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Overview and Appliance of Some Streaming Media Software Solutions

Case: streaming media technology applied to distance education in Huatai Securities Co., Ltd

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ABSTRACT

With the economic development and the progress of science and technology, human society has entered a new era of information technology. The popularity of the Internet and multimedia technology in applications on the Internet has made people increasingly dependent on the network. Transmitting static images and text content through the network cannot meet the needs of modern life. Furthermore, people really want to take advantage of the increasing demand of network real-time transmission of voice and video signals. Additionally, many radio and television companies also hope to publish their own audio and video programs via the Internet, so streaming emerged.

This thesis consists of a theoretical part and a practical case study. The whole study will be conducted through the qualitative research method.

In the theoretical part, there is a literature review including the streaming media and some basic theories such as how the streaming media works. It also includes the definition of streaming media. The theoretical material is collected from the Internet and some parts of books related to streaming media.

In the practical part, the researcher has selected Huatai Securities Co. Ltd as a case company to analyze how a real company applies the streaming media and what the advantages are. All the relevant data is collected from three face-to-face interviews.

Key words: Streaming, Streaming media, Distance education, VOD

Contents

1 INTRODUCTION

With the popularity of the Internet and the development of multimedia technology, the forms in which people obtain the information from the Internet has become more and more diverse. People could only get texts and pictures in the past, while now they can get videos, audio, three-dimensional animation and so on.

However, we have to face up to a problem: the increasing Internet users and the limitations of network equipment make the size of a file become a key problem during the process of network transmission. In this situation, streaming media has relied on its strong technological advantages quickly penetrated into all fields of social life these years such as commercial video conferencing, Internet broadcast, distance education and so forth.

In a word, it has brought a dramatic change to human society, culture, ideas, and ways of thinking, behavior patterns and lifestyle.

2 METHODOLOGY

2.1 Objective and research question of the thesis

The objective of this thesis is to discover what the advantages of the streaming media bring for a case company (Huatai Co., Ltd.) in distance education through understanding the theory of how the streaming media works as well as three interviews from this company. Additionally, the comparison of distance education and traditional education will be discussed as well in this thesis.

The approach style of this thesis is inductive research. Inductive research works from specific observations to broader generalizations and theories. The researchers begin with specific observations and measures, begin to detect patterns and regularities, formulate some tentative hypotheses that we can explore, and finally end up developing some general conclusions or theories. (William 2006.)

In this thesis, some relevant data will be collected from a study case via three face-to-face interviews. After analyzing this data from the research, the final result will be presented in the conclusion part.

Research Question

The research question of this thesis is: What kind of advantages does the streaming media technology bring for the case company (Huatai Securities Co., Ltd.) in distance education?

2.2 Research framework

The thesis covers two main parts which are theoretical review and a case study (Huatai Securities Co., Ltd).

It starts with the literature review part which focuses on the streaming media applied in distance education written by other writers. Based on themes of streaming media from those different writers, some common findings will be summarized in this part.

In chapter three, it concentrates on some relevant definition and theories of the streaming media such as the basic working theory of streaming media, streaming transmissions and delivery methods, as well as some common streaming formats applied in distance education. These theories or information will be collected from some relevant books and some Internet.

In chapter four, it is mainly about a case company (Huatai Securities Co., Ltd) using the streaming media. The researcher has three interviews focusing on streaming media applying in distance education between the CEO and the employees of this company. Some key summaries will be illustrated by the researcher base on those interviews.

Chapter five concludes the core findings according to the theoretical review and case study part. Some concrete advantages of streaming media in distance education will be illustrated to finish off the thesis.

The following figure shows the basic structure of this thesis:

