STRATEGIC ANALYSIS OF A VIDEO COMPRESSION SOFTWARE PRODUCT

by

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ABSTRACT

The objective of this project is to develop a strategic recommendation for market entry of the Client's new software product based on a breakthrough predictive-decoding technology. The analysis examines videoconferencing market and reveals that there is a strong demand for the software products that can reduce delays in interactive video communications while maintaining reasonable video quality. The evaluation of the key external competitive forces suggests that the market has low intensity of competition and high potential of profitability for the new software. A resource inventory is utilized to assess the Client's internal characteristics. Considering the Client's strengths and weaknesses, it is recommended that the Client applies for intellectual property rights over the new technology to facilitate product differentiation, and seeks partnerships with its customers for achieving fast time-to-market and reducing the business start-up costs.

謹以此文獻給我的母親以及我的好友丁雲：

感謝妳們為我的學業代禱，給予我鼓勵與支持。

This paper is dedicated to my mother and my best friend, Adeline –

thank you for the prayers, encouragement, and unconditional support

throughout this program.

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GLOSSARY

Codec   An acronym for "enCOder/DECoder" or "COmpression/DECompression" which is the software (an algorithm or a specialized computer program) or the hardware that compresses and decompresses audio and video data streams to reduce the data size for less storage space and faster transmission.

Bandwidth   "A synonym for data transfer rate – the amount of data that can be carried from one point to another in a given time period." It is usually expressed as bits per second (bps)[1].

IP   Internet Protocol

ISDN   Integrated Services Digital Network

NAT   Network Address Translation

Endpoint   A videoconferencing endpoint is a terminal for making point-to-point video calls[2].

3G   Third generation wireless communication technology that includes multimedia feature, roaming capability, broad bandwidth, and can be used on cellular phones, videoconferencing, and e-mail.

Open source software   Source code is available to the users and the developers and the support is from the user community rather than the vendors

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[1] Definition retrieved July 14, 2008 from SearchNetworking.com
(http://searchnetworking.techtarget.com/sDefinition/0,,sid7_gci211634,00.html#)

[2] "Video Conferencing: IP-Based SD", n.d.

1   INTRODUCTION

1.1   Background

Dr. Ivan V. Bajić, an Assistant Professor in the School of Engineering Science at Simon Fraser University, has research concentration in multimedia communications including video coding and streaming. Dr. Bajić and his team (the Client) have designed and created the innovative, leading-edge video decoding software that is an add-on component to the standard video decoding software applications. The Client has identified the interactive video communications or videoconferencing industry that will benefit with this technology in reducing the perceived video delay. This paper will explore the videoconferencing market and analyze the market attractiveness for the new video decoding technology.

1.2   Market and Product

Videoconferencing provides real-time audio and video communications between two or more participants on the sites located geographically apart from one another. The global videoconferencing market has experienced rapid growth since 2004. One of the main factors for the greater demands for conferencing and collaboration systems is the pressure to reduce travel expenses in organizations. The advancements of video compression technology also contribute to the adoption of the videoconferencing tools.

During communications, the delay associated with capturing and processing video is much higher than the delay associated with audio. Hence, the audio signals are delayed

purposely in order to maintain the synchronization of the voice conversations and the live videos (also called lip synchronization), and to recreate the in-person experience for the end-users. Reducing the misalignment of the audio and video is extremely important and the process to achieve this is complicated. The video decoding solution – frame prediction module, developed by the Client, uses the techniques to predict and display the future video frames before they are received by the video decoder. By predicting the future frames, the perceived video delay can be reduced.

1.3 Objective and Scope of Analysis

The objective of this paper is to assess and analyze the videoconferencing market and the Client's core competencies to determine how the Client can enter the market and launch the new product. The market opportunities are identified and assessed by studying the external environment and the major videoconferencing market segments. The internal strengths and weaknesses of the Client are analyzed to determine how the Client can serve the target market, and then the go-to-market options are recommended.

The Client published a research paper on the predictive-decoding technology at a conference in 2007 (Chen and Bajić, 2007). A light patent search, done by the author, from Google web site shows that the technology invented by the Client is unique and has not been patented, developed or incorporated into any commercial products by any organization.

This project focuses on profiling the potential customers in the videoconferencing market and finds the reasons why they will be interested in this new technology. The scope of this project does not include research on pricing models of the

videoconferencing products used by the companies in the market, product distribution strategies, and the development of the advertising and marketing communication plans for the new software product.

The next chapter provides a brief summary of the video streaming and video compression technologies and their use in videoconferencing. It discusses the challenges faced by the video communications today and how the Client's invention can help resolve these challenges. Chapter 3 discusses the target market – videoconferencing market, its characteristics, market trends, and the market size. This chapter also evaluates the attractiveness of the market using Michael E. Porter's Five Forces framework (Porter, 1980). At the end of chapter 3, the paper provides information on some potential customers that will be interested in the Client's product. Chapter 4 presents the analysis of the Client's strengths and weaknesses, and discusses the Client's current situation. Chapter 5 describes possible strategies for market entry and provides analysis of each strategy. Finally, chapter 6 provides a recommendation for the most favourable strategy and a conclusion for this paper.

This paper is based primarily on a secondary research, that is, the data and information are collected from previous studies and findings such as market research reports and articles in magazines, publications and web sites.

2 TECHNOLOGY OVERVIEW

Two important technologies that enable videoconferencing applications are the communication networks and data compression. The audio and video data for transmission during conferencing require a large amount of network bandwidth and take much time to travel from one location to another. In order to transfer the digitized video and audio signals efficiently over the network, the data must be compressed to reduce the size, hence to reduce the required bandwidth and increase the speed of the transmission. The higher the bandwidth of the communication channel, the larger the amount of data that can be sent and the higher the quality of the audio and video will be.

This chapter presents an overview of the video compression technology that is fundamental to a videoconferencing system. This is followed by the information on the technical aspects of the Client's video decoding software product and its application in a videoconferencing system.

2.1 Video Streaming and Video Compression

Videoconferencing uses real-time video streaming technology. Video streaming uses the compression and buffering techniques to break the video and the associated audio data into packets in succession and store them in a specific video file format such as Windows Media, QuickTime, etc. The video files are then transmitted from the sender's end via a network channel and viewed almost immediately without waiting for downloading all the files at the receiver's end. Figure 1 shows the high-level, one-way

