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The video surveillance industry in the USA

- the future development and the technology shift

Theme: Strategy

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Abstract

Title: The video surveillance industry in the USA - the future development and the technology shift

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Key words: Technology shift, Video surveillance industry, Organizational Learning, Knowledge Management, USA.

Purpose: By analyzing and evaluating theories about Organizational Learning and Knowledge Management we aim to clarify how the integrators interpret the future development within the industry and if they are trying to respond to it.

Methodology: The study is conducted through qualitative semi-structured interviews.

Theoretical perspectives: The study uses popular theories associated with Organizational Learning and Knowledge Management. We have used Child's theory about "the learning process in organizations and necessary conditions for success" as our theoretical framework. We have, however, modified the theory somewhat by adding some theories to it. The reason for this is to make the framework more applicable on the video surveillance industry.

Empirical foundation: The study is conducted through phone interviews with seven senior officers working at companies at the bottom of the integrators' pyramid in the video surveillance industry.

Conclusions: Noticeable is that all the integrators in our study, despite their background and geographical location, have a shared view on the IP-technology, what is going to happen in the industry and the importance of being continually morphing, improving and learning. Even though the integrators differ somewhat in size, they all seem to have a very strong organizational code and a strong commitment among the members resulting in a shared perspective and vision. This in combination with flat and open organizations encourages active and inspired members to take initiatives and suggest improvements.

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1. Introduction

1.1 Background

In the last decades Information and Communication Technology (ICT) has risen and become a more integral part of our lives. Internet, telecommunications and mobile technologies deeply influences the business world today.¹ With the rise of ICT the “old” analog technologies have been questioned and, to a certain extent, replaced by “new” digital technologies. This battle between digital and analog technologies has been, and still is, an ongoing race that influences diverse products and different markets. In most cases the digital technology has proved better and thereby become the standard. The progress has differed for different products and markets. Some has had a rapid change whereas others have had either an incremental or slow change. The academia has been trying to describe, map and analyze the ongoing transformation and development within different industries with the aim of finding which circumstances are explanatory to the changes.

The TV broadcasting industry is an example where digital technology has replaced the analog technology. The main reasons for these changes are superior picture and sound quality, but also the possibility of adding extra services, such as video-on-demand and surfing the internet. Another example is the mobile phone industry which to a large extent has outrivalled the usage of analog regular phones. One of its big advantages is the mobility of the phone and possibility of staying connected where ever you are. There are, however, also markets where a technology change has been a hot topic and constantly up for discussion in recent years. One example of such a market is the video surveillance industry which has evolved a lot in the field of technology in the past two decades but where the major shift to digital technology is still to be seen.

The birth of the video surveillance industry took place as early as in the late 1960’s in the USA. The history of video surveillance is filled with skepticism and resistance against the usage of it. Even today, fifty years later, there are negative voices being heard even though video surveillance in general is more accepted and in many cases seen as a necessity.²

¹ Karakas, 2007, p.23

² Roberts, 2005, p.1-4

The introduction of VCR's (Video Cassette Recorders) to the market gave the users the possibility to store the recorded media and made it possible to use it as evidence if needed. As a result of this several other companies within other industries, such as insurance companies and businesses prone to theft, found the technology attractive and started using it. This led to an explosion in the usage of video surveillance equipment during the 1970's. The UK was one of the early adopters and they are still the most frequent user of analog CCTV (Closed Circuit Television) video surveillance equipment in Europe. There were, however, technical problems concerning for instance low picture quality and the absence of night vision.³

In the 1990's the industry saw some relatively big advances in the technical aspects which made the products more attractive. CCD (Charged Coupled Device) and Digital Multiplexing made it possible to connect multiple cameras to the same recording device as well as filming in low light and during night time. Up to this point the users were mostly commercial and video surveillance was mainly used for big events such as the Football World Cup in 1994, parades, demonstrations and in protecting the general public by, for example, filming every transaction at ATM's.⁴

The happenings of 9/11 changed the attitudes towards video surveillance making people appreciate some possibilities of monitoring.⁵ Since then the usage of video surveillance has increased a lot and although the digital technique is, by many, considered better the analog technology is still dominating the market, having a market share of about 80 percent.⁶

Around the mid 1990's the digital network video surveillance was introduced. In the rest of this paper the three terms digital, network and IP will be used synonymously. AXIS Communications developed the world's first network camera called the NetEye 200 which was launched in 1996.⁷ With the digital technology new technical features became possible. A lot of people believed that network surveillance technology would dominate the industry but this development has been slower than expected. With this technology the picture quality was enhanced, it was possible to store a lot more information and new features such as face recognition and motion detection were made possible.⁸ This new technology was, however, a

³ Roberts, 2005, p.1

⁴ Roberts, 2005, p.1-2

⁵ Roberts, 2005, p.2-3

⁶ Kalling, 2009, p. 1

⁷ AXIS Communications, Press release, 2009, p. 1

⁸ Roberts, 2005, p.2-3

lot more expensive which to a certain extent explains the slow adaption to the digital technique. There were also several other reasons for this. One of the more important ones is the purpose of the surveillance equipment and which type of solution the company has been using in the past. If it is in a store where there is always light, this requires a less technically advanced solution compared to an outdoor area where the light differs. Another reason is that analog systems are very simple in their construction and therefore very unlikely to fail compared to a network system which can be subject to trespassing and hit by viruses. The CSO's (Chief Security Officers) or other persons responsible for the security are very keen to avoid system shutdowns and failures which make them extremely focused on the system being reliable. Network cameras are in general very light-sensitive which means that they require better lightning to deliver an equivalent result as an analog camera.⁹

The introduction of the DVR (Digital Video Recorder) changed the rules of the game in the video surveillance industry. The DVR is both an advantage and a disadvantage for the digital technology. This because the network cameras are superior to the analog in analyzing the recorded media. This advantage is heavily reduced since the DVR has the possibility of transforming and analyzing the media in an equivalent way. Where the analyzing is done is probably not of great importance for the customer. Today the best analog cameras have an equivalent performance to the digital ones, although the network cameras are progressing and becoming mega pixel cameras which increase their performance.¹⁰

Two important markets within the video surveillance industry are the ones in the USA and in the UK. There are developers in this industry with no production of their own (such as AXIS) which means that they are heavily dependent on partners such as producers and integrators.¹¹ A security integrator is a firm that is able to bring together all parts of a security program and not only installing the separate parts. This means that these firms need a thorough understanding of security as a whole to be able to evaluate different parts of an organization's security program. After evaluating the different parts, the integrator should be able to provide a solution that unites the different parts into one single system.¹² When considering the integrators, which are the focus of this paper, it is worth mentioning that they can be divided into two groups based on their background. One group advocates IP video solutions a lot

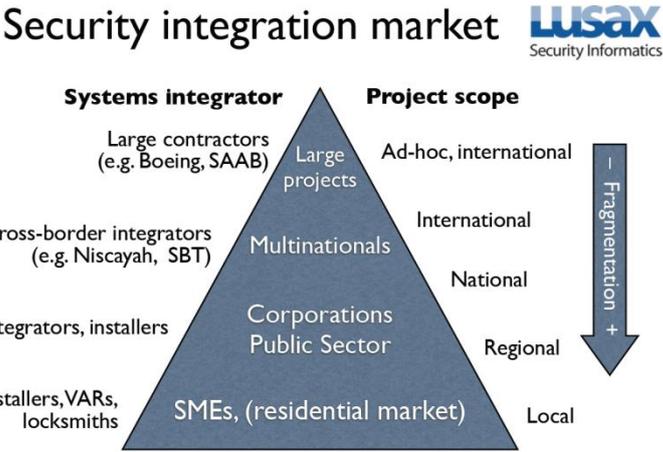
⁹ Lahtinen, Weaver, Lecture, 2010

¹⁰ Lahtinen, Weaver, Lecture, 2010

¹¹ Gren, Lecture, 2010

¹² Orr, 2010, The ITSummit

since they come from the IT sector and are relatively more technically skilled.¹³ The other group campaign analog video solutions to a greater extent much because they have been in the security industry for a long time and therefore are more familiar with using the analog technology. The fact that they have been in the security industry for a long time means that they have excessive knowledge about security/surveillance and have strong customer relations.¹⁴ Our study focuses on the bottom of the pyramid shown below. This means that our focus is on local small players with between five and fifty employees in the USA. These players are geographically spread out within the USA.



LUSAX powerpoint presentation, 9/4-10

Several studies have been made analyzing the technology shift and adaption processes within a wide range of industries. As far as we know, there have not been as many studies conducted in the video surveillance industry. This in combination with the fact that the industry might be at the tipping point of changing drastically due to a technology shift makes us consider this research valid and interesting. Since only a few studies have been made in this area, we believe that our research can contribute with some notions of how the integrators interpret and respond to the presumed technology shift. We believe and hope that these notions could be valuable for a wide range of players within the industry. If the industry is at the tipping point of changing drastically, our study could be of value for other industries in the same situation in the future. The lack of studies with the focus on the video surveillance industry means that there is no theory that is explicitly designed to explain this industry. This means that we have had to choose several overlapping theories in our desire to explain and analyze the integrators of the industry. In presenting these overlapping theories, we have had to explain the entire model/theory since we did not know beforehand which parts would be applicable to our study.

¹³ Kalling, Weaver, Memo, 2008, p. 1
¹⁴ Kalling, Memo, 2007, p. 1

1.2 Area of inquiry

The strong belief in network surveillance solutions combined with the relatively slow adaptation rate in the industry during the past decades has created several interesting questions concerning both the technology used as well as the organizations involved. Both the companies within the industry as well as outside experts try to grasp the situation in their urge to try to explain, predict and influence future developments within the industry.

As noted above there are two main groups of integrators. The situation of these two groups differs a lot today since they promote different technologies and will probably differ in the future as well. There still is a difference in purchase price between performance-equivalent IP and analog cameras which has a negative influence on the technology shift from analog to IP. As the price gap decreases the pressure of a technology shift increases. It could also be argued that the analog technology, which has been around for half a century, has not got as many developing possibilities as the newer and more technically advanced IP-technology. We are interested in how the different integrators perceive this possible shift in technology and how, and if, they adapt to it.

1.3 Problem formulation

How are the integrators reacting to the ongoing changes in the video surveillance industry?
Depending on if the integrator has historically been a security industry player or an IT industry player, how are they trying to acquire knowledge and how are they approaching it?
Which are the factors that drive or hamper the IP-knowledge assimilation for commercial purposes within the security integration industry?

1.4 Purpose

By analyzing and evaluating theories about Organizational Learning and Knowledge Management we aim to clarify how the integrators interpret the future development within the industry and if they are trying to respond to it.

2. Methodology

2.1 Research approach

Many researchers including Bryman and Bell distinguish between two approaches when conducting research. These two are the inductive and deductive approaches. The two approaches are each other's counterparts where the inductive tries to create new theories using the gathered empirical information as the base. This, whereas, the deductive approach start off in existing theories and try to confirm or reject these using the gathered empirical information.¹⁵

We have used a deductive approach since we find this best suited for this study. The relatively short time we have to conduct the study has also influenced this decision. We hope that we by using existing literature and theories will gain a better understanding of the video surveillance industry in the USA. By doing this we think we will be able to explain and analyze how the integrators are reacting and responding to the ongoing changes in the industry. We do not, however, consider it impossible to generate new theories or refine existing ones applicable on the video surveillance industry. Since we are only studying seven integrators and have a relatively short time to conduct our research, we believe it is more probable that we will question or revise small parts of the existing theories. If we are able to question or revise some of the theories we have used to explain and analyze the video surveillance industry, this is probably due to the fact that they are designed for other purposes.

2.2 Research methodology

Andersen among others distinguishes between two types of research methodologies, the quantitative and the qualitative. The qualitative type focuses on completeness, quotations and understanding whereas the quantitative type focuses on calculations, comparability and apprehension.¹⁶ Svenning describes the two types a little differently stating that quantitative data answers the questions "how many?" or "how much?" and because of that, to a large extent, consist of numbers. Qualitative data, on the other hand, consists mainly of words and texts and answer the question "why?".¹⁷ The qualitative approach is described as having a focus on interpretation whereas the quantitative focuses on numbers. This means that the qualitative approach is often used to create a better understanding of the "social environment". The "social environment" on the other hand is affected by how the respondents perceive it. There are different tools within the qualitative approach and the two most

¹⁵ Bryman and Bell, 2005, p. 22-26, 39-41

¹⁶ Andersen, 1998, p. 31-32

¹⁷ Svenning, 1999, p. 70-71

common are interviews and observations.¹⁸ The interviews are divided into two types, semi-structured and unstructured. When using semi-structured interviews the researcher sets up a framework of questions to follow but is at the same time open for changes concerning the order of the questions and has the freedom to ask attendant questions. The semi-structured interview is believed to supply detailed and complete answers in areas considered the most important by the respondents. This since the researcher has the possibility of being flexible and adaptable during the interview. Quantitative interviews, on the other hand, are very standardized and less flexible.¹⁹

We believe that the qualitative approach suits our study the best since we aim to acquire an understanding and thereafter explain and analyze and how the integrators are reacting and responding to the changes within the video surveillance industry. Since we hope to get detailed and complete answers from the integrators participating in our research we have chosen to use the semi-structured interviews.

2.3 Primary and secondary data

According to most authors within the field of methodology it is optimal to use both primary and secondary data when conducting research. This because, the two types of data can be used to strengthen or question each other and thereby increase the credibility of the study. Primary data is defined as all new data collected by the author for the research in question. Secondary data is described as already collected data of any kind, collected for another purpose.²⁰

Bearing this in mind we chose to complement our primary sources (interviews) with existing secondary sources such as literature, articles and theories. The primary data collected for this study plays a vital role primarily in the later phases of the study. The secondary data included in this study is also essential for the paper in the sense that it creates an understanding and a theoretical framework. Our main sources of secondary data have been articles and books.

2.4 Criticism of the sources

It is important to be careful when using information from secondary sources since it has been collected by someone else and usually for another purpose. The fact that it has been collected by someone else makes it hard to verify the reliability.²¹

¹⁸ Bryman and Bell, 2005, p. 297-299

¹⁹ Bryman and Bell, 2005, p. 360-364

²⁰ Halvorsen, 1992, p. 72-74

²¹ Halvorsen, 1992, p. 72-74

We have tried to deal with the credibility issues through using a broad literature base. This means that the different sources increases the trustworthiness and reduces the risk of incorrect information in the paper. It also reduces the risk of our paper being influenced by any eventual subjectivity from the different authors. On top of this we have tried to use sources that are well established and well-reputed as well as up to date.

2.5 The selection process

In the beginning of this research process we were provided with a list of 30 American companies by AXIS Communications, a major player promoting the IP-technology. The reason for this was that they wanted us to conduct a TCO-survey for them. The companies included on the list varied in for example size, background (in working with analog or IP-solutions), and experience (how long they have been on the market) etc. The companies all operate at the bottom of the integrator's pyramid presented in section 1.2. The fact that we have not been in direct contact with AXIS during this research process means that they have solely served as a source of information to us. Even though this is the case one could identify the risk of our conclusions being affected by the fact that the integrators included in our study are somewhat connected to AXIS and therefore could be biased in their opinions. We regard this risk as small since all of the integrators interviewed emphasize the importance of cooperating with the producers leading the development at the moment. This implies that performance is regarded as more important than being loyal towards one single producer at all times.