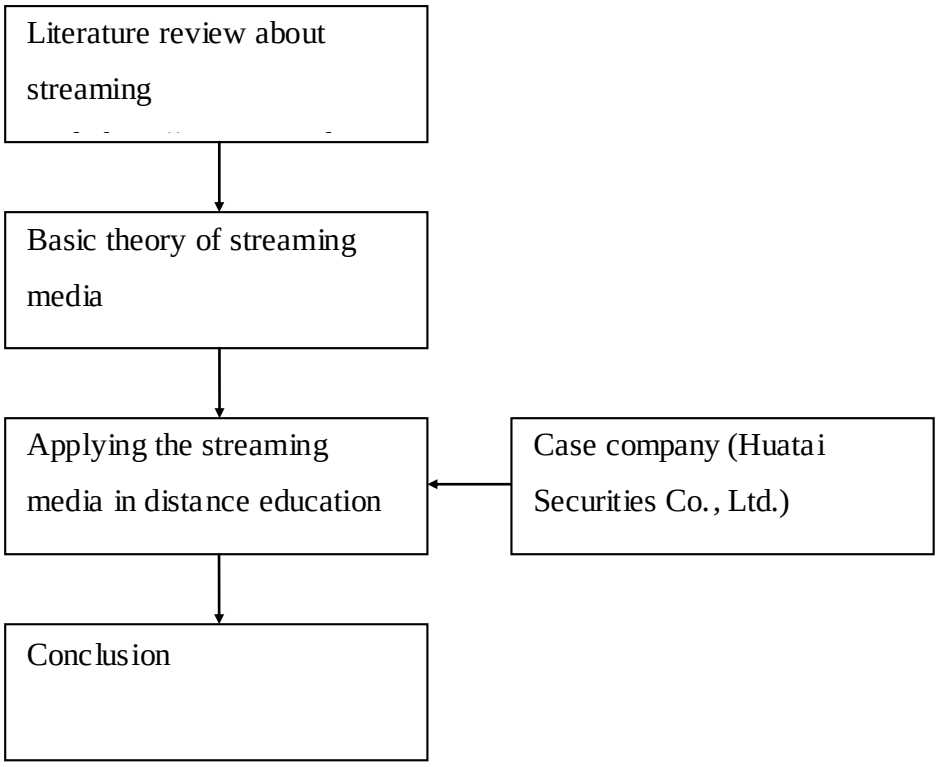

Figure 1 Basic structure of the thesis

2.3 Research methods

The basic idea of this section is to give the interpretation about what the research methods are and how the researcher of this thesis concludes the final result. In this section, the research purpose, research approach will be presented. Additionally, the researcher will give the explanation about her research data.

2.3.1 Research purpose

The purpose of this thesis is to give a result explaining what advantages the streaming media brings for a certain company in distance education through some theoretical material and an empirical case. It aims at finding a general result on what kind of advantages the streaming media brings in distance education. Therefore, this thesis can be an exploratory research and a descriptive research.

Exploratory research is conducted into an issue or problem where there are few or no earlier studies to refer to. The focus is on gaining insights and familiarity for later investigation. (What is exploratory research 2013.) While descriptive research is used to obtain information concerning the current status of the phenomena to describe "what exists" with respect to variables or conditions in a situation. (James 1997). Moreover, streaming media technology applied in the IT field has currently become more and more popular and it has come into people’s daily lives. Therefore, the exploratory research and descriptive research are suitable for exploring and summarizing the advantages of streaming media applied in distance education in this thesis.

2.3.2 Research approach

The research approach of this thesis is qualitative research.

Qualitative research is all about exploring issues, understanding phenomena and answering question (What is qualitative research 2012). The qualitative researchers develop concepts, insights, and understanding from patterns in the data rather that collecting data to assess preconceived models, hypotheses, or theories (Steven & Robert 1998). On the other hand, the qualitative researchers are concerned with

how people think and act in their everyday lives. In another word, qualitative research has been described as naturalistic. (Lincoln & Guba 1985.)

First of all, the researcher raises a research question which is mentioned in previous paragraph. Then the researcher finds some theories of streaming media and collects some relevant data in order to support the final conclusion. In the process of collecting data, the researcher prefers a case company (Huatai Securities Co., Ltd.) by interviewing. In qualitative interviewing, researchers model their interviews after a normal conversation rather than a formal question-and-answer exchange. (Steven & Robert 1998.) After collecting the data, the researcher will give the interpretation of the data and finally summarize the final conclusion.

2.3.3 Research data

All relevant data has been collected by three interviews from the case company (Huatai Securities Co., Ltd.). The researcher has interviewed two people in the Huatai Securities Co., Ltd. One is the CEO and the other is the IT manager in the company.

The CEO is a 44-year-old man and he has been engaged in this occupation for six years. The reason why the researcher chose him as one of the interviewees is that his major was telecommunication during his study in university. On the other hand, he is familiar with the working operation of this company and has some basic knowledge about IT field. Therefore, he is the suitable for these interviews focusing on streaming media.

The IT manager is thirty-nine years old and he has been responsible for IT field in this case company for ten years. He has good command of IT knowledge and he is quite familiar with IT system in this company so that the researcher chose him as the other interviewee.