video streaming process over the Internet. The video data produced from the video cameras are processed (encoded) in a computer to create the video files. The files are transmitted using the Internet to the viewer's equipment. These video files are processed again (decoded) in the viewer's equipment to be played on the viewer's side.
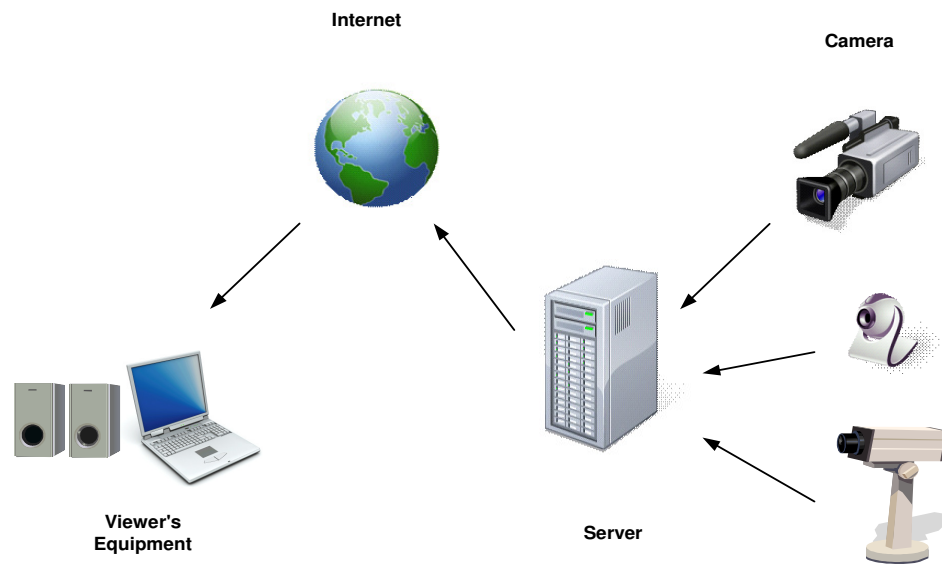
Figure 1: Simplified Video Streaming Process[3]

Some other examples of video streaming and communication applications are shown in Figure 2. The grouping of the applications is based on the property of whether the video is pre-encoded or encoded in real time and the property of whether the video communication allows interactions between participants. Videoconferencing falls into the quadrant of the real-time encoding and interactive video communication applications.

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[3] Information retrieved June 24, 2008, from Rumler, LLC web site: http://rumler.com/video.htm

	Pre-encoded	Real-time encoded
Interactive	N/A	Videoconferencing Interactive games
Non-interactive	VIdeo-on-Demand Video storage (CD, DVD)	Live broadcasts (e.g. sports events)

Figure 2: Examples of Video Streaming and Communication Applications[4]

(Source: Apostolopoulos, Tan, and Wee, 2002)

A videoconferencing system typically includes cameras, microphones, speakers, and the video compression software or hardware. Videoconferencing uses the video streaming and involves establishing a two-way or multi-way communication channel for the participants to see and talk to one another. This end-to-end transmission processes the information in the following sequence: capture, encode, transmit, receive, decode, and display. The live video streaming must have the video encoding done dynamically as the images are captured, and the encoding has to be done in a very short period before the data can be sent out over the Internet Protocol (IP) based network or Integrated Services Digital Network (ISDN), which often require a machine dedicated to the streaming.

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[4] Video-on-Demand (or VOD) systems either stream video content through the set-top boxes, allowing users to select and watch videos in real time, or download the videos to the storage devices such as computers or DVD recorders for viewing at later time (information retrieved from Wikipedia web site).

Video streaming depends on the encoding and decoding of the video and audio components in the stream. The workflow of the data compression and decompression is shown in Figure 3 below.
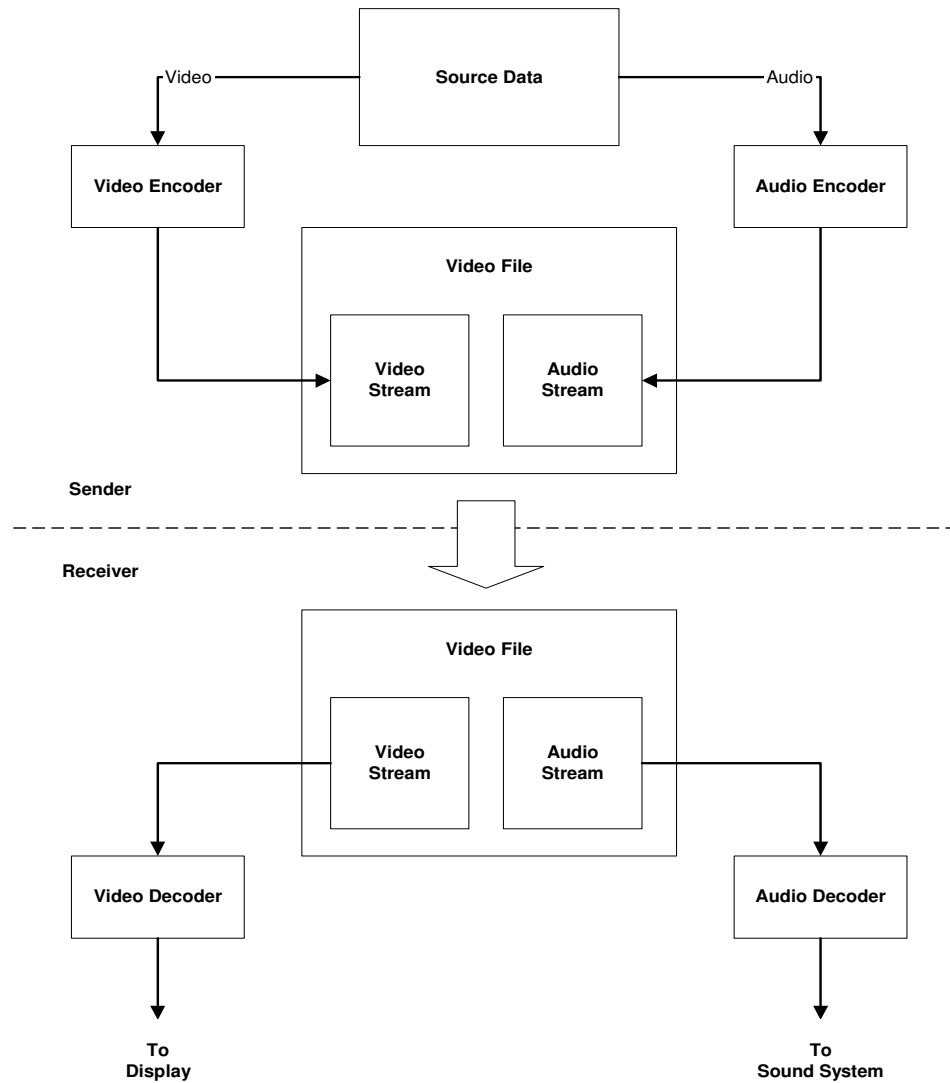
Figure 3: Data Compression and Decompression in Video Streaming
(Source: Lloyd, n.d.)

As shown in the diagram, the audio and video data from the source are processed separately. For video data, a video encoder is used to convert the data into a type of code (some symbols or information) and make the data size smaller than the source before the video file can be transferred. After receiving the video file, a video decoder converts the code back to the information that can be recognized or understood at the receiver's end.

The commonly used video compression method for streaming video files is lossy compression. Lossy compression schemes try to discard information that cannot be perceived by the human eyes. The goal is to achieve the right balance between the data size and the video quality – that is, compressing the data as much as possible while the data loss is not visually noticeable. The data restored from the stream may be different from the original data but it is still good for viewing.