Given these initial conditions, we started our research on the video surveillance industry and tried to get in contact with as many of the companies on the list as possible. After talking to them on the phone discussing the TCO-survey we found seven interesting integrators to interview for this study. They differ in background, size, experience and in where they operate geographically. The fact that the seven integrators interviewed are all at the bottom of the integrator's pyramid, differ in size, background and geographical location makes us regard them as interesting. The positive aspect of AXIS supplying us with the list of potential respondents is that it was comfortable, time-saving and dramatically increased the probability of us getting the number of interviews we needed. There are, however, negative aspects as well. For instance we do not know why these companies were included on the list which means that we cannot fully verify that the selection process has been executed in a neutral way and if they are representative for the industry as a whole.

2.6 Implementation of the qualitative semi-structured interviews

We have conducted seven qualitative and semi-structured phone-interviews with American integrators in the video surveillance industry. The choice of conducting the interviews over the phone was for us pretty natural, mostly because of the distance but also since they are all located in different areas of the USA. Performing the interviews face-to-face would have consumed too much of the time assigned for this research. It could also be argued that performing the interviews over the phone saved the respondents some time as well. We have chosen to let the respondents participating in our study be anonymous since we wanted them to be able to answer our questions as comprehensively as possibly without having to think about what they said.

The interviews conducted have been structured in the way that the questions guide was created before the interview process started. They were, however, very flexible in the way that we could ask attendant questions, choose the order of the questions based on the situation and have discussions on topics not explicitly covered by our questions. The interviews have differed somewhat in how the respondents have answered our questions. This can be seen when comparing the length of the interviews. They have all been between 35 and 55 minutes long depending on how long answers the respondents have chosen to give. This is of course influenced by how busy they were during that particular day. In general, it can be said that all respondents have been very friendly and willing to talk and express their views in depth. Both of the authors of this paper have been involved in all of the interviews in one way or another. We have separated the operation so that one of us was conducting the interview whereas the other one was taking notes on what was said. This arrangement had some advantages, we had a back-up if the recording device did not work for some reason and we were both present during the interviews which meant that we heard all answers and in what context and tone they were given in.

2.6.1 Criticism towards the qualitative semi-structured interviews

According to Halvorsen, the biggest disadvantage with qualitative semi-structured interviews is that the information gathered is hard to classify and categorize. This makes it harder and more time consuming to conduct the analysis section afterwards.²² It is of great importance to have a thought out and well working system of how to categorize the information gathered. Without this there is a risk of misinterpreting the information which could result in false

²² Halvorsen, 1992, p. 86

conclusions being made. With quantitative methods it is usually easier to categorize the information resulting in a lower risk of misinterpreting it.²³

Qualitative methods are often argued to be time consuming and resource-demanding. This has, however, not been a problem for us since we as previously mentioned conducted our interviews over the phone due to among other things time and distance issues. A more specific criticism towards qualitative interviews is the risk of the interviewer unintentionally influencing the person being interviewed.²⁴ We believe that conducting phone-interviews lowers that risk but we have been aware of the risk and have therefore been choosing our words carefully. We do also acknowledge that we might have missed vital facial expressions, body language and other non-verbal expressions since we have not been able to see our respondents during the interviews. Another risk with phone-interviews is that the distance between the interviewer and the respondent prevents the discussion from becoming relaxed. This could have an effect on the respondent, resulting in less descriptive and rich answers. In our study this has not been a problem since all the respondents have been very eager to tell us their view on things. They have also seemed genuinely interested in our work which has resulted in good and comprehensive interviews.

2.7 Validity and reliability

It is important for research to give a true and fair view and because of this it is important to aim for high validity and reliability.²⁵

2.7.1 Validity

The challenge for researchers lies in collecting valid data for the study concerned. Svenning differ between two types of validity: inner and outer. Inner validity deals with the connections between theoretical frameworks and the empirical material whereas the outer validity deals with the project as a whole and its transferability into a greater context. More specifically, inner validity concerns asking the questions to the right target group, that the researchers cover the relevant aspects of a question using different tools and that the, for the situation, appropriate measuring device is being used. In the case of outer validity the focus lies on what possibilities there are to make general conclusions based on the study.²⁶

We can affect the inner validity of our research through evaluating if the questions we ask the integrators are connected and relevant to the theoretical framework we use. Our outer validity

²³ Halvorsen, 1992, p. 103-104

²⁴ Halvorsen, 1992, p. 89-90

²⁵ Bryman and Bell, 2005, p. 48-50

²⁶ Svenning, 1999, p. 63-66

is harder to influence since the list of companies included in our study was supplied to us by AXIS. This means that we cannot verify if the integrators we interview cover the entire spectra of integrators at the bottom of the pyramid and therefore can be said to be representative for the industry in the USA.

2.7.2 Reliability

It is argued that independent studies measuring the same data should give the equivalent result given that the targeted population is unchanged.²⁷

We have tried to increase the reliability in our study by examining problems from different angles which gives us a more complete and accurate view. When conducting interviews we tried to minimize the room for misunderstandings by having clear, straight-forward and well-defined questions. In this process we tried to be as neutral as possible by avoiding leading questions and influencing the respondents while answering.²⁸

2.8 Model of analysis

We have chosen to present and summarize the gathered empirical data in a separate chapter. This section is followed by a chapter where we analyze the data presented. The last section of this paper consists of our conclusions. The reasons that we chose to present the empirical data in a separate chapter are that we wanted to give every respondent the space to express their views and thoughts as well as give us the opportunity of quoting them. To make the views of the participating companies easy to compare and to increase the readability of the chapter we chose to divide our interview questions in to six different categories. These categories are, however, not used in the analysis chapter since the theories we have used overlap each other making it hard for us to keep this structure. Even though this is the case we believe that we have been successful in somewhat following the categories and thereby creating a red line throughout the analysis section.

²⁷ Svenning, 1999, p. 66-68

²⁸ Svenning, 1999, p. 66-68

3. Theory

We find it hard to totally separate the theory we use and our case. Because of this we have decided to explain our theories and then justify our choice and briefly apply it on the case. Hopefully this will also give the reader a better understanding of our case and why the theories chosen are of interest.

Most existing theories that we have come across take for granted that a new technology, either equivalent or better, will substitute an old incumbent technology. These theories are generally more accepted and regarded as more valid when considering a high-tech industry like the video surveillance industry. The fact that the technology shift within the video surveillance industry has been slower than expected or by some even questioned whether it will happen at all, makes us wonder if there are forces hindering the shift from taking place.

To explain an organizations ability to take in new technologies, the academia usually uses theories concerning Organizational Learning and Knowledge Management which explains learning both at an individual and at an organizational level. When studying Organizational Learning and Knowledge Management we have encountered numerous models and theories describing very similar things which leads us to believe that there is not one or a few “correct” models within the field. There are, however, models that we have encountered on several occasions and therefore believe are well established. We have chosen to use a couple of these well established theories when trying to explain and understand the integrators within the video surveillance industry. These models tend to mainly focus on the cognitive aspects of learning. It is, however, important to remember that non-cognitive aspects such as norms and values and strategy play a critical role in the learning process²⁹. We acknowledge the importance of this and believe that we cover some non-cognitive aspects with our interviews and some since Nonaka and Child include commitment and intention in their models. Factors which are non-cognitive such as motivation, commitment, culture, norms and values could be argued to explain learning on their own but could also be said to explain other cognitive factors that drive learning.

As some authors have noted, the academia concerning Knowledge Management has grown considerably in recent years. Although in doing so, there are those academics who argue that the theories are too focused on describing knowledge itself and not how knowledge and performance is connected. The reason for this, Kalling argues, is that most academics take the

²⁹ Kalling, 2007, p. 69-70

connections between knowledge and organizational performance for granted. Kalling, however, argues that knowledge is not always utilized, and even if utilized, that knowledge does not always lead to enhanced performance.³⁰

3.1 Different sequences in knowledge

Kalling has made a distinction between three different sequences describing how knowledge results in improved performance, these are: knowledge development, knowledge utilization and knowledge capitalization. The knowledge development describes how learning is achieved, the knowledge utilization is concerned with how knowledge is applied and lastly, knowledge capitalization describes how the applied knowledge gets translated into profit.³¹

We acknowledge the view of the author, but since we are interested in how the integrators are reacting to the ongoing changes and how they are acquiring knowledge we do not particularly focus on how knowledge is capitalized. Therefore, our paper focuses on how knowledge is utilized and especially on how it is developed. If we were analyzing the capitalization sequence, this paper would require a lot more time since the research would be a lot more complex. Instead our study focuses on the sequences of knowledge development and knowledge utilization and we hope to find some interesting aspects in these two areas.

3.2 Knowledge Management and Organizational Learning

In today's society it can be said that acquiring and generating new knowledge is essential for firms.³² These two attributes are included in the concept of Organizational Learning. The result of learning is the acquisition of new competences. Closely connected to the concept of Organizational Learning are the many theories regarding Knowledge Management. Strictly seen, knowledge can only be created by individuals and an organization can only support creative individuals and provide an environment well suited for knowledge creation. This can give the organization the ability to apply new knowledge, enhance the performance of a specific activity or help the organization prepare for new circumstances which are drivers for change. Peter Senge argues that the pace of change in the modern world is very rapid and therefore it is not sufficient for organizations to learn only how to adapt. Instead organizations should have a more preventative approach to learning giving them the opportunity of being proactive instead of reactive. This makes it easier for companies to acknowledge latent

³⁰ Kalling, 2007, p. 67

³¹ Kalling, 2007, p. 70-73

³² Nonaka, 1994, p. 14

customer needs and based on that build new markets and explore the application of new technologies to satisfy those needs.³³

Change has been a hot topic in the video surveillance industry for a relatively long time. This far there has not been any major technology changes but in our view this change is ought to come. Once this change becomes reality, the company that has the best ability to adopt and learn will gain a competitive advantage.

3.3 Theoretical framework

We have chosen a model by John Child describing Organizational Learning as our theoretical framework. The model describes the learning process in organizations and identifies some necessary conditions for successful learning. We have, however, slightly modified Child’s model and added some theories to it. The main reason for this is that we wanted to make it more applicable to the video surveillance industry. The model consists of four separate but interdependent parts where we will mainly focus on the second part called “Capacity to learn”. This since our study does not intend to focus on leadership and since we believe that the integrators capacity to learn directly influences how they interpret the future development within the industry but also how they respond to it. We believe, however, that the third and fourth parts of the model called “Creation of knowledge” and “Conversion of knowledge into an organizational property” will be covered by our study, since the theories used cover both the acquiring, generating as well as the sharing of new knowledge within an organization.

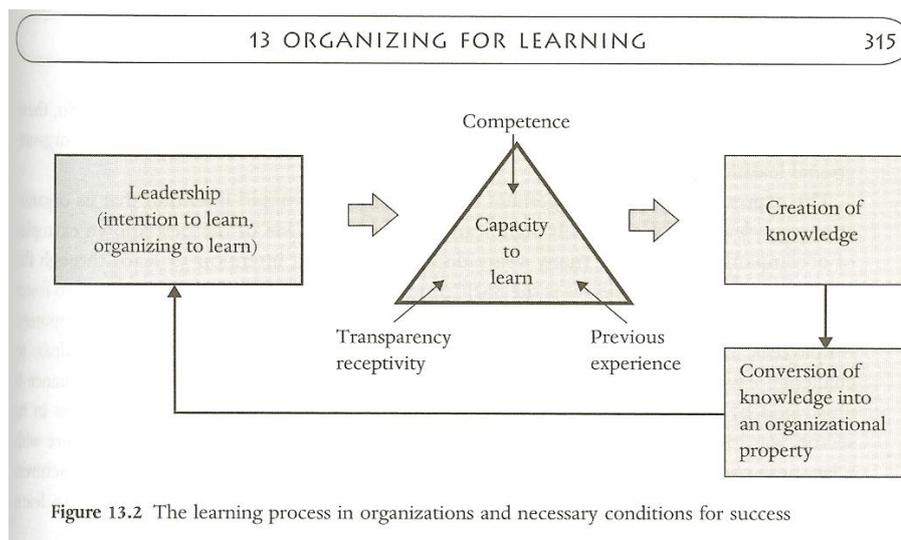


Figure 13.2 The learning process in organizations and necessary conditions for success

Child, Organization - Contemporary Principles and Practice, p. 315

³³ Child, 2006, p.310

3.4 Capacity to learn

Child has divided the capacity to learn part into four sub-parts. These four are: Previous experience, Competence, Transferability and Receptivity.

3.4.1 Previous experience

To fully understand the importance of historical events and developments we have chosen to start by discussing diminishing and increasing returns which results in and leads us to the Path Dependency theory. Closely related to the Path Dependency theory, are the terms exploration and exploitation and how organizations decide where to invest their money.

3.4.1.1 Path dependency

It is argued that the resource based parts of the economy in general are subject to diminishing returns whereas the knowledge based parts are subject to increasing returns.³⁴ This means that there is a possibility that the video surveillance industry, with its high-tech and knowledge based products, could be subject to increasing returns if the IP-technology becomes the standard. Given today's situation, however, with two standards competing, these are most likely subject to diminishing returns. Since we in this study focus on the integrators and how they perceive and adapt to the presumed ongoing technology change, it is relevant for us to consider the historical investments made as well as the standards race. When discussing historical investments it is important to note that analog solutions still have a market share of approximately 80 percent. This leads us to three questions: how can the analog technology's domination be explained, does this legacy of investments have an impact on future development and investments and why has the industry been so slow to adapt to the new technology that by many is believed to be the winning standard?