The interviews happened between July to September in 2012 when the researcher had her practical training in this company. The researcher had three face-to-face interviews with the CEO and the IT manager. The first interview was held on the 10th July 2012 focusing on some basic ideas for applying streaming media technology in the distance education in this company. The second one was held on

the 8th August 2012 and the last one was held on 1st September 2012. Each interview lasted about 30- 45 minutes.

On the other hand, the researcher also attended video conference applied streaming media technology in this company twice. So the qualitative data comes from not only the interviews but also a real implementing case.

Due to this company being in China and all the interviews and conversations were held in the Chinese language, the researcher used both recording and hand-writing method to collect all the relevant data.

3 LITERATURE REVIEW

3.1 Previous research about streaming media

Hartsell, T., & Yuen, S (Hartsell & Yuen 2006) were engaged in video streaming in online learning and they gave the common definition about streaming video in their report. They defined that streaming video is a term applied to the compression and buffering techniques. These techniques can help users transmit video files as well as watch videos in real-time through the Internet. It is not necessary for learners to download an entire video file. They can just download small portions of digital video files from the Internet. Normally, the size of none-streaming video files is quite large. The biggest disadvantage of this large file size it that the users have to spend a long time on downloading the video videos before it starts to play on the user's computer. However, the program downloads the file in smaller size buffer packets in streaming video. When the appropriate number of buffer packets is reached and readies for play the video, the client side's media player (e.g., QuickTime player) displays the packets into one seamless stream. In other words, streaming media is the simultaneous transfer of digital media files such as video, audio, and data. This transfer depends on a server application which can be displayed in real-time by client applications. Once a streamed file has been downloaded and viewed, the physical file will not be presented on the user's computer any longer. In short, the video/audio data is projected to the user as it is being received. However, it cannot remain on the computer's hard drive."

In addition, Hartsell, T., & Yuen, S (Hartsell & Yuen 2006) pointed out several advantages of using streaming media technology in teaching videos. First of all, the video-on-demand technology can meet the instant play. Learners can choose the learning videos according to their study progress. Secondly, broadcasting technology will distribute live events and the learners can attend the live lecture online at home instead of going to a real classroom. The third advantage is multicasting to multiple users, which means one server can send streaming data to thousands of users at the same time. In addition, the educators can get the benefit from streaming video files. The most advantage for educators is to create visually driven materials which are more appealing to learners. It can help educators handle

volatile or quickly outdated materials that can be stored into a searchable database. On the other hand, educators can create synchronized presentations by having audio accompany still images, graphics, or text.

With streamed videos, the material can be sent to learners asynchronously. There is no limitation for the location, which the learner are no longer bound by the traditional education method. Learners do not need to go to a real classroom or the library to view visual materials provided by the instructor. Instead of going to classroom to have a lesson, learners can get the visual materials at home and at any time with streamed videos. Another control element is the choice over which material to observe on-demand. Finally, another benefit for learner is that they can easily control the visual material, for instance, they can start, stop, skip, and fast-forward these learning material. In short, the primary advantage of streaming video is the ability for students to self-pace their learning. (Hartsell & Yuen 2006.)

Timothy R. Haley (Haley & Timothy 2005) focused on how to create a streaming video for distance education and he defined the basic idea of streaming media. On the other hand, he paid more attention to creating streaming videos. As he has mentioned in his report, encoding for compression needs to be used in order to deliver video online. If the video file is too large, the image and audio quality will be poor or even unplayable. Therefore, video files need to be reduced in size to be delivered online. There are two common ways to decrease the overall video file size: 1) reduce the video window size, and 2) apply a video compression codec. There are three common streaming video compression file formats: Windows Media (WMV), Real Media (RM) and Apple QuickTime (MOV).

3.2 Basic theory of how streaming media works

In this section, some basic definition and function of streaming media, streaming media transmission and delivery methods as well as some common streaming file formats applied in distance education will be presented.

3.2.1 Definition of streaming media

Streaming media refers to the form of audio, video and multimedia files to stream transmitted over the network. Streaming media file format is a media format which can support streaming transmission and playing. Streaming transmission mode is to compress video and audio multimedia files into each package with special ways, and then the packages will be transmitted to the users continuously and real-time by the server.

In the system of streaming transmission mode, the users do not need to wait until the file is downloaded completely to see the content of it like non-streaming, they only need a few seconds of start-up delay to play the compressed video or audio or other kinds of streaming media files by corresponding players on the users' computers. The rest will continue to download, until it is over.