2.2   Video Codecs

A software module that performs video compression and decompression of digital video is a video codec. A video codec is a necessary and very important part in a videoconferencing system. It encodes (compresses) video signals for storage or transmission and decodes (decompresses) information for playback. Video codecs are complex mathematical algorithms, and there is continuing research and development in this area from various corporations and academia to provide the most suitable codecs for the market. The codec functionality can be built into a device, normally a semiconductor chip, which does the same video compression and decompression as the software codec. The frame prediction module developed by the Client is a software module for the software video codec.

There are many software and hardware video codecs available in the market. This paper will focus on the software-only video codecs. Videoconferencing systems use the video codecs that are either proprietary or built according to the industry standards. The key advantage of using standardized over proprietary codecs is to ensure system interoperability[5], so that the decoders and the encoders made by different companies or parties can communicate, and the compressed data can be properly decoded. The commonly used video codec standards are MPEG-1, MPEG-2, MPEG-4, H.263, and H.264/MPEG-4 AVC. All of these standards employ lossy compression.

2.3   Frame Prediction Module

Videoconferencing is one type of real-time, interactive communication. Real-time video communications have time constraints. The audio and video information is useless if it arrives late. For interactive communication applications, it requires low end-to-end latency on the transmitted information. Therefore, the number one challenge in videoconferencing is delay reduction, and typically, the delay is required to be below 150 milliseconds (Chen and Bajić, 2007). The source of the delay often comes from the transmission of the data over the networks and the process of video compression and decompression. During the communication, the performance of video compression and decompression is essential to achieve high quality images and natural interactions.

To reduce the delay in the video communications, the Client has researched and developed new video decoding techniques and created the frame prediction module as a

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[5] IEEE defines "interoperability" as "the ability of two or more systems or components to exchange information and to use the information that has been exchanged." Usually, these systems do not share the same hardware or software environment to perform their required functions ("IEEE Standard Computer Dictionary: A Compilation of IEEE Standard Computer Glossaries", 1990).

solution for improving video <u>decoding</u> efficiency. The module is a computer program that applies the techniques of using the received video data to predict the future video frames and display those future frames before they are processed by the video decoder. By predicting the future frames, the perceived video delay can be reduced while maintaining reasonable quality of the video presentation. The frame prediction module is implemented to be independent of the computer operating systems. That is, the software is platform-independent. The module can be integrated into proprietary or standard decoding software or firmware.

The simulation of this predictive decoding technology has shown promising performance in video communications with less complex motions such as videoconferencing. This technology outperforms other methods, such as error concealment and data recovery, on the task of delay-reduction for the transmitted video stream, and it is able to reduce the video delay by up to 100 milliseconds while maintaining reasonable quality (Chen and Bajić, 2007). The Client believes that this video decoding solution will contribute to the change of the videoconferencing industry by improving the conferencing experience. More details of the videoconferencing market, its characteristics, and the attractiveness of the market are presented in the next chapter.

3   ANALYSIS OF VIDEOCONFERENCING MARKET

Videoconferencing market is identified as the target market for the frame prediction software module. This chapter describes the characteristics of the market, the product and customer segments, the market size and the competition. Michael Porter's Five Forces analysis model is used to assess the attractiveness of the videoconferencing industry to help make strategic decisions. The profiles of some potential customers are described at the end of the chapter.

3.1   Overview

Videoconferencing is one of the video collaboration solutions that simulates the real-time meeting environment and allows simultaneous audio and visual communications between two or more parties on different sites.

Videoconferencing systems were commercialized in the 1980s, but they were not widely embraced by consumers or businesses because of their high cost and poor performance. The first working videoconferencing product was introduced by Compression Labs in 1982 for the price of $250,000 USD with $1,000 per hour line fee[6]. The advancements of IP networks, video compression techniques, software, hardware, and other technologies have reduced the cost of the equipment, improved the quality of the systems and made systems easier to manage, hence helping videoconferencing to make its way to the corporate offices and the consumers' desktops around the world.

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[6] ("Video Conferencing History", n.d.)

Videoconferencing market is now a part of the wider real-time collaboration, i.e. unified communications, market that also includes audio conferencing, web conferencing, data collaboration, instant messaging, IP telephony, and other products and services.

3.2   Product Segments

The videoconferencing market is divided into group videoconferencing systems (or endpoints), desktop videoconferencing systems, and network infrastructure equipment. The product segments are as follows:

- **Group (or room) videoconferencing systems**: The systems are designed to be used in the meeting rooms, boardrooms, or auditoriums where a group of people gather to communicate with other parties at different locations. Compared to the single-user (or desktop) systems, the group systems use high-end sound, lighting, display and other equipment, provide best possible quality of video communications, have higher prices, and require expertise to set up the system or change the configurations.

- **Desktop (or personal) videoconferencing systems**: The desktop systems use the components such as video cameras and microphones that are for peer-to-peer, single-person use. These systems are designed for the office or cubicle environment and they are suitable and affordable for small and medium enterprises and the individual consumers. The system configuration can be either hardware-based or software-based. This segment includes PC-based systems, standalone systems, all-software systems on PCs, videophones, and other appliances.

- **Network infrastructure equipment**: This product segment includes equipment such as multipoint control units, gateways, gatekeepers, and network address translation (NAT) firewalls that connect participants in the same videoconferencing session or connect and manage systems on different networks.

Equipment manufacturers have adopted videoconferencing standards to ensure interoperability or compliance between equipment from different manufacturers. Two most common standards are H.323 for communications by the equipment on IP-based networks and H.320 for systems on ISDN networks.

3.3 Market Trends and Issues

Many business organizations choose videoconferencing systems as collaboration tools to facilitate global competition, develop or strengthen corporate partnerships, and enhance productivity. The expected benefits are:

- Speeding the communication process (with direct discussions) instead of exchanging e-mails or messages;

- Better communication experience (almost face-to-face communication) than the telephone calls and e-mails within the organizations, with business partners and with customers;

- Helping dispersed teams to work together more efficiently and effectively.

Other factors that drive the growth of videoconferencing market include the following:

- *Rising business travel expenses and the associated costs*

  Organizations are pressured to reduce travel budgets in order to be cost effective. Recently rising oil prices that increased the cost of business travels has become another reason for enterprises to further cut back on the travel expenses. More companies invest in videoconferencing systems to reduce travel costs (Lohr, 2008; Collins, 2008).

- *Increasing fears of terrorism and other threats*

  After 9/11 in 2001 and the SARS (severe acute respiratory syndrome) outbreak in 2003, business trips have been reduced or avoided for the fears of terrorism, natural disasters, epidemic diseases, and other threats. Tightened security at the airports causes delays and excessive time spent for travelling. Videoconferencing is used as one of the travel substitutes for business meetings and communications.

- *Taking green initiatives*

  There has been increasing awareness of the global warming effects. The emission of carbon dioxide from the vehicles, airplanes, and other modes of transportation will be reduced if the business travels are replaced with other types of solutions (Collins, 2008). Organizations around the world are taking initiatives in the direction of conserving natural resources and reducing pollution by adopting videoconferencing as the collaboration solution to cut down corporate travel.

- *Organizations' globalization and decentralization*

Companies doing business on a global scale and setting up offices and facilities in various countries need to have the collaboration tools to communicate effectively for administrative matters, conducting job interviews remotely, providing sales presentation, training, and technical support assistance at a distance. Videoconferencing enables these functions and improves the productivity in the organizations.

