayStation 2, Xbox, and so on) or mobile-device clients. We believe that there will be more technology on online games and OSS will contribute more on software development.

Another future work to examine is the effect that computer consoles will have on the PC gaming market. The fact that XBOX 360 and PS2/3 consoles have web access put them in direct competition with PC online game. They represent a new method of delivery of online entertainment. Ireland have the highest level of console ownership per head of population in the world. The next generation of gamers will have greater choice of applications.

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APPENDIX A – GPL LICENSE

GNU GENERAL PUBLIC LICENSE

Version 3, 29 June 2007

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Preamble

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To protect your rights, we need to prevent others from denying you these rights or asking you to surrender the rights. Therefore, you have certain responsibilities if you distribute copies of the software, or if you modify it: responsibilities to respect the freedom of others.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must pass on to the recipients the same freedoms that you received. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.

Developers that use the GNU GPL protect your rights with two steps:

(1) assert copyright on the software, and (2) offer you this License giving you legal permission to copy, distribute and/or modify it.

For the developers' and authors' protection, the GPL clearly explains that there is no warranty for this free software. For both users' and authors' sake, the GPL requires that modified versions be marked as changed, so that their problems will not be attributed erroneously to authors of previous versions.

Some devices are designed to deny users access to install or run modified versions of the software inside them, although the manufacturer can do so. This is fundamentally incompatible with the aim of protecting users' freedom to change the software. The systematic pattern of such abuse occurs in the area of products for individuals to use, which is precisely where it is most unacceptable. Therefore, we have designed this version of the GPL to prohibit the practice for those products. If such problems arise substantially in other domains, we stand ready to extend this provision to those domains in future versions of the GPL, as needed to protect the freedom of users.

Finally, every program is threatened constantly by software patents. States should not allow patents to restrict development and use of software on general-purpose computers, but in those that do, we wish to avoid the special danger that patents applied to a free program could make it effectively proprietary. To prevent this, the GPL assures that patents cannot be used to render the program non-free.

The precise terms and conditions for copying, distribution and modification follow.

APPENDIX B – SURVEY QUESTIONNAIRES

Research on MMORPG play & development and Open source support model
Q: 1. Please input your contact e-mail address:
Q: 2. What is your age? <input type="checkbox"/> 18- <input type="checkbox"/> 18 - 25 <input type="checkbox"/> 26 - 35 <input type="checkbox"/> 36 - 45 <input type="checkbox"/> 45+
Q: 3. Where are you from? <input type="checkbox"/> China <input type="checkbox"/> Ireland <input type="checkbox"/> Other (Please specify): <input type="text"/>
Q: 4. What is your income currently? <input type="checkbox"/> No income <input type="checkbox"/> 10K-20K <input type="checkbox"/> 21K-30K <input type="checkbox"/> 31K+
Q: 5. How do you access to the broadband services? <input type="checkbox"/> Telephone line <input type="checkbox"/> ISDN <input type="checkbox"/> Cable <input type="checkbox"/> ADSL <input type="checkbox"/> Internet Cafe <input type="checkbox"/> Other (Please pecify): <input type="text"/>
Q: 6. How long do you spend online per day? <input type="checkbox"/> Less than 1 hour <input type="checkbox"/> 1 - 4 hours <input type="checkbox"/> 5 - 8 hours <input type="checkbox"/> 8 hours +
Q: 7. What do you do when you are online? <input type="checkbox"/> Checking emails and reading news <input type="checkbox"/> Entertaining and gaming <input type="checkbox"/> Studying and administrating <input type="checkbox"/> Other (Please Specify): <input type="text"/>
Q: 8. Do you play online games? <input type="text" value="Please Select"/> Yes/No
Q: 9. If No (Skip 10), why do you not play online game? <input type="checkbox"/> Too busy <input type="checkbox"/> Don't like them <input type="checkbox"/> Too expensive <input type="checkbox"/> Don't know how to play <input type="checkbox"/> Other (Please Specify): <input type="text"/>
Q: 10. Suppose you play online games, what's your knowledge about MMORPG (Massive Multiplayer Online Role-Playing Game)? <input type="checkbox"/> Don't have any clue. <input type="checkbox"/> Player <input type="checkbox"/> Developer

Q: 11. If there was Open source MMORPG which gave free access, would you play?

- Yes Maybe, depends on the content
 No, don't trust Open source Not sure

Q: 12. What MMORPG games below do you familiar with/ Play?