The series of the relevant packages in this progress are called "streaming". Actually, streaming media is a new way of media transmission, not a new media. After comprehensive application of the streaming media technology, people can chat on the Internet by voice input. If they want to see appearance and expression of each other, they just need a camera of their own. When they see what they are interested in on the Internet, the image of guide and the product will appear on the screen after clicking. In addition, news can appear even more realistic images.

Streaming media technology is originated in the United States. It is used in United States very widespread nowadays. For instants, HP uses network video for launching product and sales personnel training.

Streaming transmission mode divides the whole audio or video and 3D multimedia files into each package using a special compression method. The packages will be transmitted to the users continuously and real-time by the video server. In the system of streaming transmission mode, the users do not need to wait until the file is downloaded completely like using the ways of downloading. They only need to use a few seconds of start-up delay by decompression device (hardware or software) to play and watch the compressed A/V, 3D or other kinds of multimedia files after compressing. And then, the rest part of the file will continue to download in the backend server.

3.2.2 Basic theory about the function of streaming

The following picture shows all the necessary components that work together in order to make streaming media happen on the web (See Figure 2).

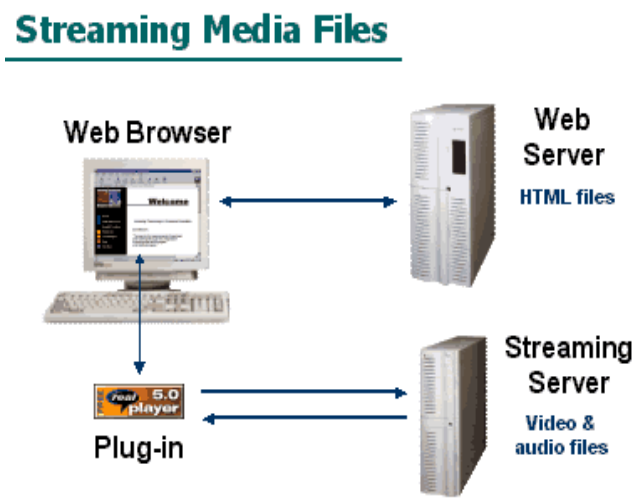

Figure 2 Streaming Media Components

First of all, a user needs a computer connecting to the internet through a local network or a modem. Then the user also needs a web browser including a proper media player or plug-ins which can be downloaded freely.

On the other hand, web pages and HTML files will be stored to a web server and the streaming media files always reside on a separate dedicated server. Therefore, every time when a user clicks the web pages, the browser will read the HTML code. After that the player or plug-ins will take over immediately. Then the player will check the streaming server and has the target media file by using a path statement. Later, the streaming videos will appear on the user's screen after a few seconds of buffering.

Therefore, next time when the user clicks the web page, it will try to envision all the components working again automatically. (Streaming media 2008)

3.2.3 The basics of streaming transmission

There are mainly two programs for transmission of audio / video and other multimedia information on the network. One is downloading and the other is streaming. In general, audio or video files are larger so that the storage capacity required is also large. Due to the limitations of the network bandwidth, downloading often takes several minutes or even hours, so is isn't a good approach as well.

However, streaming media do not need to download the entire file before playing.

The beginning of the content will be stored in the memory and there is a delay of only a few seconds or tens of seconds after the start.

The key technology implemented by the streaming media is streaming transmission. In a word, there are two ways to achieve streaming: real-time streaming and progressive streaming.

Real-time streaming

The real-time streaming means it is guaranteed for matching the media signal bandwidth and network. Therefore the media can be real-time viewed online. It requires a dedicated streaming media server transport protocol. Real-time streaming is always transmitted in real time, especially for the live events and supports random access as well. Users can fast forward or rewind to watch the future or former parts. Theoretically, the real-time streaming cannot stop once it's playing. However, it may occur that sometimes there is a signal break and the playing stops for some time. The real-time streaming requires specific servers, such as QuickTime Streaming Server, Real Server and Windows Media Server. In addition, the real-time streaming needs special network protocols, such as RTSP (Real-time Streaming Protocol) or MMS (Microsoft Media Server). These protocols may sometimes have problems that will result in the customers are not able to see the real-time content in some locations.