Path Dependency theory is an alternative analytical perspective which explains why certain companies or standards get ahead of others and become leading in that particular industry. One of the leading authors in the field is W. Brian Arthur.³⁵ Arthur argues that if several similar-sized companies enter a market with increasing returns at the same time, small unexpected and random events will give one firm an early advantage. These small random events can accumulate and become magnified by positive feedback which determines the outcome.³⁶ In a similar way, to Sewell, path dependency means "that what has happened at an

³⁴ Arthur, 1994, p.3

³⁵ Liebowitz et al, 1995, p. 205

³⁶ Arthur, 1994, p.5

earlier point in time will affect the possible outcomes of a sequence of events occurring at a later point in time”.³⁷

In the theory of path dependency there is said to be two types of sequences which are of interest to analyze. The first one can be said to analyze the self-reinforcing sequences while the other one discusses the reactive sequences. The self-reinforcing sequences are characterized by the formation and long term continuous reproduction of a pattern leading the process towards an outcome. These self-reinforcing sequences are connected to increasing returns which means that further adoption of a technology increases the benefits. Once this pattern is established it gets increasingly difficult not to follow it. This means that a superior technology can experience difficulties gaining a footing or even get locked-out from the market.³⁸ This can be a way of explaining why the analog technology still is dominating the video surveillance industry and therefore we will examine if the absence of a competing technology have made the self-reinforcing sequence even stronger for the analog technology and therefore further aggravated the establishment of the IP-technology in the industry. This reasoning is strengthened by the view of many economists stating that “...the logic of increasing returns has been used to explain the persistence of several potentially inefficient technologies...”³⁹

The second type of sequences, the reactive sequences, is causally interrelated and each event is both a reaction to the prior events and a reason for subsequent events. This means that early events are particularly important for the outcome since a small change in one of these can accumulate over time and be the reason for a totally different outcome. The two types of sequences follow a different logic where the self-reinforcing process reproduces itself and thereby reinforces early events. In a reactive sequence every part is characterized by action and reaction which means that the prior event causes a reaction leading to an action that influences the subsequent event. In other words the direction of a self-reinforcing sequence depends heavily on early events whereas a reactive sequence gets influenced by every single event throughout the sequence (even though a small change in an earlier stage can generate a bigger difference on the outcome).⁴⁰

³⁷ Pierson, 2000, p.252

³⁸ Mahoney, 2000, p. 508

³⁹ Mahoney, 2000, p. 512

⁴⁰ Mahoney,2000, p. 526-527

There is, however, criticism towards the usage of the Path Dependency theory. Mahoney argues that definitions such as Sewell's, among others, are too vague and resulting in Path Dependency theory being used in situations where it is not applicable. In an attempt of clarifying when Mahoney consider it appropriate to use the Path Dependency theory he has set up three defining features. Firstly, early parts of a sequence are of greater importance than later ones. Timing is vital which means that events that happen "too late" will have little or no effect. Secondly, in a path dependent sequence early historical events are connected and interdependent but the outcome cannot be explained by initial conditions or prior events. Instead, the outcome and the initial conditions are stochastically connected. Thirdly, once historical events have affected the sequence and put it in motion towards an outcome, the motion tends to continue in this direction.⁴¹

In the case of the video surveillance industry these three defining features are not fully met. Based on this, one could argue that the Path Dependency theory is not applicable in our case. We argue, however, that the fact that the IP and analog surveillance technologies did not enter the market at the same time explains why Mahoney's two first defining features are not relevant in the given situation. Early events shaped and reinforced the analog technology but cannot be said to have had any impact on the relationship between the two technologies. In our view the introduction of the IP-technology did not happen "too late" since it has captured about 20 percent of the market and therefore has had an effect. We consider the second feature irrelevant since the technologies were introduced at different times. This means that if the outcome and the initial conditions were stochastically connected or not, in the case of the analog technology, is not relevant. The third feature is, however, fully relevant which makes us believe that the theory still is valid in our case. This view is in coherence with Arthur's. He states that "...an early start technology may already be locked in, so that a new potentially-superior arrival cannot gain a footing".⁴²

Path Dependency theory is a possible cause and explanation of why the video surveillance industry looks the way it does – with the analog technology dominating. The situation and attitudes among companies today will strongly affect their ability to adapt to and absorb new knowledge as well as acquiring competences. This has proven to be critical in almost all

⁴¹ Mahoney, 2000, p. 511

⁴² Arthur, 1989, p. 123

industries, especially in the knowledge based industries.⁴³ As a result of this it is essential for companies to be constantly morphing if they want to stay competitive.⁴⁴

3.4.2 Competence

3.4.2.1 Exploration and Exploitation

Connected to Senge's thoughts about how to be successful in today's rapid changing world are the two terms exploration and exploitation, presented by March. The two terms are both of great importance to a company but they also implicate very different concerns. Exploration can be described by terms such as: search, variation, risk taking and flexibility whereas exploitation is described by: refinement, efficiency, implementation, choice and production. In other words exploration is about exploring new possibilities and new areas whereas exploitation is about refinement and further developing within the field you are in.⁴⁵ For the integrators there is most likely a problem in how to relate to the fact that there are two competing technologies. Depending on their background they will probably have different views on whether they should explore the competing technology or exploit the technology they have been using themselves. March makes some interesting observations regarding what concerns companies will have when choosing between these two concepts.

Organizations that focus solely on exploration are highly probable of having high costs and low profits. This because they experiment and exhibit too many undeveloped new ideas while possessing too few well developed and unique competences. On the other hand, organizations that engage exclusively in exploitation are likely to be trapped in a stable, but yet not, optimal situation. The difficulty and key success factor therefore lies in how to balance the usage between the two. Since both are essential and compete for scarce resources organizations will have to decide which way they want to go. They make these choices both based on explicit factors, such as calculations, and implicit factors which are embedded in the organizational structure. Organizations need to choose between searching for new information about alternatives and use currently available information to improve present returns.⁴⁶

The situation gets even more complicated since there are possibilities that new investment alternatives or new information might appear shortly before or after an investment has been made. If the organization chooses to explore new alternatives this reduces the speed of

⁴³ Nonaka A, 1994, p.14-15

⁴⁴ Hamel et. al, 2003, p. 52-53,

⁴⁵ March, 1991, p. 71

⁴⁶ March, 1991, p. 71

refining existing skills, whereas improvements in existing skills make experimentation less attractive. Another aspect that differs is that the returns from exploration are less certain, more remote in time and deviate from what the organization is doing at present. This generally makes exploitation more attractive since the refining processes are improved at a higher rate. The speed combined with a cumulative effect, where each improvement of a competence increases the probability of being rewarded for engaging in that particular activity, strengthens the advantage of exploitative investments. This reasoning is closely connected to path dependency since performance is dependent on the potential return from an activity and how skilled the organization is at that particular activity. This means that increased experience often results in increasing returns for an organization. Furthermore, this results in positive feedback that produces a strong path dependence that could lead to a suboptimal equilibrium being chosen and thereby a lock-in effect for an inferior technology. Since being successful in the long run relies on a certain amount of exploration, this makes these tendencies towards increasing exploitation at the cost of exploration, potentially self destructive.⁴⁷

The discussion about exploration or exploitation has been used to explain and analyze different phenomena within the social context of organizations. It has been used to elaborate the mutual learning of an organization and the individuals in it. Organizations have gathered knowledge over time, learning from their members. This knowledge is stored in their procedures, norms and rules. At the same time as an organization is learning from its members it is also socializing their thoughts into fitting the organizational beliefs (called the organizational code). This mutual learning affects how the organization deals with and manages explorative and exploitative investments. As people within organizations develop and become more knowledgeable they also become more homogenous in their knowledge. Since they have developed within the organization, this also means that they to a high degree share the values and beliefs (code) of the organization.⁴⁸

This discussion finalizes in whether slow or rapid learning on both the organizational and individual level is to be preferred. In general slower socialization leads to a greater knowledge at equilibrium (where beliefs and values are shared by the organization and its members) whereas a higher rate results in reaching equilibrium earlier. There is also the case when socialization from the individual is slow but where the organization learns quickly from its

⁴⁷ March, 1991, p. 72-73

⁴⁸ March, 1991, p. 73-75

members which results in a greater knowledge at equilibrium than if the organization learns slowly but its members are socialized quickly. The highest equilibrium knowledge is achieved when the individuals socialize to the organizational beliefs slowly whereas the organization learns rapidly from its members. Studies have shown that slower learning encourages exploration of different alternatives and a better balance in the development of specialized competences. In the long run, however, there might be some advantages of having a combination of fast and slow learners in an organization.⁴⁹

It is highly important for organizations to regard factors as those presented above in the continuous development of an organization but also in for example a recruitment process. Recruits can be relatively similar or different compared to the current members of the organization and thereby also to the organizational code. They are usually less knowledgeable than an average member but instead of knowledge they contribute with their diversity. If the organization wants to create variability or try to improve the organization, it can try to employ a person that is slow to adapt to the organizational code which means that this person will stay deviant for long enough to affect the organizational code. This is, however, easier said than done since it is very hard for an organization to predict which recruits that are slow/fast to get socialized. The other way of creating variability is by introducing personnel turnover. This is, however, only to recommend to a certain extent and under the right circumstances. Slow learning combined with a high turnover rate, for example, leads to insufficient exploitation.⁵⁰

To fully be able to understand how organizations and companies decide whether they want to invest in the known (exploitation) or in the unknown (exploration), it is important to evaluate how open and willing they are to take in and adapt to new technology. In doing this it is important to be able to distinguish between different types of knowledge and how these are transferred. This leads us into the third sub-part of Child's capacity to learn which is the transferability of knowledge.

3.4.3 Transferability

When considering transferability, Child emphasizes the need of organizations having the capability to transfer knowledge from the outside of the organization as well as within it.⁵¹ To better understand this process of knowledge sharing it is important to make some distinctions

⁴⁹ March, 1991, p. 75-76

⁵⁰ March, 1991, p. 78-81

⁵¹ Child, 2006, p. 324

between different types of knowledge and some factors which drive or hamper knowledge creation. One of the academia's most influential works connected to this is Nonaka's theory concerning knowledge creation. We find it interesting to gain a better understanding of different types of knowledge and how they can be transferred in the organization. Hopefully this can be of interest to us when trying to grasp how different integrators work with knowledge aspects and how these influence how they interpret future developments.

In Nonaka's view information in different forms is what constitutes knowledge. Without having sufficient understanding about the information being received it is hard for the individuals, as well as the organizations, to associate to the information. Therefore Nonaka considers information a prerequisite for creating new knowledge. Knowledge, at a basic level, can only be created by individuals and is defined as "justified true beliefs". He stresses the importance of considering the personal justification of the belief to better understand knowledge itself and how it is created at an individual level, but also how it is amplified and crystallized in organizations.⁵² In close connection to this Nonaka emphasizes the need of individuals having commitment to spur knowledge creating activities. Three factors constitutes the individual commitment, these are: *intention, autonomy and fluctuation*.

The *intention* regards how individuals make sense of their environment and how they approach it. A person's intention greatly influences personal meaning of an object but also limits its form.⁵³ *Autonomy* can be applied both at an individual, group or organizational level. Nonaka argues that autonomy is an important motivator which brings a sense of purpose to the object. It increases the possibility of absorbing knowledge and therefore also of realizing unexpected opportunities.⁵⁴ Lastly, attention is directed towards the need of *fluctuation*, being an important factor for individual commitment. It is argued that there is a need of individuals stepping out of their comfort zone, breaking free from habits and routines and start questioning the validity of these. In other words it is essential that they question their fundamental perspectives and thinking when realigning their commitment to new knowledge.⁵⁵

3.4.3.1 Different types of knowledge

The part explained above about the commitment of individuals is essential to successful knowledge creation. Nonaka continues to explore knowledge by dividing the knowledge

⁵² Nonaka, 1994, p. 15-16

⁵³ Nonaka, 1994, p. 17

⁵⁴ Nonaka, 1994, p. 18

⁵⁵ Nonaka, 1994, p. 18

creation process into two separate types of knowledge, *explicit* and *tacit* knowledge. When considering the transferability of knowledge we will see that this separation is of interest since different types of knowledge can be transferred more or less easily. These two types of knowledge can be found in different contexts.

Explicit knowledge is knowledge that is codified and easily transmitted through formal language. *Tacit* knowledge, on the other hand, is knowledge that is highly personal and therefore cannot easily be transmitted with either speech or writing.⁵⁶

Nonaka argues that the knowledge flow, the transferability, from one individual to another can be seen from four different modes of conversion between tacit and explicit knowledge, these are: (1) from tacit knowledge to tacit knowledge, (2) from explicit knowledge to explicit knowledge, (3) from tacit knowledge to explicit knowledge and, lastly, (4) from explicit knowledge to tacit knowledge.⁵⁷

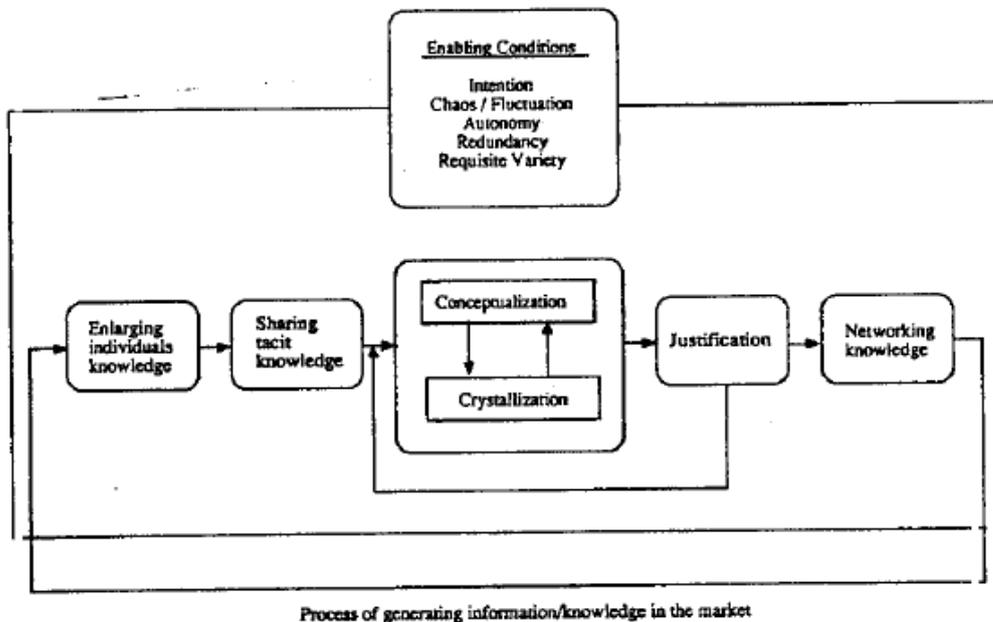
The first mode is called *socialization* and concerns individuals creating new tacit knowledge out of existing tacit knowledge. This can often be represented by on the job training, and involve imitation, practice and observation. Worth mentioning is that this can be done without the spoken or written word, although without a sufficient amount of shared experience this mode of knowledge creation is extremely difficult. The second mode, called *combination*, can be exemplified by meetings and telephone conversations where individuals share explicit knowledge with each other. The third mode, *externalization*, is the conversion of tacit knowledge into explicit knowledge. Externalization is the counterpart to the fourth mode, the *internalization*, which deals with explicit knowledge converted into tacit knowledge. Nonaka argues that both externalization and internalization are examples of that explicit and tacit knowledge are complementary and expand over time as they form a process of mutual interaction. While externalization often is created through the use of “metaphors”, the process of internalization is often framed by “action”.

⁵⁶ Nonaka, 1994, p. 16

⁵⁷ Nonaka, 1994, p. 18-19

3.4.3.2 Organizational knowledge creation

Nonaka uses his models and concepts, as discussed above, and relate these to the organizational level. A picture of Nonaka's model can be seen below and although it is described as a sequential model it is argued that the process can start off anywhere and jump from one stage to another, both forward and backward.⁵⁸



Nonaka, Dynamic Theory of Organizational Knowledge Creation, p. 27

Nonaka argues that since knowledge strictly seen stems from individuals own experience and tacit knowledge, the quality of that tacit knowledge is of importance for the whole organization as it needs to *enlarge the knowledge of the individuals*. The quality of the tacit knowledge is to a large extent determined by two factors – the “variety of an individual’s experience” as well as the “knowledge of experience”. Regarding the variety of an individual’s experience Nonaka argues that if an individual is limited to routine tasks, the tacit knowledge gained by the routines decreases over time. The capability of individuals to make future conversion of new knowledge decreases as his or hers ability to relate to different situations declines.