- *Outsourcing and teleworking*

More and more organizations outsource the work to countries with lower labour costs. As a result, companies may have to send employees across the world for meetings and on-site inspections. The use of videoconferencing allows more frequent communications than travelling. Employees working at remote locations can also use videoconferencing to visually communicate with their colleagues and avoid work interruptions due to commuting or travelling to the offices.

- *Technology advances*

With the advances in technologies that lower the hardware costs, videoconferencing systems have become more affordable for small and medium enterprises. Improvements on the ease of use, transmission speed, and the image quality for the videoconferencing systems also have accelerated the adoption.

- *High-profile vendors joining the competition*

Companies such as Cisco, IBM, Hewlett Packard, and Microsoft introduce new and/or improved videoconferencing solutions, and promote their products and services to the enterprises and the consumers. The entry of these well-established companies into the videoconferencing market helps promote the use of videoconferencing to a wider audience.

- *Collaborations in the industry*

  Videoconferencing system manufacturers form partnerships with the IT firms, such as Microsoft and IBM, and with other companies in the videoconferencing industry to integrate their products and broaden the distribution channels.

The major technologies that change the videoconferencing industry are the following:

- *High-definition video*

  High-definition (HD) videoconferencing systems support high-resolution images that greatly improve the video quality over the standard definition equipment. In 2005, vendors started adding HD videoconferencing equipment in their product portfolios as an option to offer more functionality of the videoconferencing systems. It is believed that HD systems will be the next major trend in the videoconferencing market (ICC Information Group Limited, 2007).

- *Telepresence*

Telepresence systems are the high-end group videoconferencing systems

that closely replicate the real environment as if the participants are all in

the same room. The systems use top-quality, high-definition display and

audio equipment to provide the life-size images, the appearance of true

eye contact, and the experience of greater realism. Because the

telepresence system requires bigger bandwidth and the system can cost

$300,000 USD or more to deploy (plus monthly fee to operate the system),

it is not yet the mainstream product. However, with more vendors selling

telepresence systems, the competition will result in some low-cost

solutions for a wider clientele. The telepresence systems, "coming off a

small base, are growing at an even faster clip." (Market Wire, 2008).

- *Firewall Traversal*

The usage of videoconferencing has been limited within an organization

sharing the same network due to the corporate firewalls that protect and

control the corporate networks. New videoconferencing standards,

H.460.18 and H.460.19, were created in 2005 to allow firewall traversal.

The equipments supporting H.460.x standard are able to connect to other

equipments over different networks without the loss of security. This

enables secure visual communications between organizations and

increases the adoption of videoconferencing systems.

- *Mobile Solutions*

Companies have been developing third generation (3G) based mobile

video communication solutions to satisfy the increasing demand in the

videoconferencing market. The mobile solutions allow videoconferencing between the office systems and the mobile devices such as mobile video phones and personal digital assistants (PDAs) that communicate using 3G mobile networks. This makes video calls ubiquitously possible from any place in the world.

- *Video compression and decompression*

  The continuing research and development of new video compression and decompression techniques provides improvement in video quality and efficiency of data encoding and decoding, which enhances the performance and features of the videoconferencing systems.

3.4 Market Size and Growth Rate

As more businesses are becoming aware of the value of videoconferencing, the applications of videoconferencing are spreading in wider markets. Some examples of the installations are in the following industries:

- Manufacturing, used for product development and quality control;

- Healthcare sector, used for training professionals, patients' consultation with specialists, and pharmaceutical representatives' meeting with clients;

- Medical fields, used for information exchange between clinicians and researchers;

- Education sector, used for distant learning;

- Justice organizations, used for attorney consultations and parole hearings.

Videoconferencing industry long-term growth rate is about nine percent per year (Market Wire, 2008). In 2007, the worldwide videoconferencing endpoints market had shown a record growth of more than 25 percent over 2006, and the sales revenues were over $1.1 billion USD. According to the analysis from growth consulting company Frost & Sullivan, the estimated revenues will reach $3.9 billion USD in 2014 (Frost & Sullivan Research Service, 2008).

In terms of value, Europe/Middle East/Africa led the global market growth in 2007 with 56 percent increase, followed by North America with 34 percent[7]. North America has been the world's largest region for videoconferencing, and the United States is the global market leader. Other large national markets in the world include the People's Republic of China, Japan, and the United Kingdom (ICC Information Group Limited, 2007).

3.5   Customer Segments

As described in the previous section, the United States is the largest nation for videoconferencing systems in the world; the U.S. market is selected as an example to identify the groups of customers in the videoconferencing market. There are four major customer segments found in the U.S. videoconferencing market that have significant adoption of videoconferencing systems. These vertical markets[8] are corporate, government, education, and healthcare (Frost & Sullivan Research Service, 2005).

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[7] "Videoconferencing Sees Record Growth", 2007

[8] Vertical markets are defined by the type of similar businesses and customers that engage in trades based on specific needs (definition retrieved August 4, 2008 from Wikipedia and Moneyterms.co.uk).

The market share of each segment is shown in Figure 4. The corporate and government segments provide the most revenue opportunities for the vendors. The revenues of the videoconferencing products in the corporate segment is expected to reach $838.4 million USD by the year 2011, which is about 73 percent of $1.15 billion USD in total videoconferencing revenues in the United States[9].

Figure 4: Percentage of U.S. Videoconferencing Market Shares in Revenues
(Source:" VIDEOCONFERENCING MARKET GROWTH", 2007)

The increasing demand in the corporate market is driven by the promise of travel cost saving and productivity improvement. In addition, the available and less restrained funding in the corporations and the buy-in of the small and medium enterprises are the reasons that give the corporate market higher growth rate than other segments.

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[9] "VIDEOCONFERENCING MARKET GROWTH", 2007

3.6   Competitions

The research of the competition in the videoconferencing market is focused on the video compression software (video codec) products that are relevant to the Client's product.

Companies supplying video compression software in the videoconferencing market also offer other video codecs, encoders and decoders, for real-time or pre-coded video streaming and/or codecs for streaming in mobile devices. Among these companies, some provide software development support and product customization for their clients, while others are in partnership with the manufacturers to incorporate their products into the video communication systems. There are companies that also build the hardware codec with their proprietary technologies to satisfy different market demands. Some of the videoconferencing endpoints vendors develop their own video codecs rather than use the third party software in their products. For the software-based videoconferencing products, it is unclear whether the products utilize the proprietary video codecs or the basic video codec provided by the vendors of the operating systems.

Companies, including the videoconferencing system manufacturers, which develop the video compression software, usually have the intellectual property protections such as trademarks, patents, copyrights, and trade secrets to protect their exclusive rights of the technologies. Technology licensing revenues and royalties comprise the majority of the income for those companies except for the videoconferencing system vendors.

In the videoconferencing market, the video compression software manufacturers compete with large and well-established companies such as Microsoft and Apple Inc. as

well as those companies of similar resources. These companies also compete with the freeware and open source video codec applications that are free to the public. However, the commercial video codec software has far better performance than the free software because of the proprietary technologies.