Progressive streaming

Progressive streaming is a sequential download. The users can download files while watching the online media at the same time. At the given moment, the users can only see the parts of what they have already downloaded, but cannot skip to the part that they have not yet downloaded. Progressive streaming is not like the real-time streaming which can make adjustments based on the user connection speed during transmission. In this streaming method, the end-users will have to wait until a large part of the contents of the media file has been downloaded to their hard drive before they are able to view it. This allows viewers to save the file to their computer, if they want to complete downloading the entire file later. Progressive streaming is more suitable for the high-quality short fragment, such as titles, credits and advertisement. Because this method can ensure the final watching quality of the movie, so the parts of the file which is lossless download before playing. This means that before users watch the videos, they must experience delays, especially for the slower connections' users. Progressive streaming is not suitable for long fragments and the videos which are random access requirements, such as lectures, speeches and presentations. It does not support the live broadcast. Strictly speaking, the progressive streaming is a kind of video-on-demand technology.

3.2.4 Delivery methods

There are four main delivery methods in streaming media technology. They are unicasting, multicasting, on-demand and broadcasting.

Unicasting is a type of transmission method that is required to create a separate data channel between the client and media server. Each packet sent from a server will only transfer to a client through this data channel.

Multicasting technology is to build a network with multicast capability that allows the router copy a data packet to many multiple channels. In another word, a single server can send a continuous streaming data to thousands of clients at the same time without delay.

On-demand connection is an active connection between the client and the server. During the on-demand connection, the users can initialize the client connection by selecting the content item. Additionally, the users can start, stop, rewind,

fast-forward or pause the streaming file. This kind of delivery method can provide the maximum convection control, but it will quickly run out of network bandwidth.

Broadcasting means that the users will receive the streaming files passively. During the broadcasting, the clients can receive the streaming file but cannot control it. For example, users cannot pause, fast forward or rewind the streaming file. A single copy of the data packet will be sent to all users on the network no matter if they really need.

3.2.5 Common streaming file formats in distance education

Faced with limited network bandwidth, the best solution is to apply the streaming media technology in distance education in order to achieve high-quality and fast transfer of the network video, audio, animation, and other media material.

As mentioned in the previous section, streaming media is a kind of media format using streaming transmission mode to play back on the Internet. In the process of transmission, the streaming media is segmented. The users don’t have to wait for the entire content after the transmission is completed. They can watch the real-time, continuous content. However, there are some differences of transmission due to the different companies of different file formats. Several common streaming file formats as follows:

1. RM format

RealMedia (RM) format is a kind of multimedia format developed by Real Networks Company. It is used for streaming videos over the Internet. The extension of RealMedia is ".rm". This file formats is mainly used for real-time transmission of active video image information on the network. Different compression ratios can be used according to the network data transfer rates. It is available in multimedia player such as Real Player.

2. RA format

RealAudio (RA) format is a kind of audio format created by Real Networks Company. It is used to be a streaming audio format. The extension of RealAudio is ".ra". The audio file can be played by clients while it is downloaded.

3. ASF format

ASF is a kind of popular streaming media file format online. This streaming file format in use is inseparable from the Windows operating system by using Microsoft Media Player.

This kind of format is part of the audio format and the method is WMA encoding. In fact, the Window Media server can also transfer the streaming WMA file. However, because other audio and video encoding transmissions are not optimized on the network, they are rarely applied to the ASF format. (He & Zhao 2006.)

4. QT format

QT format is a kind of video and audio format with advanced audio and video functions developed by QuickTime. QuickTime file format supports advanced integrated compression technology such as RLC, JPEG to provide more than 150 kinds of video effects.

5. SWF format

SWF is a kind of streaming animation format based on the Shockwave technology from Macromedia Company and the source file is .fla format. This kind of format has been increasingly applied to the network animation because of its small size and the good ability for interaction. The clients can play after installing Shockwave plug-in.

In order to make the distance education more multifarious, people would like to transfer the different source files into different streaming media formats. Actually, there are a lot of forms of teaching material such as text, picture, video, audio, flash and so forth. Therefore, the four streaming media formats introduced above are normally used in distance education.

There are some streaming file formats presented in Table 1.

Table 1: Streaming file format

Video/Audio name	Media format type
RM	Real Media (Progressive Networks).
RA	Real Audio (Progressive Networks).
ASF	Advanced Streaming Format. (Microsoft).
QT	Real Video (Progressive Networks).
SWF	Shock Wave Flash (Macromedia).