The second factor, “the knowledge of experience” concerns an “embodiment of knowledge through deep personal commitment”.⁵⁹ In short this is described as gaining knowledge not

⁵⁸ Nonaka, 1994, p. 27

⁵⁹ Nonaka, 1994, p. 21-22

only by theoretical thinking but by actual experience such as direct interaction with customers.⁶⁰

If the organization becomes successful in enlarging the individual's knowledge the next step is to *share the tacit knowledge*, without this the organization will not be able to take advantage of the individual's knowledge. This can be achieved by constructing a field where individuals can meet and interact. To Nonaka, the self organizing team is an example of such a field. In teams like these it is positive to have members who are of different age and have different positions within the organization. It is also positive to have members who have had multiple career functions in their past, here referred to as "core members". These core members are seen to act as central points within the team and assure that there is a proper rate of *redundancy* of information within the cross-functional team. It is also important that these teams do not have too narrow tasks since there is a need for them to interact with different environments and tasks, for instance both with suppliers and customers. Attempts to solve new practical problems in different environments can generate links between individuals and thereby supply new valuable information. This increases the tacit knowledge of the individual as well as of the organization. These individuals can also give the organization an increased knowledge of future developments. These teams are therefore of great importance when considering the "socialization process".⁶¹

Nonaka also argues that the self-organizing team creates two fundamental positive aspects for the success of *sharing experience* which is essential for the success of the socialization process in sharing tacit knowledge. Firstly, it can be seen as a seedbed in creating "trust" within the group and secondly, the interaction within the group creates a "shared implicit perspective" of the group members.⁶² The trust is often built-up by sharing individual's original experience which means that the individuals can understand each other's notion of the world in a better way. The shared implicit perspective drives the creating of a "common perspective" as the individual's perspectives form a mutual body for understanding. Once these two aspects are achieved there is a need to articulate this perspective. They therefore need to convert the tacit knowledge into explicit knowledge so that the knowledge can be transferred to outside of the team itself, in other words the need to activate the externalization mode. Nonaka mentions dialoging as a good example of a process which can facilitate externalization. He points out the need of having a good dialogue, not being "single faceted"

⁶⁰ Nonaka, 1994, p. 22

⁶¹ Nonaka, 1994, p. 23

⁶² Nonaka, 1994, p. 24

but rather “multifaceted”, giving room for “revision or negation”. It is also argued that individuals may always share their own ideas “freely and candidly”. This can sometimes spawn dramatic discussions but it is important that these are not discouraged.⁶³

Once conceptualized, Nonaka argues that the knowledge created in the group needs to be *crystallized*, in other words the knowledge need to take a concrete form such as that of a system or a product. This mode is the internalization mode and can be seen as when other groups or departments test “reality and applicability” of the new knowledge. It is important that experimentation is encouraged as it triggers this process. One important aspect in the crystallization process is that the various groups work with redundant information creating a scope for significant knowledge conversion. One way of working with redundant information is to have groups within a company linked to many different, sometimes overlapping, processes in the creation of a product or a service. It is argued that knowledge can be crystallized faster and more effectively this way.⁶⁴

To speed up the sharing process of created knowledge the organization needs to justify the knowledge created within the organization. Remember that Nonaka argued that knowledge is “justified true beliefs”. Because of this groups and individuals within the organization need to create some sort of standards in deciding when knowledge created is qualitative and “true”. *The justification and quality of knowledge* in organizations can often be seen in terms of quantitative measures (ROI, turn-over etc) but also in more qualitative ways such as in vision and strategy statements. It is often the leaders of the organizations that have the biggest influence on these aspirations and therefore are the most influential ones in this process.⁶⁵

The last aspect in Nonaka’s organizational knowledge creation process is the *networking knowledge*. Here, the “new” knowledge is integrated into a network of organizational “old” knowledge.⁶⁶

Closely linked to the previous discussion about transferability is the discussion about the firms’ receptivity. As we shall see, receptivity in Child’s model is directly linked to the organization’s absorptive capacity.

⁶³ Nonaka, 1994, p. 25

⁶⁴ Nonaka, 1994, p. 25

⁶⁵ Nonaka, 1994, p. 25-26

⁶⁶ Nonaka, 1994, p. 27

3.4.4 Receptivity

When considering an organization's receptivity, Child argues that it is of great importance to look at the organization's "absorptive capacity". Absorptive capacity is said to be the organization's aptitude to "recognize the value of new information, assimilate it, and apply it to commercial ends". The theory was developed in 1990 by Wesley M. Cohen and Daniel A. Levinthal and takes off in the belief that the absorptive capacity of the organization at its most elemental level is determined by the individual's capacity to evaluate and utilize new knowledge. When doing so Cohen and Levinthal argues that individuals are highly dependent on prior knowledge as it "...increases both the ability to put new knowledge into memory...and the ability to recall and use it". Differently put, without appropriate contextual knowledge it is hard for individuals to fully comprehend new knowledge.⁶⁷

A relatively seen extensive amount of prior knowledge is also said to make it easier for individuals to achieve a certain level of performance compared to individuals with less prior knowledge. From this reasoning, it is also possible to argue that learning is generated the easiest within fields that are closely connected to an individual's prior knowledge. The flipside therefore is that unrelated new knowledge is harder for individuals to utilize. Closely related to this Cohen and Levinthal put forward an interesting idea that highlights a problematic aspect of competence or in other words, knowledge creation, in the organization: "Prior knowledge permits the assimilation and exploitation of new knowledge. Some portion of that prior knowledge should be very closely related to the new knowledge to facilitate assimilation, and some fraction of that knowledge must be fairly diverse, although still related, to permit effective, creative utilization of new knowledge".⁶⁸ This discussion is further developed as the authors make a distinction between inward-looking and outward-looking absorptive capacity. With a high inward-looking absorptive capacity all the individuals in the organization share the same specialized language and skills making them very effective in communicating with each other but on the other hand not very effective in taking in external knowledge. It can also lead to a phenomena called Not-Invented-Here (NIH) which means that the organization develop a direct resistance to apply knowledge from outside of the organization. The outward-looking absorptive capacity on the other hand is the exact opposite to the inward-looking where the skills of the individuals in the organization differs much, making them more effective in taking in new knowledge while not effective in

⁶⁷ Cohen et. al, 1990, p. 128

⁶⁸ Cohen et. al, 1990, p. 135-136

communicating them within the organization. The challenge therefore lies in creating and maintaining an appropriate balance between the two.⁶⁹

In environments uncertain about where useful knowledge can be found, it is important for organizations to have individuals with diverse backgrounds as this increases the likelihood of relating to old knowledge.⁷⁰ The authors also argue that it is especially important to have individuals standing on the interfaces, both between the organization and its external environment as well as between the different subunits within the firm. It is in the interfaces that the most important process of absorbing new knowledge can be found. Who these individuals are and how many they are depend greatly on the organization's structure. It can be spread out to more or less all the individuals in the organization or it can be centralized to a few. When the expertise of the individuals in the organization differs greatly from the expertise of those external actors who can give useful information to the organization, it is important to have some individuals that can translate this information. These are called "gatekeepers". This is especially important when there is a rapid technological change in the organization's environment. Although, it is important to stress that the organization must not rely solely on the gatekeepers since they only act as an interface, the absorptive capacity will be greatly reduced if the knowledge cannot be transferred internally from the gatekeeper to the rest of the organization.⁷¹

An interesting question related to the discussion above is whether the organization can increase its competence and absorptive capacity by buying it, for instance through hiring new personnel. The authors argue that organizations should not rely too much on this since, as earlier explained, absorptive capacity is largely developed in close relation to the firm-specific activities. Therefore, by nature, absorptive capacity needs to be internally developed. It is for instance said, that if a company buys technical knowledge there is considerable time lag and hardship to incorporate this knowledge.⁷²

Cohen and Levinthal argue that the characteristics of an organization's absorptive capacity will lead the organization to be more or less path dependent. This since, accumulating absorptive capacity in one period will increase the effectiveness of the accumulation in the next period. Therefore, having accumulated knowledge in one particular area will increase the ability to accumulate external knowledge in that same area in the future. A lack of early

⁶⁹ Cohen et. al, 1990, p. 132-133

⁷⁰ Cohen et. al, 1990, p. 129-131

⁷¹ Cohen et. al, 1990, p. 132

⁷² Cohen et. al, 1990, p. 135

investments in one technology can therefore result in organizations having difficulties in investing in that same technology later on, resulting in a lock-out.⁷³

⁷³ Cohen et. al, 1990, p. 137-138

4. Empirical data

The participants in this study consist of seven small integrators at the bottom of the pyramid. Even though they are all at the bottom of the pyramid they differ somewhat in size, what technology they use and where they operate geographically. The smallest integrator has less than ten employees whereas the biggest has about fifty.

Since our theories are closely connected and overlap each other a great deal, we have chosen to separate the answers received from the theories in this section. We will compare and relate the answers to the theories in the analysis section. To make this chapter a little more reader-friendly we have chosen to divide our questions into six blocks where each block consist of between three and seven questions. The questions in each group are somewhat connected which hopefully will make the text better and legible since the answers overlap. To get the most out of every interview we have decided to present the material from each one separately. We believe that this will give every integrator the space needed to describe their views and opinions as well as give us the opportunity of quoting them.

The first section consists of questions related to what the integrators do and have been doing in the past, what they think about the IP-technology, how they consider the future within the industry and their view on the eventual technology change. The second section deals with how the integrators acquire and generate knowledge, keep themselves updated on new happenings and act to stay competitive. The third section involves questions concerning how the integrators perceive their own ability to question their own work performance, constantly look for new better ways, take risks and spread and utilize information and qualities within the firm. The fourth section is about which qualities the different integrators regard as their most important and which ones they would like to improve. It also deals with if their existing knowledge is easy or hard to acquire and learn for competitors. The fifth section consists of questions related to the integrator's recruitment process and how they train and educate their new and existing staff. Finally, the sixth section of questions examines how the different integrators work, what the working climate within the firm looks like and how and if they store information to help them solve problems.

4.1 Company A

This company operates in the southern parts of the USA.

Section 1

Company A started off using both the analog and the IP-technology since they identify themselves as customer base driven. Currently the company is selling an equal amount of analog and IP-solutions. The main reason for this is that one of their biggest clients has not yet moved over to IP-technology but the respondent emphasizes that the customer is in that process. Company A pushes for the IP-technology in all of their new sales but that keep doing analog systems since there still is a demand for it. They prefer the IP-technology over the analog since it is more user friendly, accessible from virtually anywhere, can be placed anywhere and has more options. The respondent believes that the development within the industry will go towards the IP-technology. Since the company believes they have a good idea of where the industry is going, they are planning to hire more people that understand upper level programming.

He believes that the future development will lead to big integrators dominating the market since the smaller ones will not have the capacity nor the funds to keep skilled IP-staff that in general are more expensive. The respondent regards the history of the company as an advantage and argues that if it was not the company would not be in business for much longer. He believes that the development within the industry is driven by the producers since “the end users are not updated enough on the latest and greatest technology...”.

Section 2

To acquire and generate new knowledge Company A attends a lot of conferences, goes to software and camera training, does a lot of research and reads a lot of e-mails about new technology and equipment. Apart from these things, they have about five manufacturers a week coming in and updating them on the latest news. It is mostly upper management and sales representatives that are attending the conferences and doing the reading whereas the technical force and programming staff go through most of the training. On the question on how Company A is going to act to stay competitive the answer was “just keep on doing what we do, I mean we are not the cheapest guy on the block and we do not want to be, but we provide the best customer service and our customers understand that”. In doing this, he emphasizes that they refine and improve their processes and procedures internally every day

to get better but that they also keep their eyes open for new methods and technologies. The respondent also says that his company is open and willing to take in and adapt to procedures and methods that they have observed a competitor perform in a better way.

Section 3

The respondent believes that most people in the firm are constantly looking for new ways to do things but states that different people in the organization are looking at different things. The operational personnel are looking at the installation and integration of new products while upper management, sales and estimation focus on learning new things that are out there. He also states that the company is good at transferring and sharing obtained knowledge within the organization. This is mainly done through in-house training. On the question if the company is risk taking he says “Yeah absolutely, we always try new equipment, new opportunities but not at the detriment of our company...we will try something new if the manufacturer wants to bring it to us but we are going to try it in our lab before we provide it to a customer...”

Section 4

The respondent states that the most important quality of his company is customer service and that they would need to increase their upper level programmer individuals as the main thing to improve. He considers it hard for other companies to acquire and take in most of the knowledge his company possesses since “we have done some things that are leading edge that I know no other companies have done, in our area...and we did not learn those things by going to training and going to classes, we learned those things by hands on, putting them to test, figuring the solutions out ourselves”. His reaction to our statement saying that the old security integrators claim that their knowledge is the hardest to acquire meanwhile IP-knowledge is not very hard, was that his firm has an infrastructure background and therefore has no problem with that type of knowledge. He added that his company merged into the IP industry and therefore “unlike the majority of our competitors, we can build a certified network and build a certified access control or CCTV platform on top of that”. The respondent does not see any problem with the technology becoming more standardized and argues that has been the case for a while in different areas.

Section 5

In a recruitment process Company A considers internal drive and willingness to learn and grow as the most important qualities. These qualities are the most important since the recruit

can be trained and educated internally as well as externally. Their workforce is very standardized in how they do things which according to the respondent is what makes them stand apart. Apart from this they have a very low personnel turnover rate.

Section 6

The employees generally work in teams and the respondent describes the working climate as very open door policy where the “lowest man” can walk in to the president’s office and vice versa. He also states that there is a shared perspective on things within the company and that the employees have an ongoing dialogue on how to solve different issues and problems. The company has weekly meetings for this and store information on how to handle the different situations in databases.

4.2 Company B

This company operates in the southern parts of the USA.

Section 1

The company started off with the IP-technology but has later started to offer analog solutions as well. Today the sales are 95 percent IP and 5 percent analog. If a potential customer already has an analog solution, Company B is not very keen on approaching this customer “if their budget and previous position is on analog then I pretty much do not want to compete”. Usually when a customer is approaching the company they have already decided that they want an IP-solution. If that is not the case and they want an analog solution, the respondent says that they try to convince the customer to choose an IP based solution instead. Usually this is done by setting up a demonstration and show them the advantages of the IP based system, “...a live demonstration usually blows them away”. The respondent also states that the IP-technology has experienced double-digit growth in recent years and that the main reason for this is that the market for video surveillance has been growing where the IP stands for the majority of that growth.

The respondent believes that the industry will not necessarily be dominated by the IP-technology since there will still be situations where IP-solutions are not the best fit, such as the case of small retail location. The biggest part of the market will, however, support the IP-technology and the respondent believes more IP-standards will emerge. He believes that there

will be room for both small and big integrators but that “the domination will come from the major large integrators in the future”.

The respondent argues that the main reasons for the slow adaption towards IP-technology are the cost and complexity, the customers’ lack of knowledge about the IP-technology and the lack of integrators taking on the technology. He states that “any end-user looking at the two systems would prefer to go with an IP based system but the cost of it and the complexity of it today are big prohibitors... the traditional CCTV vendor has been very slow to embrace the technology and they are scared of it”. The respondent does not believe that the IP-technology is locked-out by the analog technology. Rather he believes that the growth of the IP-technology will be slow and steady and that the growth within the industry will come from the IP-technology in the future. Company B believes that the history of their company is an advantage since the whole workforce comes from the IT-world. The changes within the industry are mainly driven by the producers but the customers also have a role in this change since they demand specific solutions. “The industry is staying ahead of the customers...”. The respondent says that it is particularly the big customers that are of importance to his company since they often already have the IP infrastructure.