3.7　Porter's Five Forces Analysis

In this section, Porter's Five Forces model is used to analyze the profitability and the attractiveness of the videoconferencing market. The analysis is done by assessing five important forces – competitors, buyers, suppliers, new entrants, and substitutes, regarding the video codec software, to determine the strength of competitive position for the new product. Overall, the analysis indicates that the videoconferencing market is an attractive market to exploit the market demand for the new frame prediction module.

3.7.1　Competitive Rivalry - Low

From the author's research of the videoconferencing market, there are many sellers of video codec software products for videoconferencing in the market (listed in the Appendix), but there seems to be very few companies offering the decoder add-on software to the customers. The existing video codec software add-ons are mostly for non-interactive video applications such as video recording and video-on-demand, and these add-on products do not target the videoconferencing market. On the other hand, the Client's frame prediction module, the add-on software for video decoding, complements the decoders and helps the video codec manufacturers capture a larger market share. The module is platform-independent and can be integrated into industry standard video codecs. Therefore, the videoconferencing endpoints manufacturers, videoconferencing

software providers, and video codec software companies become the potential customers to the Client. The force of competitive rivalry is low.

3.7.2 Threat of New Entrants - Medium

For the new video compression software companies to enter the videoconferencing market, the biggest barrier is the investment of time and money for research and development to develop differentiated products with significant compression/decompression and transmission improvement for video applications. This specialized asset creates high exit cost that deters entry. Another barrier is the intellectual property. As discussed in the previous sections, the firms in the videoconferencing industry usually own the legal rights to produce their proprietary compression software for a given period of time, which restricts the entry of other companies into the market. If the software products are protected under the intellectual property laws, the videoconferencing system providers would need to pay significant switching cost to change the compression software in their products, and this makes it difficult for the new entrants to penetrate the market with new products.

The author's research shows that there is no protection of the Client's key technology at this time. The potential competitors may be able to enter the market with the same technology and weaken the Client's position. Given these facts, the threat of new entrants is medium.

3.7.3 Threat of Substitutes - Low

In the videoconferencing market, the hardware codecs (or hard codecs) are considered the substitutes of the software codecs (or soft codecs). The hard codec could

be incorporated in a set-top box or on the professional video card in the computer system as part of a videoconferencing system. Hard codecs are generally faster in data compression/decompression but more expensive than the soft codecs[10]. The soft codecs cost next to nothing to reproduce and they are easier to install (in the computers, for example). In terms of defect fixes, maintenance, and system upgrades, hard codecs are not as flexible as soft codecs. Depending on the users' objectives, hard and soft codecs may have similar performance in video compression if the proper one is used[11].

Replacing soft codec with hard codec in the videoconferencing system may require a redesign of the system, which will increase the switching cost significantly for the videoconferencing system providers. As a result, buyers' inclination to the substitutes is low. Overall, the force of the substitutes is weak.

3.7.4   Bargaining Power of Suppliers - Medium

The main suppliers for software development businesses include the operating system vendors such as Microsoft, Sun Microsystems, and Apple Inc. that provide the development environment on the computers. The suppliers also include the companies that offer the programming tools and utility applications used in those operating systems. The predictive-decoding software can be implemented for any type of operating systems, but the Client still needs to maintain the product compatibility with the changes in the operating systems. On the other hand, the cost of switching from one development tool to a different one is insignificant. Therefore, the suppliers have medium bargaining power

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[10] "What to choose: hardware or software solution?", n.d.
[11] "Digital Video Editing Getting Started FAQ", n.d.

on the cost of the software development environment and tools for the new frame prediction module.

3.7.5   Bargaining Power of Buyers – Medium

The author's research shows that the buyers of the video codec software are mostly the videoconferencing endpoint providers because the software needs to be used with the cameras and other equipment together. There are many sellers of the video compression software but only a few dominate buyers in the market. Moreover, it is a business trend that video compression software companies form partnerships with the buyers to increase the buyers' loyalty to their products and reduce the negotiating power of the buyers. On the other hand, the videoconferencing system providers cannot easily switch to another product because they have the expenses on the video codecs licensing or development for their systems and the switching cost to them for a different codec will be significant. Overall, the buyers' bargaining power is medium.

3.8   Potential Customers

In the three product segments of the videoconferencing market, the frame prediction module has no application in the network infrastructure equipment segment. Therefore, seeking the potential customers is focused on the group and desktop endpoint product segments. Based on the market size of the customer segments in the United States, which is the market leader in the global videoconferencing market, the corporate segment is the largest among the four – corporate, government, education, and healthcare segments. Hence, the potential customers for the frame prediction module are the manufacturers or the providers that offer videoconferencing systems or solutions to the

corporate customers. That is, the companies providing the enterprise group videoconferencing systems and the enterprise desktop videoconferencing systems are the target customers.

According to ICC Information Group Limited (2007), Aethra SpA, Polycom, Inc., Sony Corporation and Tandberg ASA are the four manufacturers that dominate the global market for group and desktop videoconferencing systems in 2006. Both Polycom and Tandberg each have up to 40 percent market shares in terms of value. Other major vendors in the videoconferencing market include LifeSize Communications, Inc., RADvision Ltd., Microsoft Corporation, Hewlett-Packard Co., Cisco Systems, Inc., VTEL Products Corporation and Emblaze-VCON.

In recent years, many videoconferencing product and service suppliers have started to position themselves in the unified communications market, an emerging market with the demands of the real-time collaboration systems that include telepresence, instant messaging, voice, video, and web conferencing, and other communication solutions. Companies like Polycom, Tandberg, and RADvision from the videoconferencing space are the examples that have added instant messaging and web conferencing to their product portfolios (Kelly, May 2007). It is the author's belief that the vendors in the unified communications market will also be interested in the frame prediction module for improving the videoconferencing functionality in their video solutions.

The selection of the potential customers to focus on is based on the following facts that the customer has

- Substantial market share in the videoconferencing endpoints market or in the wider unified communications market;

- Large number of enterprise customers;

- Software development capability for the key software components in its products;

- The ability to devote large sums of money to license the technologies or even acquire the inventions.

These companies will be interested in the frame prediction module because the module will enhance their video communication products, reduce the risk of development failure, and gain the advantage of fast time-to-market. The target customers recommended are Microsoft, IBM, Cisco, Polycom, and Tandberg. The detailed information of each customer is presented in the following paragraphs.

Polycom, Inc.

Polycom is a U.S.-based company, founded in 1990. The company is the global market leader for voice conferencing and videoconferencing equipment with record net revenues of $929.9 million USD in fiscal year 2007. The video communication solutions that Polycom offers include the group and desktop videoconferencing systems with HD or standard-definition displays, all-in-one packaged systems (also called executive systems), telepresense systems, video recording, streaming and content management systems, solutions for videoconferencing between mobile devices and office systems, and videoconferencing infrastructure equipment. Video communication products, excluding the infrastructure equipment, accounted for 44 percent of the company's revenues in 2007.