4 STREAMING APPLICATION APPLIED IN CASE COMPANY

4.1 Introduction of case company (Huatai Securities. Co., Ltd.)

Huatai Securities has an “AAA” rating from the China Securities Regulatory Commission and maintains 180 branch offices across the country. Huatai Securities has gained shares in a number of Chinese brokerage firms and established a joint venture with AIG to form the AIG-Huatai Fund Management. It is the first batch of securities firms approved by China Securities Regulatory Commission and it is one of the earliest brokerages accessing to innovative pilot qualifications as well.

In addition, Huatai Securities owns securities brokerage services, asset management services, investment banking services, fixed income services and direct investment in services for the improvement of the basic structure of professional securities services systems, as well as some strong service support systems such as research and consulting, information technology and risk management.

On the other hand , it owns many subsidiaries, including Southern Fund, Youban Huatai Fund, United Securities, Great Wall Weiye Futures, Huatai Financial Holding CO., LTD (Hong Kong) and Huatai Zijin Holding CO., LTD. In addition, it is the third holder of the Jiangsu Bank, and it will be an international holding group that integrates securities, futures and direct investment.

4.2 Background of the interview

In 2012, the researcher had her practical training in Huatai Securities Co. Ltd. During the 5-month practical training, she has realized the basic working operation of this company. Moreover, this company applies the streaming media in different areas such as video conference, especially in distance education for staff training. Therefore, the researcher has picked up this company as study case.

Before the interview, the researcher contacted two key people in this company. One was the CEO of this company who is familiar with the whole working operation of

the company. The other was the IT manager who has a good command of IT knowledge and streaming media technologies.

During the interview, the researcher asked them several semi-structured questions related to streaming media and its main application as well as the basic technology of streaming media applied in distance education in this case company. The researcher took the face-to-face interviews. Because of the limitation of language, the researcher has recorded the whole process of interviews as well as taking notes.

4.3 Background of distance education in the case company

4.3.1 Introduction of the distance education

With the popularity and high demand of the Internet, the teaching method has been reformed greatly these years. The most significant education reform is the distance education emerging instead of the traditional education.

Distance education is any form of learning in which the teacher is not present at the same time or place as the student. This includes instructional videos, CD-ROM programs, or interactive “real time” lectures and office hours online via webcam. The purpose of this kind of education is to deliver, through technology, education to students who are not physically in the classroom. (Hassenbury & Amy 2009.)

On the other hand, Peter and Otto (Petter & Otto 1998) stated that distance education is a rationalized method- involving the division of labor- of providing knowledge which, as a result of applying the principles of industrial organization as well as the extensive use of technology, thus facilitating the reproduction of objective teaching activity in any numbers, allows a large number of students to participate in university study simultaneously, regardless of their place of residence and occupation.

Therefore, extending Peter’s view point, the distance education is becoming a trend in future education system and it can be defined as a complex, dynamic and purposeful system of both learning and teaching.

4.3.2 Distance education in Huatai Securities Co.,Ltd.

In Huatai Securities Co., Ltd, there're thousands of employees. Every year, all the employees in different positions need to attend the different staff trainings which covers economics or business management knowledge and etc.

However, the biggest problem for this company in the beginning is how to arrange such large number of employees to attend the staff training effectively. Then, the IT professionals in this company applied the distance education to solve the problem, which all the employees can have an online learning as long as they have a computer and the Internet.

According to the CEO of the company, he estimated that distance education applied in staff training for his company has effectively brought more connivance and efficiency.

4.4 Streaming media applied in distance education in case company

In order to realize how this case company applies streaming media in distance education and sum up the advantages of streaming media applied in distance education, the researcher had several semi-structured interviews with the CEO and IT manager which have been mentioned in a previous chapter.

In addition, the reason why the researcher chose these two people as the observation is that they can expound their opinion from different viewpoints. The CEO can give his answer related to streaming media from the company's working operation viewpoint while the IT manager does from his professional IT knowledge viewpoint.

4.4.1 Main components of interviews

This section will present some main contents of the interviews.

- For the CEO of the company

Question 1: Did you have knowledge of streaming media before?

Answer:

Of course, I knew the streaming media before and I had read some information about it, but I am not a professional in the IT field so that I have no idea about its concrete technology actually.

Question 2: Why does your company apply streaming media technology to distance education?

Answer:

First of all, our company will have the staff training every year and we have thousands of employees. However, there is some limitation existing in traditional teaching style which is difficult to meet a large amount of learners in a learning environment. Therefore, we apply distance education as our teaching method.