Section 2

The respondent states that their knowledge is primarily acquired from the distributors or their manufacturer vendor partners. It is also these players that keep the company updated on the changes within the industry. He believes that to stay competitive they need to deliver solutions fast and cost effectively to their customers. More importantly, he argues, “the key is just to get out there and show the technology to the industries that have not seen it before”.

The respondent argues that the company rather refines its existing skills than explore new ways and methods. He adds that there is not really much room for learning from other integrators in their area since there are not a lot of competitors. This discussion leads him in to saying “... we are usually the innovators”

Section 3

On the question if the company is good at constantly looking for new technologies and taking them in he argues that “there is such a high demand for what we are doing already that we really do not have the time...”. New information and knowledge regarding new technology and products are collected from external sources such as distributors. This information is

mainly acquired by some specialists within the company such as project managers or network engineers that later on inform the rest of the company. He believes, however, that they are good at critically evaluating and questioning their work performance as they are “...constantly measuring our metrics in terms of installation times, man hours used, the margins that we are generating and customer satisfaction”. They are constantly trying to improve how they use the qualities and knowledge of the staff and spreading that knowledge. He continues by explaining that the individuals working there need help from their colleagues and therefore are willing to share and spread their knowledge to others.

The respondent also argues that the company is risk taking and that this is essential in their industry since “the harder the job, the more difficult the project is, that is typically where we want to compete because we find fewer competitors and we can drive larger margins”.

Section 4

The respondent argues that their most important qualities are their background and history, their knowledge of IT and that they are a part of a larger company which can make them provide a bigger part of the total solution. This is said to be unusual within the industry. In his view the qualities which they need to improve the most are their delivery and efficiency. He also means that most of the knowledge his company possesses is not hard to acquire because “...the skill-sets are out there, they are not hard to acquire, but you have to be willing to pay the money for them though”. He also states that within the traditional CCTV world they are not willing to do this.

Section 5

In a recruitment process Company B generally looks for someone with an IT background that has the aptitude against the IT technology, but also people that are curious, willing to learn and willing to make field work. Explicitly they look for people with similar personalities as those already working at the company. He also argues that since they are a pretty small company the individuals working there have more of a general knowledge rather than being specialized. Newly employed people are usually sent to training at the manufacturers but also follow more senior people at different projects when being trained and educated. The personnel turnover rate of Company B is low and the employees are described as being pretty autonomous.

Section 6

The employees of the company generally work in teams and the working climate is described as “very fast paced”. The organization has been fairly flat but they are “trying to make it more hierarchical so that we can scale”. The respondent also means that colleagues share the same perspective and that there is a constant ongoing dialogue on how to solve problems in a work set. The company encourages their staff to speak up and rely heavily on everyone’s input. They also have a weekly meeting where they can discuss different problems and ideas. The company is also trying to get better at documenting their work but accomplishing this is very dependent on the project manager and the people working on that particular project. For this reason, this question has been a high priority. Creating a system where the company can store information is considered very important since many of their customers are not so IT savvy which means that they rely heavily on the company when problems occur.

4.3 Company C

This company operates in the northern parts of the USA.

Section 1

Company C started off in the security business about 40 years ago and has been with video surveillance ever since it first became cost efficient to use. The respondent has been working at the company for 3 – 3,5 years now and has noted significant changes during this time. When he started, the security industry and the video surveillance industry were almost separate and advanced at a different rate than the IT- or Computer-world. Now, as the cameras are focusing more on the IT-world, the security world is getting in line with that and advance at about the same rate as the IT-world. This means that products last a lot shorter time than they used to do before they become obsolete.

Nowadays the company supports both analog and IP-systems. The IP-technology stands for about 80 percent of today’s sales but the figure is continuously increasing. The respondent believes that the IP-technology will take another 5 percent from the analog technology in the next few years but after that he believes ”that it is going to hang there for quite a bit until the lifecycle of the analog technology dies and gets replaced”. The reason the company is still supplying the analog technology is because of existing customer bases that is too big to switch over to an IP-solution. As an example of this he mentions a big airport where they have

installed every single one of the about 1300 cameras. For new sales the company promotes the IP-technology. They do this either by not mentioning the analog option or by discussing the advantages and better features of IP. If a discussion does not convince the customer, they often bring in and show them a demonstration. The company serves all customer segments but has a main focus on the governmental sector since this sector continues to push forward and spend money despite the present economic situation. Another reason for this focus is that they have an understanding and acceptance of the advantages of the IP-technology.

The respondent thinks there is definitely room for both small and big integrators in the future but he believes that the biggest determinant of who is going to dominate is where the integrators' mind sets are. Integrators that have not adopted the IP-mind set will probably not survive. He believes that the slow adaption rate to the IP-technology, even though a lot of people in the industry think it will be the winning standard in the long run, partly can be explained by territorial issues. By territorial issues he means that "old school" security directors feel threatened to get replaced by an IT-manager as the technology changes and because of that have been reluctant to change. Apart from this, what will determine the pace of the development towards IP are the customers and how willing they are to change, organizational issues connected to the territorial threat and the size of the system where the dollar figure plays in. Company C says that their history and understanding of the business is quite an advantage today. The respondent thinks the development in the industry is driven by both customers and producers but if he had to choose between the two he thinks the producers are a little more driving.

Section 2

The respondent says that his company acquires and generates knowledge in several different ways. They invite quite a few manufacturers to come in and talk to them and the respondent estimates that he has seen about twelve manufacturers so far this year. Apart from this the company participates in a lot of trade shows and events. The most important way, however, is trial and error. To stay updated Company C also tries to participate in more general organizations that are specific to their area. The main reason for participating in this organization is to understand what the members needs are.

On the question how the company acts to stay competitive the respondent says it has got to do with acquiring knowledge. He adds that recently Company C has been the most competitive through adapting to the IP-mind set quickly and gaining a greater knowledge about these

systems by implementing them at an early stage. This experience has helped Company C to cut the learning curve of many late adopters that are currently experiencing the problems with IP-technology that Company C had several years ago. The respondent says that the company is primarily trying to “improve the skills that we have today because if I said explore new ways and methods, that is an answer I would have given a couple of years ago when we were still trying to find our way in the dark, but I think we have found our way and now it is really about refining those skills...we are definitely not a responder so it is definitely an ongoing process”. He considers the company being good at taking in new ways and methods that have been observed since it is a relatively small company where you do not have to go through a senior staff member to be able to accomplish a small change.

Section 3

On the question if Company C is constantly looking for new things and new ways to do things, the respondent says “Yes we are...we believe that is what keeps us at the forefront of that technology change and that is our largest competitive advantage right now”. Most individuals within the organization participate in this but they have some guys that are more conservative and have been doing and selling the same things a very long time. He considers it essential to be a risk taker in this industry since it is the only way to learn and stay in the forefront of the development. The respondent also believes that his company is good at critically evaluating their own work performance. When it comes to spreading knowledge within the firm he considers the company being good at it but says that there is always room for improvement. He adds that they have no formal process of doing it. Instead it is customer directed where they will get projects and pair up appropriate individuals to work on it.

Section 4

The most important qualities of Company C according to the respondent are the history of the company, the flexibility to adapt to new technologies and that they are at the forefront of the adoption process. He believes that they do not take advantage of the market as much as they should. This is partly explained by the fact that they are a small company and therefore do not have a large number of people to send out and spread the message. On the question if the respondent thinks the knowledge his company possesses is hard to acquire and take in he says, “No, I do not think it is difficult to do but I think it takes time and resources, the people that came from the security world that are trying to transition in to IT... they may understand the security portion of it but to actually put these systems on the network and understand that,

it takes time and money to learn that...going back to what I said one of our strategies is, we look for opportunities where we can stop that process". Since Company C has been in the industry for a very long time, they have both the security knowledge as well as the IP-knowledge. When comparing which one would be the hardest to take in and learn the respondent argues that both types are equally easy/hard to acquire. He adds that his company is still learning lessons in both areas every day. He does see the standardization of the network technology as a little threat but believes that the benefits of what it would create will exceed the threat.

Section 5

When talking about what Company C looks for in a recruitment process, the respondent says they have done it in both ways. They have hired people that have been in the security world for a long time as well as people from the IT-world with no security knowledge. He considers this internal mix of different knowledge and types of people a success factor. The most important quality, however, is being flexible. The employees in the organization are mostly specialized in their knowledge right now but the long term goal internally is to spread the two different types of knowledge throughout the organization. Company C focuses a lot on hands on training but do also let their employees participate in classes, trainings and certifications offered by different manufacturers and producers. The respondent considers the staff being autonomous in their work and says that the company generally does not have a high personnel turnover rate. Lately, however, due to that the company is changing, the turnover rate has been higher than usual.

Section 6

The employees at Company C generally work in teams that are created for a special project or request. The respondent considers the individuals in the firm to have the same vision and for the most part also the same perspective on things. He describes the working climate as open even though the organization is relatively hierarchical considering its size. He adds that the open climate might not be communicated that well within the organization and therefore argues that people will find it out when they are trying new things. The respondent believes that it takes some time for a newly hired person to become socialized into the values and beliefs of the organization. The company has got an ongoing dialogue between colleagues on how to solve problems. Every department also has a weekly meeting where they discuss

issues, problems and new ideas. Company C is currently implementing a new database where they will store and share information.

4.4 Company D

This company operates in the eastern parts of the USA.

Section 1

The company started off only supporting the IP-technology and has never considered working with the analog technology as well. The career of the respondent, however, started at a firm supporting analog solutions. The company considers themselves being three years ahead of their competitors and they can design and deploy a whole system. The company does the design of the systems in-house but hires people to do the actual installation. By doing this they can keep their costs down. The respondent argues that they usually motivate the usage of an IP-system with the advantages in terms of functionality, low maintenance costs and the scalability of the system compared to an analog system. They always offer a live demonstration but more often the customer just wants to have a discussion with them. The respondent also mentions that there is a high demand for the company's services since more and more end-users want to use IP-technology. At the same time the security industry is "really kind of holding on to those last breaths of the analog world". When discussing the future within the industry the respondent argues that there is no future for the analog technology, "Analog is gone. I do not really see a use for that, I cannot think of any functional use for the analog in the future". He also means that slow adaption towards the IP-technology is mainly due to "the old school guys" that are working with the security in companies. He argues that these do not have the necessary IT knowledge and that "...they did not grow up with that knowledge" which make them keep the analog systems.

The respondent argues that it will be hard for smaller integrators in the future. This because they will not have the money to go over to the IP-technology since this requires buying more expensive material before you can actually gain experience in the IP-technology and thereby acquire and generate necessary new knowledge. When discussing whether the IP-technology may already be locked out he argues that this is not the case. Rather, he means that those companies who were early adopters to the IP-technology have important advantages that will be hard to catch up with for those other companies that were late to adopt the technology. He

also argues that in the past, the security side had a big influence on the standard within the industry. Nowadays IT directors and other customers are determining what their companies want. This means that the industry, now, is more driven by the customers and the respondent believes that it will speed up the technology shift. He gives examples of how customers often visits different producers' homepages and thereafter turn to his company with a request of a camera or system they have chosen online, "...they really kind of initiate the conversations with us". The respondent also argues that the market right now, with a technology shift approaching, is not as interested in "...these older security guys" but instead more interested in younger people with IT knowledge. He sees this as an advantage for his company. The respondent mentions that his company at the moment mainly is focusing on customers within municipalities, law enforcement and education since the commercial side has been hit hard by the economic crisis.

Section 2

The company acquires knowledge through manufacturer training, partners, attending conferences but especially from their own experience. It is by doing these things the company can keep itself updated on new happenings in the industry. They stay competitive by keeping their costs down, "not spending it on people and things" rather having a good credit line for spending on big projects. He argues, that they are always looking to explore new ways and methods to enhance their systems, "what did we do badly today, how can we get better tomorrow". Another important aspect is to focus on training their customers to maintain their network which is a good revenue source for them. They also try to change their way of doing things when they see someone doing something particularly good. To keep the performance gain they try to make it a standard within the company's work.

Section 3

All of the people in the company are trying to find better ways of doing things, but in general it is the business owner (the respondent) who drives the changes. He says that "there are plenty of case studies, plenty of white papers and plenty of opportunities where we can learn from someone else's mistakes..." and that "I spend over half my day looking at stuff on the internet that may or may not be something that we can use in the future".

The company is constantly evaluating and questioning their work performance and the respondent considers their ability to be risk taking as a great advantage. He emphasizes that

there is currently not a lot of risk taking in the industry, much because of the security guys. He argues that a lot of the risk taken is connected to the technology development and that this is done mostly in-house.

Section 4

The company's most important quality is the people but the respondent also says that it is the quality that they need to improve the most. Two of the things he said during this discussion was "everybody here is charged with making profit, if you do not make profit you cannot be here" and that "the worst problem we can have is not having the right person in front of that customer at any given time and that can damage a small company". In his view the knowledge of his company is easy to acquire. What is necessary is time and resources and it is also argued that you need "... a general understanding of how technology works on a network...". He adds that "...the knowledge is really simple to acquire, they are just lazy about acquiring it". The respondent continues by arguing that generally people in this industry avoid the IP-technology since "they are afraid to break it and not know how to get out of it". In connection to this he argues that the analog security people often have a good knowledge of camera lenses, lighting and placement. This is not always the case when considering an IP integrator, although he considers his company possessing knowledge from both sides.

Section 5

When hiring new people, they look for people with a passion towards small businesses in general and towards the IP-technology. They need to have the urge to learn "...not because they want to get rich...or find a bigger job down the line". The respondent also stresses that these individuals should not be afraid to speak up, be progressive and be problem solvers. Typically these recruits are former business owners. All of the employees are specialized in their knowledge and the respondent considers them "totally autonomous" and adds that "it takes about a month typically for someone to be out on their own". The personnel turnover rate is said to be low.

Sections 6

The individuals in the company generally work in teams with an open working climate. It is said that "you can say what you feel and you can drive your own ideas which is very important but it is also very demanding". They have weekly meetings discussing problems, issues and ideas. The respondent also argues that everyone has a shared perspective and

stresses the importance of this, “everybody has the same vision they just would not work with somebody who had a different goal”.

4.5 Company E

This company operates in the western parts of the USA.

Section 1

Company E started off working with the analog technology but is currently supporting both systems. IP stands for about 80 percent of their sales and it has been like that for about two or three years. About five years ago the relation between IP and analog sales were 50-50 and about seven years ago the analog technology accounted for about 75 percent of the sales. The reason Company E is still supporting analog solutions is because there are still customers that have analog solutions that do not want to change.

The region where Company E operates is very technology driven and likes to be the first to adapt to new technology which means that new technology often comes to this region before it comes to other parts of the country. This makes it fairly easy for the company to convince customers to choose IP over analog. He adds “for us showing a customer an analog camera versus an IP-camera there is no comparison, the IP quality is just so much better...IP is still a little bit more expensive but there are so many more advantages...especially because our focus of customers is typically more a Fortune 500 type of a customer, so there is going to be multiple buildings and multiple campuses...makes it much easier to sell IP...”. The company often brings a potential customer with to an already existing one, so that the potential buyer can see how a system works in real life.