According to Polycom's 2007 annual report, the company has over 330 United States and non-U.S. patents issued to protect its intellectual property rights, and has approximately 340 patent applications pending. Polycom has license agreements with various companies for video communication software source code and algorithms and for other third-party software that are incorporated in its products. Polycom is in strategic partnerships with Microsoft, IBM, Skype, Avaya, Nortel, and some other companies to deliver video collaboration solutions.

With Polycom's being the leading provider of visual communication systems in the global videoconferencing market, its technology leadership with hundreds of intellectual properties, and its software development capability, the company can be the potential customer for the frame prediction module. As indicated in the Polycom's annual report, the company faces stiff competition in the video solution industry. With the frame prediction module integrated into Polycom's products, the company may further differentiate itself from its competitors.

Tandberg ASA

Headquartered in Norway and United States, Tandberg is the world's leading provider of telepresence, group and desktop video conferencing endpoints, and mobile video conferencing solutions. Tandberg claims to be "the number one provider of high definition video"[12] after the acquisition of one of its competitors. In fiscal year of 2007, the company had operating revenue growth up to $630.5 million USD, and its global market share for videoconferencing endpoints was 40.5 percent in terms of revenues.

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[12] "Tandberg Annual Report 2007", 2008

Tandberg spent $29.5 million USD in development costs and $65.4 million USD for the acquisitions of patents, licenses, and other intangible assets in 2007.

Tandberg has collaborated with Hewlett-Packard to make their videoconferencing systems interoperable and to provide telepresence solutions built with the components from both companies[13]. Tandberg licensed Microsoft proprietary video codec and audio codec that were used in Microsoft Office applications, which enables interoperability between Tandberg's products and Microsoft Office Communications Server 2007 and Microsoft Office Communicator 2007[14]. Tandberg also has strategic alliances with IBM, Nortel, Cisco, and Avaya.

Tandberg is known as one of the leading manufacturers in the videoconferencing market worldwide. It is shown in the company's annual reports and the news releases that Tandberg has the capability of software development to integrate Microsoft's technologies into its products, and the company has financial resources for licensing third-party technologies. From Tandberg's business activities, the company is a potential customer that will be interested in the frame prediction module.

Microsoft Corporation

Microsoft announced its strategy for the unified communications market in June 2006. The company's vision is to form partnerships with industry leaders to provide the products and services that break down the media and devices barriers and people can use a single identity for all modes of real-time communications such as audio-, video-, and

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[13] "TANDBERG and HP Open Up World of Telepresence", 2007
[14] "TANDBERG Licenses Microsoft RT Video Codec and Microsoft RT Audio Codec", 2007

web-conferencing, instant messaging, and mobile communication. Microsoft's approach to unified communications is mainly through its software products so that business communications can be simplified and more efficient. Microsoft formed alliances with Polycom, Nortel, Hewlett-Packard, Motorola, and Siemens to ramp up its efforts for unified communications[15].

Microsoft has been investing heavily in its unified communications products and has integrated its conferencing and collaboration capabilities into Microsoft Office and other business software applications. According to Kelly (October 2007), Microsoft has gained a significant number of enterprises as the current and potential customers for using its Microsoft Office Communications Server 2007 solution, which has in turn made the company the leader in the unified communications market.

Because of Microsoft's financial resources, marketing capability, intensive researches in video compression, and corporate strategy of delivering unified communications, Microsoft is chosen as the potential customer for the frame prediction module. The module is a software application that can be integrated into the software decoder to be used in the real-time, interactive video communication. The frame prediction module is a strategic fit of Microsoft's unified communication solutions.

Cisco Systems, Inc.

Cisco designs, manufactures, and markets Internet protocol-based networking equipment. The company also provides hardware, software, and services related to

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[15] "Microsoft Unveils Unified Communications Product Road Map and Partner Ecosystem", 2006

communications technologies for the enterprises worldwide. Cisco is one of the top three vendors in the unified communications market, competing with Microsoft and IBM (Joe, 2008; In-Stat & Wainhouse Research, 2007). Cisco launched its telepresence systems, the high-end group videoconferencing systems, in 2006.

As Cisco continues to enhance the video capabilities in its telepresence systems and other video applications in its unified communications product portfolio, the company will definitely need new technologies incorporated into its software applications. The frame prediction module will help Cisco to achieve its goal in becoming the leading provider of unified communications solutions.

International Business Machine Corp. (IBM)

IBM, a software vendor, competes with Microsoft in the unified communications market. The company is known for designing software products and solutions for global corporations to improve business efficiency. A key component of IBM's strategy in unified communications is to provide the product, Lotus SameTime, as an application and as the development environment to its partners. Lotus SameTime is enterprise collaboration software that provides the functions including instant messaging, voice-, video-, and web-conferencing, and data sharing. The partner companies are able to deliver Lotus SameTime as is, or extend the capabilities of the application and develop other useful functionality in addition to the features that Lotus SameTime offers.

IBM is a well-established company with a large and loyal customer base for its products. IBM has many innovations in the business software applications. According to

the report from Wainhouse Research (Kelly, May 2007), although Lotus SameTime does not have as many capabilities as some of the web conferencing products, the software provides the majority of the functions that are useful for the business communications. Adding the frame prediction module to IBM's core product will enhance its performance in videoconferencing function and increase the adoptions of IBM's customers and partners. This makes IBM an ideal customer for the frame prediction module.

3.9   Summary and Implications

In summary, with the advancements of the technologies, videoconferencing systems have become more affordable and easier to use for businesses and consumers all over the world compared to just two decades ago. Customers are able to transform their business models to service their customers in a better way with the help of the videoconferencing systems (Follett, 2008). The global demand for the video collaboration tools is increasing and the long-term growth rate is approximately nine percent per year.

The video compression software companies face significant competition in the videoconferencing market, but the market is weakly competitive for the video decoder add-on software. From the analysis of Porter's Five Forces model, the videoconferencing market is attractive because the intensity of the forces is moderate to weak. Business strategies can be developed to improve the Client's competitive position to counter the forces of threat of new entrants and bargaining power of buyers.

The impact of the market trends creates the opportunities in the videoconferencing market for the Client and these opportunities are listed below.

- The enterprises worldwide demand the videoconferencing systems mainly for cost saving and improving productivity. Each system requires the video compression software or hardware to process video data. The frame prediction module can be added to each copy of the compression software for performance improvement.

- Market demands video compression technologies for video quality and communication performance improvement.

- Videoconferencing systems developers and manufacturers look for firms with the innovative technologies to form partnerships with and integrate their products with those of the partners'.

- There are very few competitors offering similar products for the video decoder add-on software, which makes market entry easier.

- The high-definition and telepresence solutions require more advanced video compression technology, and the frame prediction techniques can help reduce the prices while offering similar performance.

The threats and risks to the Client in the markets are listed below.

- Market demands the video codecs, not the add-on software to the video codecs, so the strengths of the frame prediction may not be perceived.

- Because the frame prediction module requires software integration into the video codecs in the videoconferencing systems, the Client can only target videoconferencing software providers or video conferencing system

providers with software development capability, not all the customers in the market.

- The Client has made public the information about the frame prediction module without obtaining the intellectual property rights to protect the invention. There is a risk that the property rights are owned or an application is filed by another party.