Secondly, the most important reason why we apply streaming media technology to distance education is that all the video files applying streaming media don't need to be downloaded totally before playing. The video starts playing and at the same time the remaining part of the multimedia file continues to download in the background. Based on this feature, our employees can watch the teaching videos by using less time, with high efficiency. The second reason is the key point why we apply streaming media technology to distance education.

- For IT manager of the company

Question 1: How does your company apply streaming media in distance education?

Answer:

First, we transfer the material of the distance education courses into a streaming media format. In our company, we usually use Microsoft Media Technology, ASF format, which is related to the Windows operating system. In addition, this format is suitable for many kinds of files such as audio, video, images and other command, which is flexible. The employees can watch the material videos by using Microsoft Media Player.

Secondly, the files will be stored to the server after transferring the teaching material into ASF format. At this stage, I have to praise the greatest advantage of ASF format. This format can make the source files much smaller so that it is convenient for IT professionals to transfer them to network as well as it can lighten the load of server.

In a word, the whole process is to apply the video-on-demand (VOD) technology in streaming media. For this case, the best advantage is that our employees can access the teaching content what they want to learn from the server anytime until they fully understand the content of material.

Question 2: Because of my limitation of the knowledge about streaming media, could you explain in detail what does “Broadband Video on Demand” mean?

Answer:

VOD (Video on Demand) is short for video-on-demand technology, also known as interactive TV-on-demand system. IT-professionals will use the progressive streaming transmission to upload the teaching material to the server. It belongs to a kind of technology behind the streaming media. In another words, the user can play a video program according to his or her needs and favorites. Taking this streaming media technology into distance education is to meet the demand that different employees can choose their favorite or necessary teaching videos many times according to their different progress of learning. From my view point, this is also an important reason why we choose streaming media technology in our company staff training system.

Question 3: From your view point, VOD is a good technology. So where else does your company use VOD technology except distance education?

Answer:

Actually, we use VOD in our company’s homepage as well. We have put some videos describing our company, financial products, services and activities on this webpage. On the other hand, we also provide every user some information and file-sharing in different types such as text, picture, and graphical line and so on as well as the search function, which can allow our users to find the content that they

want quickly and easily when they look through our company's homepage. In a word, Streaming through its special coding makes it very suitable for transmission on the Internet.

Question 4: What other kinds of streaming media technology are applied in your company? And how are they applied in distance education?

Answer:

We once utilized one of the streaming transmission- real-time streaming to complete a live broadcast about an academic exchange.

In 2009, our company invited a famous professor to make a live report about business administration among the senior management employees in our company. For this case, we took advantage of real-time streaming transmission to broadcast this report live.

First of all, we used a camera to shoot the whole process of this report as a video. Then this video was uploaded to streaming media server after acquisition and encoding. Finally, our employees can watch the live report through the network in different locations at the same time.

4.4.2 Data Analysis

According to the answers between the CEO and the IT manager in these interviews, the researcher has summarized several advantages for applying streaming media technology to distance education in this case company.

The following findings are summarized by the researcher, demonstrating the advantages that streaming media applied in distance education has brought to this company.

1. The teaching video with streaming file format on the server no longer need to be downloaded entirely before starting to watch them, which can save a lot of time.

2. All the teaching material transformed into streaming file format, especially, will become much smaller than the source files, which can save the space of server and speed of broadband.

3. The streaming file formats are very diverse and IT professionals could transform different source files into different streaming formats. There is no doubt that these formats make the teaching form much richer than the previous distance education system. The teaching material could be text, picture, video, live video as well as flash.

4. Using real-time streaming transmission in streaming media to hold a live teaching event actually brought the convenience for all the employees of this case company. There is no need for them to go to a real class. They can just attend a live teaching course anywhere as long as they have a computer and Internet. The best advantage for using real-time streaming in education is that the students can attend a live teaching course to learn knowledge and there is no limitation for the place. On the other hand, the case company can save money for renting a big classroom.

5 CONCLUSION

Streaming media technology has become more and more popular these years and it has been applied in many fields. People will use streaming media for entertainment such as watching videos or listening to the music online. In addition, more and more companies use streaming media for video conference, especially for the staff training. Many IT professionals will apply streaming media technology into distance education in their companies which can help companies save a large amount of money for renting a big classroom. On the other hand, all the staff can learn knowledge anytime and anywhere conveniently without any limitation.