- World of Warcraft
- Eve Online
- Final Fantasy XI
- Lord of the Rings Online
- City of Heroes/ City of Villains
- Dark Age of Camelot
- EverQuest
- Dungeons & Dragons Online
- Lineage 2
- Saga of Ryzom

Q: 13. Do you think network bandwidth is important to an MMORPG?

- Definitely Don't know No bother

Q: 14. What OS do you use to play MMORPG / online game?

- Windows NT/98/2000/XP/Vista Linux
 MacOS Other (Please Specify):

Q: 15. While you are playing MMORPG, what software are you required to install?

- Game itself Third-party software
 Game and components Do not require anything
 Other (Please Specify):

Q: 16. How many hours do you spend on the MMORPG per day?

- Less than 1 hour 1 - 4 hours
 5 - 8 hours Greater than 8 hours

Q: 17. What kind of MMORPG are you playing?

- Open source MMORPG Commercial MMORPG

<input type="checkbox"/> Both Open source & Commercial <input type="checkbox"/> Other (Please Specify): <input type="text"/>
<p>Q: 18. What element do you think is important to the MMORPG?</p> <input type="checkbox"/> Graphics <input type="checkbox"/> Story <input type="checkbox"/> Music <input type="checkbox"/> Cost of service <input type="checkbox"/> Control <input type="checkbox"/> Compatibility with different platform <input type="checkbox"/> Other (Please Specify): <input type="text"/>
<p>Q: 19. What is your knowledge about Open source Software?</p> <input type="checkbox"/> Heard about it, but can not use it. <input type="checkbox"/> Basic knowledge <input type="checkbox"/> Very well - would use them regularly <input type="checkbox"/> Other (Please Specify): <input type="text"/>
<p>Q: 20. What programming languages do you familiar with?</p> <input type="checkbox"/> SQL <input type="checkbox"/> XML/HTML <input type="checkbox"/> JavaScript <input type="checkbox"/> Visual Basic <input type="checkbox"/> C++ <input type="checkbox"/> Java <input type="checkbox"/> Not clear <input type="checkbox"/> Other (Please Specify): <input type="text"/>
<p>Q: 21. Do you know LAMP (Linux + Apache + MySQL + PHP) stands for?</p> <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not all of them, I know one or two of them
<p>Q: 22. What is the main advantage of the Open source software to you?</p> <input type="checkbox"/> Free to use <input type="checkbox"/> Safe <input type="checkbox"/> User requirements driven <input type="checkbox"/> High efficient <input type="checkbox"/> Other (Please Specify): <input type="text"/>
<p>Q: 23. Would you join into the Open source Community, and why?</p> <p>Yes, I would. <input type="text"/></p> <p>No, I would not. <input type="text"/></p>
<p>Q: 24. As a game developer, what kind of toolkits will you use to support the development?</p> <input type="checkbox"/> Open source Software/ Toolkits <input type="checkbox"/> Commercial tools <input type="checkbox"/> Shareware <input type="checkbox"/> Free demo

APPENDIX C – SURVEY RESULTS

Questions	Percentage
2) What is your age?	
18-	2.3
18 - 25	54.5
26 - 35	34.1
36 - 45	6.8
45+	2.3
3) Where are you from?	
China	54.5
Ireland	34.1
4) What is your income currently?	
No income 10K-20K	22.7
21K-30K	36.4
5) How do you access to the broadband services?	
Telephone line	2.3
ISDN	6.8
Cable	18.2
ADSL	50
Internet Cafe	0
Other	22.7
6) How long do you spend online per day?	
Less than 1 hour	0
1 - 4 hours	45.5
5 - 8 hours	27.3
8 hours +	27.3
7) What do you do when you are online?	
Checking emails and reading news	41.2
Entertaining and gaming	28.4
Studying and administrating	26.5
Other	3.9
8) Do you play online games?	
Yes	56.80%
No	43.20%
9) If No (Skip 10), why do you not play online game??	
Too busy	38.9
Don't like them	33.3
Too expensive	5.6
Don't know how to play	5.6
Other	16.7
10) Suppose you play online games, what's your knowledge about MMORPG (Massive Multiplayer Online Role-Playing Game)?	
Don't have any clue.	51.4
Player	42.9
Developer	5.7
11) If there was Open source MMORPG which gave free access to you, would you play?	
Yes	17.1
Maybe, depends on the content	65.7