The barriers to entry of videoconferencing market for the new companies are the significant investment for research and development and the access to equally efficient technologies for production. The Client's research was funded in part by the government grant and the development of the frame prediction software was completed successfully. This add-on software complements the industry standard video codec software and it will be able to help reduce the overall delay in the interactive video communications. The Client invented this new technology and the product is market ready for production. If the Client has the proprietary rights for producing the frame prediction module, the module becomes a unique product and guarantees that no competitor can use the application of this technology to produce and commercialize the software.

Overall, the videoconferencing market is attractive because of the trends, the growth potential, and the opportunities. Although there are few to none competitors offering the decoder add-on software, the Client must provide a unique product as the only software using this predictive-decoding technology for delay reduction in video communications to the market to gain competitive advantages and to deter potential competitors. In the next chapter, the analysis will be focused on evaluating the Client's

internal competencies and resources to determine how it can enter the videoconferencing

market.

4   INTERNAL ANALYSIS

In order for the Client to enter the videoconferencing market successfully and position itself competitively, it is important to assess the internal characteristics of the Client to determine how the Client can develop its competitive advantages. This chapter identifies and analyzes the Client's competencies and their existing and potential resources that are superior to those of the potential competitors. The analysis indicates that the Client's key competitive advantages can be created from its breakthrough technology research in video compression, the proprietary know-how of the frame prediction module, and the highly skilled development team.

4.1   Strengths and Weaknesses

When a firm has an advantage over its competitors to generate greater profits and retain more customers, it is said that the firm has a competitive advantage[16]. From a resource-based point of view, the competitive advantages is offered by the resources and the internal characteristics of an organization that can be utilize to create the values.

The approach taken to analyze the core competencies of the Client is to list an inventory of its intangible resources by functional areas (Boardman and Vining, 2003). The intangible resources, as opposed to tangible resources, comprise of all the non-material items and the capabilities owned by an organization to develop sustainable competitive advantage (Carmeli, 2004, pp.111). This type of resources may include the

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[16] Retrieved June 29, 2008 from Investopedia.com.

reputation, proprietary knowledge, intellectual property, the organizational culture, marketing capability, and management competency.

The intangible resources identified and applicable to the Client for creating sustainable competitive advantages are listed in Table 1. The first three items are the assets and the rest are related to the skills that the Client has. The criteria for the high-level assessment of these resources are based on the resources' value, rareness, imitability and substitutability. The resource is valuable if it contributes to the Client's performance to compete in the market. Rareness means that the resource is "possessed by a small number of firms relatively to the number of firms that need it to create a perfect competition dynamics" (Carmeli, 2004) in the industry. If the resource is inimitable, it is costly for the competitors to replicate the resource. Substitutability is about whether the immediate substitutes can be established by the competitors to accomplish the same functions (Carmeli, 2004, pp.111). The summary of the assessment is shown in Table 1.

The Client has an innovative and highly skilled team to develop and support the frame prediction software. The human capital and its research and development capability are the Client's core competencies that can create its key competitive advantages. The managerial competency was demonstrated in managing the software development process; however, the competitors can find managers specializing in managing software development to do the same work, so the managerial competency is substitutable. The frame prediction technology will become the competitive advantage if the technology is protected by the intellectual property laws or the special non-disclosure agreements.

Intangible resources	Value	Rareness	Imitability	Substitutability	Advantage position
1. Human capital	Valuable	Rare	Inimitable	Non-substitutable	Sustainable competitive advantage
2. Intellectual property	Valuable	Rare	Inimitable	Non-substitutable	Sustainable competitive advantage
3. Product/Service reputation	Not valuable	Not rare	Imitable	Substitutable	Advantage absent
4. Managerial competence	Valuable	Rare	Inimitable	Substitutable	Temporary competitive advantage
5. R&D capability	Valuable	Rare	Inimitable	Non-substitutable	Sustainable competitive advantage
6. Ability to learn	Valuable	Not rare	Imitable	Substitutable	Competitive parity
7. Ability to raise funds	Not valuable	Not rare	Imitable	Substitutable	Advantage absent
8. Business development and planning	Not valuable	Not rare	Imitable	Substitutable	Advantage absent
9. Industrial relation	Not valuable	Not rare	Imitable	Substitutable	Advantage absent
10. Marketing and selling	Not valuable	Not rare	Imitable	Substitutable	Advantage absent

Table 1: Assessment of Core Intangible Resources

Based on Carmeli's Framework (2004)

Similar to many IT start-up companies, the Client has rare and inimitable technology and product, but, from the analysis in Table 1, the Client's weaknesses are as follows:

- There is weak or no product reputation because of the product newness.

- The Client has no prior experience in raising venture capital.

- The Client has no experience in business development and planning because the technology and the product were developed through an academic project.

- The Client has limited industrial relation.

- The Client has limited or none marketing and sales experience.

4.2   Current Situation

As discussed previously, one of the Client's objectives is to decide whether to enter the videoconferencing market with the frame prediction technology. In addition to the Client's strengths and weaknesses analyzed in the previous section, more information about the Client and the frame prediction software is presented below.

The software product is niche and complementary to video codec software that serves the target market. The module is market ready for commercialization and requires no additional investment for research and development. The software is independent of the computer operating systems and can be integrated into proprietary or standard decoding software or firmware. However, the module is an add-on software to the video decoder for the purpose of performance improvement, so it does not provide other features. It requires engineering work to incorporate the product into the customers' video codec software rather than being a plug-and-play component.

The technical information of the proprietary frame prediction techniques was published in one of the Client's research papers in November, 2007. In order to position itself competitively, the Client's other objective is to decide whether to obtain the patent or other type of intellectual property for its new technology to guarantee the Client's

exclusive right to differentiate itself from the potential competitors. The strategy

alternatives for market entry are discussed in chapter 5.

5 SOLUTION ANALYSIS

The purpose of this chapter is to present and analyze the alternative market entry strategies for the Client. These strategies are developed based on the Client's strengths, current situation and the objectives. The benefits and disadvantages of these strategies for the Client are discussed in this chapter, and the conclusions and recommendations are followed in chapter 6.

5.1 Market Entry Strategy Options

From the analysis in the previous chapters, the target market is the videoconferencing market and the customer segment selected is the corporate segment that has the most revenue opportunities. Four market entry strategy options are developed that could assist the Client in achieving its goals. These options are evaluated based on the information from the market research, the product characteristics, and the Client's strengths and weaknesses in order to determine the most favourable entry strategy.

5.1.1 Option 1: Launch Frame Prediction Module As Is

The objective of this strategy option is to launch the frame prediction module as is without any proprietary rights protection. This option requires the least resource commitment from the Client among the four options for product launch, and the option has the advantage of achieving fast time-to-market because the module is market ready.

Besides the business start-up and the production costs for fixture and equipment, licenses and permits, advertising, salaries and wages, etc., there will be no expenses for

obtaining the intellectual property such as patent application costs, and no time spent

waiting for issuance. However, this strategy has the high risk of the software technology

being replicated or reverse-engineered once it is out in the market. Without the

intellectual property protection, it is hard to create customer lock-in that generates higher

profits. It also makes the start-up business unattractive to the potential investors because

it is difficult to show that the innovation has sustained advantage for a given period of

time.