According to the interviews, the basic idea of the distance education in Huatai Securities Co., Ltd is to apply the streaming media technology for making the videos, audio and so forth as part of the teaching. The streaming media is used to provide staff training to the employees of the company. The teaching content via streaming media technology will be diversified which includes all types of data such as video, audio, text, picture and so on.

In the distance learning process, the basic requirement is to pass information from the teacher to the distance learning students. Based on the case company and the theoretical part, the following key points summarized by the researcher can demonstrate that the streaming media technology brings some advantages to distance education.

- Diversity and rich teaching form

There is not much diversity or richness in teaching form in current distance education, the most common teaching form is text. However, there are many streaming file formats available which have been mentioned in the previous section. Therefore, the knowledge content can be diversified into different types of data, such as video, audio, picture, text, as well as flash. This advantage of streaming media technology makes the teaching form much richer and more diverse.

- Saving time for teaching and learning

The streaming media technology could save time in the whole process of teaching and learning. Applying the streaming file format and streaming transmission into

teaching videos, the users don't need to download the whole videos before watching, which is much more different from the non-streaming video. This means that it can save time and students can watch teaching videos while the remaining documents will be downloaded in the background.

- Improving the effectiveness of teaching

The video-on-demand technology in streaming media makes distance education more effective. As we all know, the ability and progress of obtaining new knowledge are different among people in the progress of learning. Therefore, VOD technology is quite suitable for different students to solve this problem. IT professionals transfer teaching material into streaming file format and then upload to server. Then the students can watch the teaching material anytime until they get the idea totally according to their different teaching progress.

- Saving space from the server and reducing the loading time

The streaming files will become much smaller than the source files through transferring them into streaming file formats, such as ASF, RM, RA and ETC. This feature and advantage can help save the space of the server and reduce the loading times for the users. It makes the students browse the teaching material fluently.

- Making teaching system open

Compared with the traditional teaching method, the distance education system with streaming media technology breaks the limitation of time and space. First of all, the students can choose suitable time and place for study. Secondly, all people can learn the knowledge by attending distance education as long as they have a computer and Internet. Therefore, streaming media technology applied to distance education makes the teaching more open and no limitations for the time and place.

There are five advantages have been concluded by the researcher above.

In a word, streaming media technology has become one of important technologies that affect distance education. Applying the streaming media technology is to break the traditional text-based education which can make up for the unicity of teaching.

Furthermore, because of many advantages of applying streaming media technology into distance education, more and more schools have tried to apply this technology into their education system.

The use of streaming media technology for distance education can be regarded as a breakthrough point of developing online learning system. It is conducive to the formation of the modern distance education and the open learning system.

6 DISCUSSION

6.1 Comparison of literature

In the previous section, the researcher found two previous researches related to streaming media applied in distance education. One was written by Hartsell, T., & Yuen, S and the other was written by Timothy R. Haley.

The research written by Hartsell, T., & Yuen, S named "Video Streaming in Online Learning" and it focused on the streaming videos applied in distanced education. The writers gave more information about the technology of streaming video as well as some hardware and software. Then the writers concluded the advantages of using streaming videos in online learning. In a word, the writers totally concentrated on streaming video as well as its technology and advantages in online learning. The writers (Hartsell & Yuen 2006) thought video streaming allows online instructors the opportunity to deliver alternative course materials to students who are not campus-bound.

However, there is another research written by Timothy R. Haley named "Streaming Video for Distance Education". In this passage, the writer described his own experience for using streaming video in distance education when working at Sandhills Community College. However, the writer paid more attention to introducing how to create a real streaming video, including knowledge about encoding for compression, compression file formats, streaming media protocols, streaming server software and so forth. Actually, the writer gave professional skills for creating a streaming video but he hasn't given concrete advantages for using streaming media in distance education.

In this thesis, the researcher found some relevant technologies for streaming media applied in distance education. Then she selected a case company to analyze what the streaming media technology brings as advantages to a real company in distance education. Compared with the earlier findings in literature, the most difference is that the researcher from this thesis only focused on the technology of streaming media applied in distance education and then summarized the advantages for using it in distance education.

6.2 Further research

Although this thesis has covered many advantages for using streaming media technology in distance education, there're still some areas which are not covered in this thesis remaining to be discovered.

First of all, some other kind of technologies applied in distance education could be explored and compared to this kind of technology with streaming media in distance education. Then some advantages could be analyzed according to the comparison.

Then, some disadvantages could be explored for using streaming media technology in distance education. Additionally, it could be studied whether there are any other technologies that can make up for its disadvantages?

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