On the question concerning the future development within the industry, the respondent is not entirely positive towards the IP-technology since there still are some things to work out. Examples of such things are individual camera driver standards and integration into access control. He also identifies some potentially unnecessary features that he argues is not needed by most customers, such as people tracking and facial recognition. He is, however, not sure what the next turn in IP video is going to be. As a concluding thought he says, “IP video I think is here, I do not think it is ever going to go away, it will only get better”.

He believes that there will be room for small integrators in the future as well. The respondent argues that in 1999 and 2000 the trend was that customers preferred big integrators over small. Since then the trend has changed and nowadays small integrators are preferred in many cases. The reason for this is that small integrators can choose any partner they want for big projects or projects in a different location whereas big integrators are tied to their “sister offices” even if that particular “sister office” is not very good. The respondent believes that the reason the industry has been so slow to adapt to the potentially superior IP-technology is because of territorial issues. As long as the cameras and systems are analog the security manager will be in control but they feel that they might lose this control if their company switches to IP. This since they do not have the required knowledge about IP and therefore might lose their job to an IP-manager. The respondent does not, however, believe that this situation is applicable in his region since IP is pretty dominant there already with about 80 percent of the video surveillance market. He does not believe that the analog technology is locked in, preventing the IP-technology from gaining a footing. In his view, the rest of the country will probably need another five years before the development moves towards more usage of IP-technology. The critical issue is that the people in the other parts of the country do not spend a lot of time on IP, which makes the progress slower. He sees a tendency that the integrators are not changing and the customers are not changing and until someone takes the first step towards a change nothing will happen.

The respondent considers the history of the company being an advantage. In his view the technology change in the industry is driven by the integrators. After the integrators have taken the first step and introduced something new that is working, the consultants “jump on it”. After getting two or three bigger customers the rest of the crowd starts following. On the question if they have any customer segments that are particularly important and if this affects the way they look at technology he says “Yeah, our core customer is a Fortune 500 type of a customer and those guys usually want higher technology even at a little bit more of a cost because they understand the efficiency that the technology with-bring and a lot of times the security managers in our area kind of compete against security managers at other companies and they like to have something bigger, better kind of bragging wise, so if we build something really cool for one customer, we try and get other customers to go see it because then they will want to top it...”.

Section 2

Company E acquires and generates knowledge by doing a lot of training and going to a lot of industry shows that a lot of their customers and manufacturers are at. Apart from this they choose a couple of manufacturers and pick their best products. They choose these products mainly based on quality and perceived easiness to sell. To stay competitive Company E is always looking for the next technology and the next thing that nobody else has stepped in to yet. The respondent adds, “early on with some of our better manufacturers we have learned to not be too fast to get on it” and that they often try to “buy it and play with it here in the office and then once we find something that differs that we think is going to be the next leading or at least something that our competitors have not jumped on that is viable, we try to get on it early and try to sell it as much and as fast as we can to get as big of an advantage over our competitors as we can”. This exploring process is described as continual and the respondent concludes the discussion saying that right now with the current economic situation cheaper is better but generally, “We would rather lose a job on price than to have lost it on quality, we would rather not put something in inferior just to have won a job”. The respondent says that if the company sees anything that looks particularly good at a work set that a competitor has done, they are not afraid to “steal” that idea. He adds that this can happen when they get calls from customers that want to change integrator for various reasons.

Section 3

In the respondent’s view the employees are constantly looking for new ways to do things. The company does not have a specific individual or group assigned for this task but the respondent says that some guys are better at it than others. He also adds that the company and the employees in general are good at critically evaluating and questioning the work performance but that some individuals within the company are better at it. The respondent believes that it is essential to be risk-taking within the video surveillance industry since you do not want to be just like everyone else. It is also an opportunity for the company to differentiate themselves and thereby justify charging a little bit more than others. Company E considers themselves being good at using and spreading the knowledge within the organization but thinks there is always room for improvement.

Section 4

In the respondent's view the most important quality of the company is long time customer focus. He says the company tries to be a good consultant to the customer and sell them the best product instead of making the biggest sale. The respondent thinks the company sometimes has to get a little better at finding ways that are a little less expensive especially with the economic situation that we are in. They do not, however, want to cut quality just to be able to cut costs.

On the question if he considers the knowledge the company possesses as easy or hard to acquire and learn he says, "I would say both, it is not hard to acquire because it is plenty of people in our area out there that have the knowledge, I would say if the people running the offices of our competitors are not comfortable with that technology it is probably going to be hard for them to hire the right people and feel like they are getting the value out of these people because they somewhat have to understand the technology and what it is doing and they have to be able to sell the right products to take advantage of those people". When discussing the standardization of the technology the respondent says that there is a side of it that they do not like since it is becoming easier and easier which means that it becomes harder and harder for them to differentiate themselves.

Section 5

Company E has a good mixture of guys from different companies in their staff and this means that they often hire an individual that someone at the company knows and can recommend. Apart from that they generally look for a personality that fits in and sometimes also a certain skill-set. The employees within the organization are generally possessing general knowledge but they do have a few guys specialized in software and in databases. To develop their employees, the company sends them to manufacturer's training, Cisco or Microsoft training but they do in-house training as well. The staff is relatively autonomous in their work but the company has its standards and requests their employees to do things by those standards. The personnel turnover rate is very low since they for the most part hire people they know and have worked with in the past.

Section 6

The employees of Company E generally work in small teams under a project manager. The project manager can move people around in those small teams. This has the advantage of

making people perform tasks the same way since the teams are split up every now and then. The respondent describes the working climate as pretty positive. He says that their employees are relatively happy since they have been able to work almost full-time every week compared to many competitors. The company has been investing a lot in training and education during this period which has been appreciated. The respondent feels like they have a shared perspective within the organization where they all have the same goals. New recruits tend to get socialized pretty fast since they are a relatively small company. He describes the organization as very flat. Company E has an ongoing dialogue between colleagues on how to do things. They share and store information through handbooks, drawings and notes. They also have “cheat-sheets” that they keep as a word-file and on a ftp-site. The company also has weekly meetings with its employees.

4.6 Company F

This company operates in the western parts of the USA.

Section 1

The company is a “full integrator” of IP-solutions with its core markets in the agricultural industry. The reason the company choose to support and work with the IP-technology is mainly because the company has a history in the IT industry but also because they think the IP-technology is better. They supported analog solutions as well for a while but as more and more people started to choose the IP-technology it made no sense keeping the analog. The respondent argues that when customers got an explanation of the two competing technologies, each technology’s advantages and disadvantages and got to see a live demonstration “...it became kind of a no brainers to which one to purchase for our customers”. The biggest advantages of an IP-solution are its ability to work wireless and show high quality pictures. The respondents also argues that there are those analog cameras that can show pictures of good quality but that these cost as much as an IP-camera and therefore it makes no sense choosing this technology.

The respondent argues that the industry will only use the IP-technology in the future. He says that as more and more products become digital and connected to different networks it becomes more obvious to have IP video surveillance as well. The respondent believes that there will be room for both big and small integrators as, in his view, the big players are only

focusing on the major customers and missing out on the smaller ones. In his view the slow adaption can be compared to that of when the CD took over from the tape in the music industry. This took quite some time and he thinks this will be the same for the IP-technology in the video surveillance industry and this explains why the analog solution still dominates. He does not believe that the analog technology is locked in and that the IP-technology will not gain a footing in the industry. He further argues that the history of his company is an advantage when taking in new technology.

In the respondents view the technology shift is largely driven by the customers and he says that “sometimes I do not think the producers are listening”. His company is not trying to concentrate on any specific segment since “if you prioritize any particular market, then you miss out on big segments and big revenues generators”.

Section 2

Company F acquires knowledge by going to different large trade shows and trainings that are offered by the different manufacturers, “the trade shows are a good way to keep on top of the emerging products and the trainings are a good way to make sure you are getting the knots and bolts of the products you integrate”. By staying on top of emerging technologies and sticking to their core, the networks, the respondent believes that his company will stay competitive. He believes that some integrators will be out-competed since they are not supplying the whole IP-solution. The respondent argues that the company needs to both refine their existing skills as well as explore new ways and methods. If he had to choose between the two he thinks it is more important to concentrate on refining their skills, “if you cannot do what you need to do today, you cannot handle tomorrow either...” He also stresses the importance for the company to be able to change and adapt to a better way if they find something that a competitor does better.

Section 3

The respondent says that his company is good at always looking for new ways and methods and adapt to these, “...we always have our eyes out there”. He stresses the need of having everyone in the company looking for new ways and methods, even newly hired personnel, “just because you are the new guy that has been here for two and a half months does not mean that you cannot find something worth looking at, or have a good idea”. He also believes that his company is good at evaluating their work performance which is done in an informal way

and on a regular basis when working on different projects. The company needs to get better at spreading the knowledge of the individuals between the company's different divisions but the respondent says this works well within the divisions. When talking about whether his company is risk taking or not he says they are careful "we try not step in the mud, so we spend a lot of time testing and researching stuff here in our lab areas long before we put it out to a customer".

Section 4

When considering the company's most important quality the respondent says that it is the people of the company, "...this company very much so understands that people that are doing the job everyday are its' most important assets and through that we have hired, then empowered some very talented people to make things happen".

He believes that most of the knowledge in his company is not so hard to acquire if you have a background working with network technologies. He takes himself as an example and says that he had not worked with video surveillance four years ago, "...for me it was not that hard to come in and spend some time to learn video surveillance...but I think that someone who has done analog video surveillance would have a very hard time stepping into the network arena". The respondent also believes that it is hard to take in the knowledge possessed by the analog integrators for some IP integrators but adds that it is perhaps even harder for analog integrators to learn the IP-knowledge, "I would challenge any analog guy with no network experience to come build that (considering a 30 frames/sec, full resolution IP video surveillance network) and build half of it on a wireless network". He does not see any threat in the technology becoming more standardized and rather considers the technology as already standardized.

Section 5

When hiring new people the company tends to look for people with an IT/IP background but even more important is that their personalities fit the company. This means a personality that is similar to the ones already working for the company, "...we have success based on the formula we have and the people that have been here for a long time so if it is not broke do not fix it". The training in the company is mainly conducted through "trial-by-fire" where the new recruit is stress tested in the beginning, "I figure that if they cannot make it past the first six months here then they were not the right hire". This can be done either at in-house projects or

out at customers. After six to nine month they start to involve the employees “in going to manufacturers training and that sort of things”. Most of the people are specialized in their knowledge and quite autonomous in their work, “...we try not to micro manage” but he stresses the importance of communicating all the time. The company is also said to have a quite low personnel turnover rate.

Section 6

Most of the time the employees work in teams but they do have individuals working on their own. These individuals, however, still have discussions about different solutions with other employees. He describes the company as hierarchical but “...it is pretty grey hierarchy so it looks pretty flat”. The working climate is said to be good with a good moral and happy employees. This is stressed to be of importance when trying to get satisfied customers. He argues that they do not always have the same shared perspective when looking at different questions and problems but that this is mainly positive. He adds that otherwise they would “...miss out on opportunities to implement new technologies...”. He gives an example of how his team recently built a solution where they had different views of how to build it all throughout the project. The end-result, however, turned out really good and the system has been “rock solid” since then.

When answering the question whether Company F has sources of stored information telling employees how to solve problems, he answers that they do have a database. The information is, however, fairly restricted to networking rather than to video surveillance and he adds that the company rely more on their experience. The managers at the company have a monthly meeting but the rest of the employees have more spontaneous meetings where “...pulling our chairs out in the isle of the cubicles...” is common.

4.7 Company G

This company operates in the middle parts of the USA.

Section 1

Company G started off with the analog technology and have since then switched to use more IP based solutions. The company currently works with both the analog and IP-solutions where they provide total solutions to the end-customers. Today IP-solutions constitute about 75-80

percent of the total sales. The respondent says that the percentage rate of IP is increasing every year which the company has been anticipating since five years back, "...it seems like this year all or at least the majority of the stuff that we are clothing is IP based...".

When selling a new system to a customer they try to see what kind of budget the customer has, "...if there budget is extremely, extremely tight and they only need a few cameras, maybe eight or less, then typically we push toward a very low-end DVR solution with analog cameras". Often, customers contact Company G telling them that they want an IP-solution, "...a lot of times the customers will tell us they want an IP-solution with mega pixel cameras, they want exactly what they see on CSI..." but often the customers do not have the budget for this and instead they have to get a cheaper solution.

When looking into the future, the respondent believes that there will be fewer developers providing the integrators with the whole system. Instead he argues that the development is going towards more specialized players, "everything turns to an open standard to where you can pick and choose the components of the systems from a manufacturer that best fit your needs...". He gives an example of how his company chose a certain system giving them the opportunity to choose between hundreds of different cameras from different manufacturers "...depending on the exact setting of what that camera was suppose to do...". He believes the future will bring products with much higher technological performances. The respondent thinks there will be room for both big and small integrators in the future and adds that those smaller integrators who have not already moved towards the newer technologies will have difficulties staying competitive. In the respondents view mergers will become more frequent within the industry. These mergers will primarily be between bigger integrators but the respondent believes some smaller integrators will merge as well. This development is something that Company G is looking in to continuously. He mentions that one problem for smaller integrators in doing so is that their financial statements often are not available.

One important reason to why the adoption of the IP-technology has been slow is that many integrators have been slow to pick up the technology themselves, "...it is a major commitment and it requires a financial commitment on those dealers to get all the people certified and trained at a new technology...and if the dealers are hesitant to pick up the newer technology, certainly they are not going to push that to the customers". He also states that this shift will be faster now since "...the end-users are also becoming more (IT) savvy... and we are starting to see a shift from a traditional security director more towards the IT-person taking on some of

those responsibilities...”. When discussing whether the analog technology already is locked in he says that he does not believe so. In his view, contrary to the access control systems, it is possible to use the existing video surveillance infrastructure and put on more IP based parts. He also believes that the shift can be quick since even “old” core analog producers are beginning to produce IP based solutions.

The respondent considers his company’s history being both an advantage and disadvantage when taking in new technologies and work routines. He argues that all companies have some people being resistant to change, and within his company he gives an example of “...old-school people that have been with us for twenty-plus years...” but adds that these individuals also have some very important knowledge. In getting these people to accept newer technologies he says it is important to be clear with where the company believes the future will be and why they are doing the things that they are doing.

In his view the industry is driven by the producers, the integrators but also the customers. The part with most influence is said to be the integrators since it is their job to inform the customers which technology is out there and what they recommend. Thereby they have a very direct influence on the industry development. He also mentions that he recently has seen examples where IT-personnel at companies, within other industries, buy and install cameras for their companies. He adds that this often “...backfires on them”, but points out that the customers as a group is becoming more influential. He claims that his company does not consider any specific customer segment more important since the segment with the best purchasing power differs from year to year.

Section 2

Company G acquires knowledge through their employees which they also consider their biggest asset. They send them to training to keep them updated on all the latest within the industry. The company is constantly looking for new solutions which will be of value for the customers in the future. The company tries to develop an early relationship with manufacturers providing and supporting new technologies. The respondent believes this can give them an advantage in the long run. They try to stay out of the bid market since it is brutally competitive.