The implementation of this strategy requires building the sales and marketing

force for commercialization, distribution, and customer relations, and building a team for

product support after sales.

5.1.2 Option 2: Enter Frame Prediction Module With Intellectual Property Protection

The goal of this strategy option is to obtain the exclusive intellectual property

rights for the frame prediction module. Then the Client can sell the product or license the

technology to other companies. The use of the technology will be protected by laws,

which creates a competitive advantage. This option will generate revenue stream for a

longer term, increase customers' switching costs, and reduce the buyers' bargaining

power. The start-up business would be more appealing to the potential investors and

acquirers because the intellectual property helps them see the potential return on

investment (ROI) (Cardullo, n.d.). However, the strategy loses the fast time-to-market

advantage because the Client has to go through the intellectual property application

process to get the protection for the technology before selling the product.

The appropriate type of intellectual property that should be obtained for the frame prediction module is not in the scope of this paper. However, in order to present an idea of how much it would cost to receive the legal protection for the software, the patent application is used as an example.

The patent application process is overall costly and time consuming. It generally takes 24 to 36 months to obtain an issued United States Patent, for example. The main cost will be the professional fees for preliminary patentability search and preparation of the applications. The expense to obtain a U.S. patent is expected to be at least $10,000 USD, and the cost is higher for patents involving software systems. To file patent application outside of U.S., there is an additional expense of $20,000 USD per application for each foreign country (The Law Office of Jerry R. Potts, n.d.). There is also patent maintenance fee to be paid after the patent is issued. Moreover, the patent owners need to prepare to defend patent against infringement, which can be very expensive.

The implementation of this strategy is similar to option 1 with additional funding for intellectual property applications.

5.1.3 Option 3: Form Partnerships With The Customers While Waiting For Obtaining Intellectual Property Protection

Considering the Client's advantage on the knowledge of the predictive-decoding technology, the objective of this strategy is to deliver the products in a shorter period of time. This option would also create the revenue stream from business partnerships while waiting for the issuance of the intellectual property. After filing the application for intellectual property on the frame prediction module, the Client can seek opportunities to

form alliance with the potential customers described in section 3.8, and co-develop products with these customers using the proprietary knowledge.

The Client will need small marketing and sales forces at the start-up stage to approach the bigger companies. After obtaining the intellectual property, the marketing and sales teams may be expanded to pursue larger market share.

5.1.4   Option 4: Launch Video Codec Software

This entry strategy is to build the video codec (encoder and decoder) software with the frame prediction technology embedded and launch the video codec in the initial market, the videoconferencing market. The Client can apply for intellectual property on the frame prediction module while developing the codec software. The product has a wider range of applications like video streaming, interactive video games in addition to videoconferencing. The attempt is to provide customers one-stop shopping for video compression solutions in order to capture the market share and generate greater profits.

This is an aggressive entry strategy and the Client needs to devote much time, money, and other resources for research and development, marketing, sales, distribution, etc. This option does not offer the advantage of fast time-to-market because the components of the product, except the frame prediction module, are not developed.

With or without software property rights on the product, the business may face intense competition in the target market and the profits may not be as good as expected. There may also be unexpected development costs and technical risks in the process of developing the new video codec.

To execute this strategy, the Client has to re-assemble the development team for technical implementation, plus other teams for product development.

5.2   Analysis of Alternative Strategies

Based on the evaluation of Client's strengths and weaknesses in terms of its resources in chapter 4, all four options require the Client to invest resources for the business functions of marketing, sales, product distribution, and support.

Both option 1 and 2 allow the Client to leverage its existing human capital and skills to compete in the videoconferencing market. Option 1 requires the least amount of financial resources and achieves short time-to-market. With option 2, the business can benefit from the intellectual property protection and the product can be further differentiated. However, the potential costs associated with the intellectual properties and their protection should be taken into consideration.

Similar to option 2, option 3 uses intellectual property to facilitate product differentiation, and this strategy also shortens product's time to market. The Client will be able to generate revenues from business alliance before obtaining the intellectual property. However, without the protection of the intellectual property, it might be difficult to convince the big companies on the fact that the new predictive-decoding technology is greatly different from the existing technologies and that it is worth investing resources in developing products based on this new technology.

Option 4 would require the Client to have access to substantial funding and additional human capital to create and commercialize the new product utilizing the predictive-decoding technology. The efforts are not only for building the teams for new

product development but also for the research and development of the video encoding and decoding functionalities provided by the new product. To the best of the author's knowledge, there is no public information of how much financing is needed to create and commercialize video codec software, and no information of how much time it will take to develop such a product. To create a video codec superior to the competitors' products, the cost is expected to be much higher than the cost for developing the frame prediction module.

The exit strategy for option 1, 2, and 3 would be to sell the business to the acquirer. If the Client has the proprietary right on the product, the business is more attractive to the acquirer because the intellectual property helps the acquirer estimate the potential returns on the investment and make the "build or buy" decision (whether to build its own product or buy it from the Client).

The competition is very intense in the video codec software in the videoconferencing market. Therefore, the exit strategy for option 4 will be to either downsize the operations to only producing the add-on software and avoid price competition, or to sell the business as it will be easy for the Client to find a buyer for the business in the market and get out of the investment.

6 CONCLUSIONS AND RECOMMENTATIONS

Given the size, the growth potential, and the global trends, the videoconferencing market is attractive to both equipment and software manufacturers to design and develop videoconferencing solutions. As the solution providers in the wider unified communications market start adding video communication to their portfolio, the potential revenue opportunities are even greater.

The assessment of the environment in the videoconferencing market reveals that the market demands advanced video compression technology to counter the limitation of the network bandwidth and the challenges of displaying high quality images and creating in-person experience. Based on these findings, the Client should seriously consider the possibility of addressing the needs of the videoconferencing market where the frame prediction module proves useful.

The evaluation of the Client's strengths and weaknesses in terms of its resources shows that the Client has leading video compression technology and skilled product development team. From these two internal strengths, the Client is able to develop competitive advantages over its rivals. Therefore, it is recommended that the Client approaches the videoconferencing market with the third strategy option – form partnerships with the customers while waiting for obtaining intellectual property protection. The Client can use the intellectual property to deter the imitation by the competitors and gain access to financing for building strong marketing and sales teams

with the ability to successfully communicate the perceived strengths of the product. The

Client can also generate revenues from the business partnerships with larger companies.

The level of success of the market entry will be determined by the Client's efforts

in renewing its core capabilities, differentiating the product, business planning and

development, and building industry relation.

APPENDIX

Providers of Video Codec Software for Video Communications

Some companies that provide the video codec software for videoconferencing are listed in the table below.

Company	Product Name
LEAD Technologies	LEAD Video Codec – H.263, H.264
3ivx Technologies	3ivx MPEG-4
Sentivision	H.264 / AVC Video Conferencing CODEC
Wave Three	Wavelet Transform CODEC
Apple	QuickTime – H.264
Agora Labs	Video Codecs – H.261, H.263, H.264, Universal
GAO Research	Video Codecs – H.261, H.263, H.264
MainConcept	Video Codecs – H.264

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