No, don't trust Open source	2.9
Not sure	14.3
12) What MMORPG games below do you familiar with/ Play?	
	Average Score
World of Warcraft	4.68 / 10
Eve Online	5.09 / 10
Final Fantasy XI	3.53 / 10
Lord of the Rings Online	3.42 / 10
City of Heroes/ City of Villains	4.58 / 10
Dark Age of Camelot	4.64 / 10
EverQuest	5.73 / 10
Dungeons & Dragons Online	4.92 / 10
Lineage 2	6.60 / 10
Saga of Ryzom	6.89 / 10
13) Do you think network bandwidth is important to an MMORPG?	
Definitely	82.9
Don't know	11.4
No bother	5.7
14) What OS do you use to play MMORPG / online game?	
Windows NT/98/2000/XP/Vista	87.1
Linux	6.5
MacOS	0
Other	6.5
15) While you are playing MMORPG, what software are you required to install?	
Game itself	34.5
Game and components	37.9
Third-party software	10.3
Do not require anything	6.9
Other	10.3
16) How many hours do you spend on the MMORPG per day?	
Less than 1 hour	64.3
1 - 4 hours	25
5 - 8 hours	7.1
Greater than 8 hours	3.6
17) What kind of MMORPG are you playing?	
Open source MMORPG	24
Commercial MMORPG	28
Both Open source & Commercial	28
Other	20
18) What element do you think is important to the MMORPG?	
Graphics	21.5
Story	19.4
Music	14
Cost of service	18.3
Control	16.1
Compatibility with different platform	7.5
Other	3.2
19) What is your knowledge about Open source Software?	
Heard about it, but can not use it.	24.1
Basic knowledge	48.3
Very well - would use them regularly	24.1

Other	3.4
20) What programming language do you familiar with?	
SQL	14.5
XML/HTML	19.3
JavaScript	18.1
Visual Basic	6
C++	12
Java	16.9
Not clear	8.4
Other	4.8
21) Do you know LAMP (Linux + Apache + MySQL + PHP) stands for?	
Yes	41.4
No	37.9
Not all of them, I know one or two of them	20.7
22) What is the main advantage of the Open source software to you?	
Free to use	50
Safe	10.9
User requirments driven	17.4
High efficient	19.6
Other	2.2
24) As a game developer, what kind of toolkits will you use to support the development?	
Open source Software/ Toolkits	34
Commercial tools	25.5
Shareware	12.8
Free demo	23.4
Other	4.3
25) What kind of database do you use to support the MMORPG?	
Mysql	29
Oracle	32.3
SQL Server	22.6
Access	6.5
Other	9.7
26) What O/S do you use to develop MMORPG?	
Windows NT/98/XP/2000/Vista	48.1
Linux	33.3
MacOS	11.1
Browser Only	0
Other	7.4
27) If you are currently using Open source Software / Toolkits for developing the MMORPG, what is the reason?	
Exellent Capability	22.9
Cheaper	25.7
Safe ad stable	14.3
Low Cost of energy	20
Compatibility	11.4
Other	5.7
23) Would you join into the Open source Community, and why?	
No, free thing is shit, and not good service	Yes, Because the software is developed by people not money-hungry commercial companies.
No, have no time	Yes, Coz it will be the development trend of software.

No, Heard about it	Yes, easy to use and free and safe
No, I am not a computer wizard.	Yes, Free, sharing, lack of duplicity in development efforts
No, I like to make money from programming.	Yes, I can spare happiness and source with others.
No, I would not have the time to contribute to products or review work or fix bugs.	Yes, I have already
No, no need	Yes, I need it
Not enough time	Yes, I would join into the Open source Community to find useful information.
Not so clear, not usually play the game.	Yes, I've never used that so I would like to try it.
	Yes, if I have time and attracted by one famous project I like, I would spend time to bring my own contribution to the project.
	Yes, Improve the coding ability.
	Yes, it's a positive environment that fixes issues quickly. The philosophy is good.
	Yes, to gain experience from other senior developers
	Yes, why not.
28) Please specify the main barrier for the development of a MMORPG project:	
A lot of work is needed to develop a profitable game.	Sometimes the open source software is not as good (robust, reliable, and so on) as commercial software. This is probably because companies can throw loads of resources and money at software where as open-source is often voluntary for the "love" of the software. I think that open source development may need more money (in the form of government grants or whatever) to get to a similar level as commercial software.
Cost, i.e. development and server costs. must keep users interested, adding new content	The market acceptance.
Cost, story, staff and time.	the recognize of both player and developer
Funds is main thing	Too complicated, need lots of people to actually make it playable
high free	lack of standard platforms for development
I do not see any barriers to development.	maybe the capability of the project
invest, energy	Need more people to be familiar with it. At least I don't know it now.
It is difficult to develop a game which can play for a long time, because the game should be updated often.	not enough documentation of the libraries, bugs, many of beta versions and so on..