The respondent says that the company is both trying to refine existing skills as well as look for new things. He emphasizes, however, that continually looking for and implementing

change and renewal is considered the most important. He exemplifies this by saying “five years ago we saw technology going from analog solutions to an IP-solution, so we had to go out and actively change the products that we were selling and get all of our technicians and new products certified, new methods of installing...we are continuously looking for those changes to come still today for the future, I mean to think that this is the way it is going to be forever is kind of ignorant and you have to continuously think that things are always going to be changing and you will have to be willing to change with them or you are going to be left in the dust”. The respondent says that his company is always looking at what their competitors are doing and are willing to take in something a competitor has done better.

Section 3

As mentioned above, the company follows what their competitors do but they also follow the manufacturers to make sure that they are developing and responding to change. The respondent considers this crucial if you do not want to be left behind like Pelco. The company has a group of three to four people that have it as a part of their job to look for new methods and things on the market. Company G considers itself being good at critically evaluating and questioning its work performance. The respondent explains this by saying “the key that make us good at doing this is the people that we have doing this are very open to that key word again which is change...”. In the respondent’s view, Company G are pretty risk taking but he adds that they always have some “safer” solutions as a backup to fall back on if the solution they are trying to change to fails.

Section 4

In the respondent’s view the company’s most important quality is the ability to change and constantly look for new changes. He thinks this is made easier since the company is small and has a decentralized decision-making-process. The respondent argues that the company has done a good job in getting their technical staff network-certified. Even though this is the case, he thinks they need to improve their technician base so that they feel more comfortable in a networking atmosphere since “new” IT-players are very good in this area. The respondent believes that it is easier for a traditional security company like Company G to acquire the knowledge from the IT-side than vice versa. He states, “I think it will be easier for us to gain that knowledge than to have the networking companies’ technicians try to understand and learn security and access control, video surveillance possibly, you know video surveillance is not as tricky, but once you get in to large security, integrative security and access control

systems the knowledge that the technicians from the old school security companies have in those systems is much more difficult for networking companies to acquire than it is for us to go out and acquire their knowledge”. The respondent sees the standardization of the technology as a positive thing for the end users whereas it could be seen as a bad thing or threat for the integrators. He adds that even if it is a threat you will need to have the knowledge from the internal employees to be able to supply a total solution.

Section 5

When hiring new personnel the company looks for “...motivated people that have the drive to go out and learn and are willing to accept change”. They want people that have different skills and personalities since “...those different ideas and those differences are going to increase the communication and conversation...you do not want everybody to think the same way or be the same way because it is not a good mix”. People tend to have more specialized knowledge on the less senior positions within the company whereas the “higher” up you get in the organization you tend to have more of a general knowledge.

Section 6

The employees generally work in teams as the company tries to be team-oriented. On the question if the company has handbooks, databases or other sources of stored information it is said that they have some guidelines in handbooks and some databases suggesting different systems depending on the variables you put into the system. He stresses that this only works for less advanced solutions, when considering more advanced ones “...you really have to rely on the inherent knowledge that lies in the brains of our senior technicians”. The respondent argues that they do not have many weekly or monthly meetings where they discuss problems and ideas. Rather, this is done more on a continuous basis. The working climate within the company is described as very open and they always encourage people to think “out of the box”.

5. Analysis

In this chapter we will analyze the data collected through our interviews. To be able to do this in the desired areas and relate this back to the theories we have been using, we will have to shortly summarize the relevant parts of the empirical data. Since our theories are overlapping it was not possible to structure the analysis section in the same way as the empirical data chapter. Instead, we have focused on separating the theories as far as possible and use the overlapping parts to link them together. We hope that we by doing this have succeeded in creating a red line throughout the analysis chapter.

5.1 The integrators and the future development within the industry

Out of the seven integrators interviewed, three started off working with the analog technology, three started off with the IP-technology and only one company started off supporting both technologies. Worth noticing is that all the companies are currently supporting the IP-technology. There are only two firms that are exclusively supporting the IP-technology and none that are solely working with the analog technology. Six out of the seven firms interviewed state that 80 percent or more of their sales today come from the IP-side whereas the remaining one says that they sell an equal amount of both solutions. All of the participants state that they in the past three to five years have, and still are, experiencing increasing IP-sales and that they expect this development to continue. They all expect a strong development for the IP-technology in the future but they express this belief somewhat differently. Some think the analog technology will die/be replaced completely whereas others think both technologies will still exist but that a majority of the market will belong to the IP-technology. Interesting to note is that three of the respondents argue that the main reason to why they still sell analog solutions is the fact that some of their bigger customers have not yet switched over to the IP technology. The main reason to why these big customers have not yet switched over to the IP-technology is that they have invested heavily in big analog solutions that would cost millions of dollars to replace right away.

Since most of the respondents are very positive towards the IP-technology, they believe IP will play a big role in the future. They do not, however, have the exact same view of what is going to happen. About half of the respondents believe that the development will go towards the IP-technology but are pretty vague in their statements. The other half expresses a very clear belief of the IP-technology dominating or even replacing the analog technology. Interesting to note is that two integrators in our study do not have a specific customer segment that they regard as more important. This since they argue that they would miss out on

opportunities to make profit since the segment with the best purchasing power changes on an annual basis. The four remaining integrators focus either on big customers or on the governmental and state sectors. There are mainly two reasons for this, these two segments have to a greater extent been able to continue to push forward and spend money despite the present economic situation and are said to possess a general understanding and acceptance of IP-technology. Several respondents state that the commercial side has been hit hard by the ongoing economic crisis. In our view, these answers either show that the economic crisis has resulted in a greater focus on the governmental and state sectors or that this has been the case for a long time. The fact that the USA is a very large country and that each state to a certain extent is independent means that the governmental and state sectors constitute a very large market. According to us, the probability is high that the integrators have realized and taken advantage of the potential of this large market at an early stage. This would imply that the economic crisis has only resulted in a bigger focus on this sector. Numerous respondents argue that the IP-technology is an advantage when considering big video surveillance solutions including multiple buildings and large campuses. Based on this, it could be argued that the integrators' focus on large companies and the governmental and state sectors has positively affected the learning process of the integrators as well as increased the acceptance and usage of the IP-technology.

To sum this discussion up, it can be said that all of the responding firms are very positive towards the IP-technology and have a strong belief in it. Even though they operate in different regions of the USA, they have all witnessed a change within the industry with the continually increasing IP-sales. We believe that, the fact that all the responding firms, regardless of where they operate, have seen these changes, is a sign that the IP-technology is gaining ground relatively fast and that an increasing amount of customers as well as integrators are realizing the benefits of it. It should be noted, however, that there are some variances over the country. For example, there is one integrator from a well-known and historically IT-savvy region stating that the IP-technology already stands for 80 percent of the market in his region. This can be compared to another respondent, stating that they do not have that many competitors in his region. This comment and how it was expressed makes us believe that the IP-technology has not gained nearly as much acceptance and usage in that region yet.

The positive attitudes and the strong belief in the IP-technology from the participating integrators have made us wonder why the development towards more usage of the IP-technology has been so slow and why the analog technology still dominates with about 80

percent of the market shares. In our view this development can be explained by two different scenarios.

The first scenario is that the industry as a whole is path dependent and therefore a lock-in effect of the analog technology exists. This would imply that the firms that we have interviewed are generally not representative for the video surveillance industry in the USA as a whole. A reason for this could be that they are somewhat connected to AXIS and therefore represent some of the relatively few integrators that are successful in selling IP-solutions. The participating companies have all experienced a considerable growth of the IP-technology but the adaption process, in the industry as a whole, has still been slow. This implies that the reasons given by the participating firms, of why the adaption process to IP-technology has been so slow are more important and stronger than believed. Three companies consider territorial issues being the main reason for this. By territorial issues they mean that the “old school” security managers are threatened of becoming unnecessary since they do not have the knowledge about the IP-technology and this is the reason they are holding on to the analog technology. The other three integrators touch upon several different reasons, such as the IP-technology being more costly and complex, the customers’ lack of knowledge about new technologies and that the IP-technology requires a high degree of commitment in different ways.

If this scenario is true, the Path Dependency theory is applicable on the video surveillance industry even though the companies participating in our research state that it is not. This would imply that a representative firm within the industry spends the marginal dollar on the analog technology since they have been doing so in the past. Even though the firms interviewed by us all consider the history of the company as an advantage, one respondent argues that it could be a disadvantage since there is a risk that it prevents the company from changing. For what we know, this could be true in the rest of the video surveillance industry in the USA.

Mahoney identifies and describes two types of path dependent sequences: the reactive sequence and the self-reinforcing sequence. In our view, the reactive sequence seem less applicable in the case of the video surveillance industry since every event is causally interrelated and is both a reaction to the prior events as well as a reason for subsequent events. A small change, especially in an early event, can totally change the outcome. This means that a change such as the introduction of the IP-technology probably would have changed the

outcome more drastically than it has. Instead we believe that the self-reinforcing sequence better explains the development in the video surveillance industry. This since the analog technology got an early advantage that became more evident over time and along with the increased adoption of the technology. One possible explanation of the development thereafter is that once the process came in motion towards an outcome it reinforced itself and became hard to disrupt.

The second scenario suggesting that the Path Dependency theory is not applicable, argues that we are in the very beginning of a new “era” with a faster transition towards more IP-usage. This could be the case since almost all the participating firms have experienced a rapid growth in their IP-sales over the past years. This scenario is based on the fact that the IP-technology has been showing double digit growth in the recent years. One of the main reasons for this growth, we believe, is that the price of IP-solutions is continually decreasing even though the purchasing price still is a little higher than for an analog solution. Another important reason is that video surveillance has become more useful in several new areas and for numerous new customer segments which have meant, and still means, that the market for video surveillance is growing. The majority of this growth is constituted by IP-sales which mean that the analog technology has been somewhat stagnating in recent years whereas the IP-technology has grown a lot. The major part of this growth has, however, not been at the expense of the analog technology but rather from new sales. This is, according to us, the main reason that the analog technology still is able to hold such a big part of the market. With further market growth and increased acceptance of the IP-technology from manufacturers, integrators and customers, the development of the IP-technology will probably be strong for several years to come. In the near future this growth might not be as visible as it would if the IP-technology were taking market shares directly from the analog technology.

In our view, the second scenario better explains the ongoing development in the video surveillance industry. Even given the risk, that the participating firms in our study are not entirely representative for the industry as a whole, we consider the second scenario more probable. This since there is such a unanimous view of where the future development is going and all integrators consider this development the only possible. This implies that it would be sufficient for a few participating firms to be considered as representative for the industry as a whole, since all the respondents in our study share the same view.

5.2 The size of the integrators and drivers of change

In their future scenarios, five of the respondents think there will be room for both big and small integrators if the small integrators are able to take in the “IP-mind-set”. One of these five participating companies states that the customers prefer the small integrators over the bigger ones. The remaining two companies believe there will only be bigger integrators since the smaller ones do not have the capacity nor the funds to hire and keep IP-staff that are generally more expensive. We see a possibility of the development going both ways. The big integrators are less sensitive to an economic crisis and are less dependent on single customers whereas small integrators often have the advantage of being able to take in and utilize new information and knowledge rapidly. One of the respondents states that big integrators have to work with their “sister offices” on bigger projects whereas small integrators can choose any partner they want. He considers this as an advantage for the smaller integrators since the bigger companies usually have a certain amount of bad performing “sister offices”. This shows how highly the integrators rate flexibility and strengthens our view of the industry as fast paced.

We also believe that there is an upcoming shift in who is driving change within the industry. This change is believed to speed up the adoption process of the IP-technology. When we first started this research process individuals possessing knowledge of the industry told us that change within the industry was mainly driven by the producers. The firms participating in our study do, however, not fully agree on this. Instead it is a close call of who is driving change within the industry. Two respondents argue that it is the customers, two that it is the integrators and three that it is the producers. The respondents stating that the integrators play the biggest role say that it is because they are the ones advising the customers of what solution to invest in. The ones considering the customers the biggest driver of change, state that the customers in general are becoming more IT-savvy and usually know what kind of system and what features they want. We argue that the customers’ increased understanding of the technology is closely related to the technology becoming more standardized. This development has been seen in many other industries over the years such as in the computer industry, television industry and camera industry. With this increased knowledge of networks and surveillance related IT products comes wishes, demands and suggestions of other possible areas of usage from customers. We believe that these new aspects on the usage of the technology will increase the pace of the adoption process. This view is shared explicitly by

Company D and Company F, where Company D states: "...they (the customers) really kind of initiate the conversations with us", but also implicitly by Company G and Company C.

5.3 How the integrators learn, compete and balance between exploration and exploitation

Since we aim to clarify how the integrators interpret the future development within the industry and if they are trying to respond to it we need to gain a better understanding of the integrators' knowledge and how the organizations acquire and use this knowledge. This is also related to how they stay updated with happenings within the industry and how they act to stay competitive.

The companies participating in our study acquire and generate knowledge in very similar ways. They all emphasize the importance of manufacturers' training, conferences and trade shows as well as trial-and-error. They seem to have close relationships with their manufacturers and most respondents state that the manufacturers keep them updated on the latest news in the industry. This even though, the respondents state that the customers are becoming more influential and driving. The integrators have very different views on how to be able to stay competitive in the future. Their strategies involve things such as keeping costs down, supplying the best customer service, introducing the IP-technology to those industries not familiar with it, cutting the learning curve of competitors and to constantly be looking for the "next thing" in the industry. Four out of the seven integrators in our study argue that it is most important to primarily refine the company's existing skills whereas the remaining three argue that exploring new ways and methods is of greater importance. They, however, all share the view that this is an ongoing process that needs to be continual if they do not want to be left behind.

The respondents all seem to realize the importance of continually acquiring and generating new knowledge. This gives them the opportunity of being proactive instead of reactive in their learning processes which is in coherence with the thoughts of Peter Senge. The theories about Organizational Learning emphasize the essentiality of acquiring and generating knowledge in an organization's urge to create an environment well suited for knowledge creation. We argue, that the fact that all the participating companies constantly look for new methods, new technologies and new ways to differentiate themselves is a sign that the video surveillance industry still is a high paced and constantly changing industry. This constant chase for new and better ways is also explicitly expressed by the respondents. Among other things they mention that new problems occur frequently and that they because of this have to continually

generate new solutions to be able to solve these. One respondent states that his company in general tries not to implement new solutions too early since they want to avoid the first set of “child deceases”. These aspects in combination with the participating firms’ totally different descriptions of how to act to stay competitive, makes us believe that this industry still has not reached the point of slowing down and maturing. As previously discussed, the technology within the industry is becoming increasingly standardized. This process is, however, according to us still at an early stage which further strengthens our view of the industry as immature.

From the answers received, it seems like the companies interviewed all realize the importance of both explorative and exploitative activities but that they have different views on which one to focus on. The theory about Exploration and Exploitation emphasizes that the difficulty and key success factor lies in how to balance the usage between the two. If a company focus too much on exploration, they are probable of having high costs and low profits since they exhibit too many undeveloped new ideas and possess too few well developed competences. On the other hand, if they focus too much on exploitation they are likely to be trapped in a stable, but yet not optimal situation. To us, it seems like none of the responding firms have been experiencing any of these situations. They seem to have focused a lot on exploration in recent years which means that they are unlikely to have been trapped in a stable but yet not optimal situation. Then again, the participating firms express that they have been successful both in their transition into IP and in selling it. This means that the scenario of high costs and low profits does not seem to have occurred either. Even though the companies included in our study all seem to have understood the importance of achieving a balance between explorative and exploitative activities, it is essential for them to keep this knowledge in mind. This since their choices will have direct effects now as well as in the future. The three choosing exploration must be aware that this process reduces the speed of refining their existing skills whereas the four remaining must be aware that refining existing skills make experimentation less attractive.

The theory of Exploration and Exploitation argues that the returns from exploration are less certain, more remote in time and deviate from what the organization is doing at present. If the IP-technology still is to be considered as explorative, this means that the statement above is not fully true. Since an increasing amount of integrators are taking the technology in and it is gaining acceptance from an increasing amount of customers, it can be argued that the returns

are becoming more certain. Because of this, the returns are also becoming less remote in time and deviate less from what the organization is doing at present.

A few of the respondents state that their companies engaged in a lot more explorative activities a couple of years ago when they were still trying to find their way. This has, however, changed lately and nowadays they are to a greater extent focusing on refining their existing skills. We argue that there could be two main reasons for this. The first reason is that the respondents claim that there are still a relatively low number of integrators supporting the IP-technology in the industry. This in combination with an increasing demand for IP-solutions means that the companies prefer to refine their existing skills instead of looking for new ways. As a result of these refining activities, the companies do not have to constantly explore new ways to stay competitive since increased knowledge about the IP-technology give them an advantage towards later adopters. The second reason is that they have not encountered any major problems while acquiring and adapting to the technology. This means that the adaption process and thereby the explorative phase has been fairly short for some integrators resulting in a possibility for these companies to refine the skills acquired at a relatively early stage. It is, however, important to note that this adaption process starts off at different times and lasts unequally long for different integrators depending on for example their background and size. One could also argue that the increased rate of refining activities is a sign of the industry being in the initial phase of the maturing process. Since three out of the seven respondents still state that their companies engage more in explorative than in exploitative activities, we believe that this process still is at a relatively early stage.

As previously discussed, it seems to us that the companies included in our study have not encountered any major problems while acquiring and adapting to the IP-technology. This view seems to be shared by all the respondents. Interesting to note is that six out of the seven integrators believe that it is harder for an IT-company to acquire the security knowledge than for a traditional security company to acquire the IT-knowledge required for supporting IP-solutions. One of the participants clearly expresses that the analog security knowledge as a whole is harder to acquire and take in than the IP-knowledge. He argues that video surveillance is one of the easiest parts within the security industry and therefore believes integrators going from IT to security will encounter problems with for example integrative security and access control. Our interpretation of the respondent's statement is that he argues that it will not be profitable for an integrator to only focus on video surveillance. This because the company will not be able to offer and supply a total solution since it does not understand

and master other vital parts of security knowledge. The integrators consider it to be only a matter of spending time and resources to acquire and adapt to the IP-knowledge. A major reason for this is that most of the information is available on the market. In contrast to the theory presented by Nonaka, most of the participating firms do not express any problems with acquiring IP-knowledge by hiring people with that knowledge instead of generating it internally.

5.4 Individual knowledge creation

Nonaka and Child argue that knowledge, strictly seen only can be created by individuals and that the organization only can spur this process by providing an environment well suited for knowledge creation. Cohen and Levinthal present the theory about absorptive capacity and take off in the belief that absorptive capacity of the organization at its most elemental level is determined by the individuals' capacity to evaluate and utilize new knowledge. These views are highly connected and both stress the importance of the individuals within the organization. The participating firms in our study all seem to have realized this and therefore focus a lot on giving their employees the proper training and education. The executives at all the companies we have been in contact with seem to have been successful in hiring the "right" people with the desired set of skills. Most of the respondents state that the most important skill in a new recruit is their willingness to learn and their inner drive to constantly get better at what they do. With this strategy the firms seem to have created a commitment among the executives and employees within the organization. Having a strong commitment within an organization is by Nonaka believed to spur the knowledge creation processes. Nonaka identifies autonomy as one part of commitment and argues that it is an important motivator. The fact that the integrators in our study are all generally autonomous, work in teams and seem very committed to be in the "front line" of the development within their industry makes us believe that they are good and successful at creating and absorbing new technology and new knowledge.

It seems to us that the integrators in our study also benefit from the fact that they are relatively small organizations, which means that the new information and knowledge can be acquired and utilized relatively fast by the organizations. We also argue that committed leaders and employees will affect non-cognitive aspects such as the strategy and vision of a company. Almost all respondents state that they have the same vision within the entire company even though the perspective might differ somewhat. One company explicitly states that they try to have meetings or conversations with their members to make sure that they all know and feel

included in the strategy and vision of the company. This kind of conversation has according to the company, proved to be necessary and useful in situations where employees have been hesitant towards change and thereby often towards the IP-technology. According to us, these conversations and meetings are signs that the integrators understand the importance of having a clear strategy and a shared vision within the company.

Information is by Nonaka considered a prerequisite for creating new knowledge. All of the integrators we have been in contact with seem to rely on their manufacturers supplying them with correct and valid information. They do, however, point to the fact that the people receiving the information need a certain general understanding of IT. Nonaka as well as Cohen and Levinthal argue that without this understanding and contextual knowledge it is hard to generate new knowledge or use the acquired knowledge. This view is shared by a majority of the participating firms. They stress the difficulty of hiring the “right” people and selling the “right” products without this understanding. Many of the participating firms use the acquired information to be able to continually improve their work performance and to create new solutions. These solutions are mainly created and tested in-house through trial-and-error and experimentation.

Most of the knowledge within the companies in our study is acquired by either training sessions of different kinds or by actually working on different projects. This is especially true for the operative and installing staff whereas the executives and directors, apart from these things, also gain knowledge through attending conferences and trade shows. The fact that a majority of the knowledge is acquired and generated by a “learning by doing” mentality suggests that most of the knowledge the companies in our study possess is tacit. This view is strengthened by the fact that new recruits often “shadow” senior staff members during their first time working for the companies. Several of the respondents state that their recruits are trained relatively fast and that they start working by themselves after about a month. This implies that, even if the knowledge possessed by the integrators is to be considered as tacit, it is passed on to another member of the organization relatively fast.

The hands on approach used by the integrators in our study has a lot of similarities to the “socialization” process described by Nonaka, where tacit knowledge possessed by one individual in the company is transferred to another individual by imitation, practice and observation. All the respondents describe and emphasize the importance of having an ongoing discussion about ideas, issues and problems on a work set to facilitate this transfer of

knowledge. We argue that these dialogues are benefitted by the fact that the employees generally work in teams and thereby get multiple viewpoints on different matters. This view is shared by Nonaka who also stress the importance of enabling and encouraging the individuals to speak “freely and candidly”. This can sometimes spawn discussions and result in improved solutions. One integrator gave a concrete example of how he participated in a project where the members had very different views on how to design the solution. In the end, however, these discussions and different views resulted in a very good solution. We argue that the hands on approach combined with the ongoing discussions will speed up the sharing process of the tacit knowledge. It is probable, that the sharing process would have been slower if the integrators to a greater extent worked individually.

Closely related to having open dialogues on different work sets to discuss upcoming issues and ideas are making the employees think “out of the box”. Especially one respondent expressed this view and considers it as an essential part of generating new knowledge and coming up with new solutions. Since only one of the participating firms in our study mentioned this explicitly, we wonder how much the other integrators focus on and encourage their employees to think out of the box. There is a possibility, however, that the other integrators regard this as equally important but that they express this view in an indirect way by saying that they are constantly looking for change and are willing to take it in. Several of these integrators emphasize the importance of including all employees in the process of identifying and suggesting potential changes but add that there is generally a group of more senior employees that spend more time on it. Nonaka acknowledges the importance of thinking “outside of the box” and argues that there is a need for individuals to step out of their comfort zone, break free from habits and routines and start to question the validity of these. Connected to this is if the integrators are good at questioning their own work performance. All the companies included in our study consider themselves being good at doing this. We believe that the fact that these integrators operate in a fast changing industry, all stress the importance of being open and willing to take in new things and encourage their staff to speak openly implies that they actually are good at questioning their own work performance. If they were not some of them would probably not be as successful as they state.

5.5 The organizational code and the sharing of knowledge within the organization

As previously discussed these relatively small integrators seem to have a shared vision, a relatively shared perspective and very committed employees within their organizations. These

aspects in combination with what qualities they regard as most important in a recruitment process heavily influence the organizational code of the company. This code on the other hand has a big influence on whether the organization chooses to focus on explorative or exploitative activities. As already mentioned, the majority of the integrators included in our study regard willingness to learn and inner drive to constantly get better as the most important qualities in a new recruit. They do, however, also consider what skills and type of personality the recruit has got as important. Some integrators explicitly look for similar personalities as those already working for the company whereas others emphasize the benefit of having a mixture of personalities. Several of them also state that they are looking for some specific skills where the most common answer is IT-skills. We argue that there is a trend of almost solely focusing on acquiring IT-knowledge which implies that companies without the analog security knowledge “built in to their structure” could be in risk of being left behind. If the hired recruits have a similar personality to those within the organization, this will in most cases result in a fast socialization into the organizational code. On the other hand, a recruit with a different personality will in most cases require more time to socialize into the organization’s values and beliefs.

We argue that almost all integrators we have been in contact with have a strong organizational code. We believe that the ones claiming that they look for a similar personality to those already in the organization as well as a certain skill set are looking to further strengthen the code and with this the belief in the IP-technology. The ones looking for a different personality, however, are according to us extremely focused on change and consider the ability to change a key success factor. This implies that they are “afraid” of losing that ability and therefore hire people with different personalities. These respondents do, however, acknowledge the importance of working towards the same goals and having a shared perspective within the organization. This means they are less likely to “lose the identity” of the company in the process of diversifying it.

The theory about Exploration and Exploitation states that a balance of slow and quick learners in an organization is preferable. Our interpretation of the previous discussion and of what the respondents have told us is that most recruits are to be considered fast learners which mean that they socialize with the organizational code rapidly. We argue that hiring similar personalities that get socialized quickly can be said to strengthen the code. The integrators hiring individuals with diverse personalities are in our view more likely to come across a slow learning individual that will be able to contribute and have an effect on the organizational

code. This process is considered important and called mutual learning by March. We argue that analog security integrators that have started supporting the IP-technology as well, have an advantage in having “old school” employees that have been doing and selling the analog technology for a very long time. This since these individuals possess a large amount of tacit security knowledge, which is hard to acquire according to the respondents. They are also in general hesitant to changes towards more usage of the IP-technology which mean that they serve as slow learners benefitting the organization as a whole.

Related to the fact that knowledge strictly seen only can be created by individuals, is that the quality of this knowledge is of importance for the entire organization. This especially regards tacit knowledge and focuses on the organizations’ enlargement of the individuals’ knowledge. The quality of the tacit knowledge is in our case affected by the type of knowledge possessed by the employees as well as by the experience of those individuals. A majority of the integrators included in our research state that their employees are generally specialized in their knowledge. Worth mentioning is that only one respondent says that their staff only possess general knowledge. In our view, having a specialized workforce could be considered a risk since the lack of variety does not stimulate the individuals’ own thinking. This makes it harder for that individual to “think out of the box” and thereby improve his/her performance as well as discover new ways and methods. Nonaka describes it as important to not only gain knowledge through theoretical thinking but by actual experience as well. The companies participating in our study emphasize the need of and focus on hands on training and experience. Since the firms participating in our study have a “learning by doing” mentality and focus a great deal on training, we argue that they have high quality knowledge within their organizations. The next step is to share the knowledge of the individuals within the organization to fully be able to utilize their qualities. All respondents included in our research claim to be relatively good at this. They state that there is always room for improvement which we believe is true. We do, however, not think there is a need to question their answers, since most integrators have flat and open organizations, generally work in teams and have some form of weekly meetings where ideas, issues and problems are discussed.

Based on the previous discussion about tacit knowledge, we argue that the analog security knowledge is tacit to a higher degree than the IT-knowledge. This even though the IT-knowledge seems to get a lot more attention and by many is considered critical. According to us, one possible explanation to this is that the integrators are relatively bad at transforming tacit knowledge into explicit. Four respondents state that they have either handbooks,

databases or some other way of storing information whereas two state that they are currently developing and implementing similar systems. The last company considered itself being too small for such a system to help them in their work. Even though a majority of the companies claim to have a system designed for storing information, most of them add that it is only of value when they are about to do minor jobs. This means that there are no advanced information and solutions in these databases. These comments make us wonder how much effort they put into implementing and updating these systems and if they really consider it important to transfer tacit knowledge into explicit. As previously mentioned, it seems as many of the integrators favor people with the same skills as those already working in the firm. This is an important reason to why the tacit knowledge within the companies can be shared successfully and quickly. Based on our interviews, we argue that the knowledge sharing processes within the companies work well at present. Since this is working at the moment, the companies do not realize the importance and value of converting the tacit knowledge into explicit knowledge.

One might also argue that the fact that the industry is still immature makes it hard for the companies to transfer tacit knowledge to explicit, since the industry is constantly changing and improving. We do, however, suggest that the integrators should put more effort in to making the IP-knowledge more explicit since we regard this knowledge less tacit than the analog security knowledge. Another reason for this is that the majority of the respondents argue that it is harder to acquire and utilize analog security knowledge than IP-knowledge. They do, however, emphasize the importance of having a sufficient IP-understanding to be able to work with IP-solutions. Based on the previous discussion and the lack of basic IP-understanding among a large number of analog security individuals, we argue that it is currently hard for the integrators, especially those, starting off solely supporting the IP-technology to incorporate the analog security knowledge into their organizations. By making the IP-knowledge more explicit, companies working with the IP-technology would create an easier way of acquiring analog security knowledge. This would make it possible for an individual possessing analog security knowledge to gain a sufficient amount of IP-knowledge. In other words, it would be easier for an individual possessing analog security knowledge to learn a sufficient amount of IP-knowledge than it would for an individual possessing IP-knowledge to learn analog security knowledge.

Related to this discussion, is the question why a large number of integrators supporting the analog technology are so hesitant to embrace the IP-technology and step in to that market.

This since the IP-knowledge, according to us, is less tacit and thereby easier to acquire than the analog security knowledge. We believe that the main reason for this is the current security managers at many firms supporting analog solutions. Their influence over their companies' decisions in combination with their attitude and lack of IT/IP-knowledge keeps these companies from changing. This reluctance towards change also influences the technology shift within the entire industry.

5.6 The Framework and theories used

The theory by Child, that we have been using as a framework in our research can be said to be very comprehensive and open since it could pretty much include any theory. The part we have mainly focused on called "Capacity to learn" could according to us contain almost any theory connected to learning. This is both a positive and a negative quality since it gives the model the possibility to explain numerous situations. On the other hand, the model does not give any precise piece of advice on how to act in a specific situation or industry. The four theories we chose to include in this framework have been relatively good at explaining how the integrators are reacting and responding to the changes in the industry but also at pointing out important aspects to consider in this process. They have, however, not been good at predicting what will be the future development within the industry.

There are two theories included in our study that we have some doubts about and therefore question to a certain extent. These two are the Path Dependency theory and the theory about Exploration and Exploitation. As previously stated, the Path Dependency theory is in our view not fully applicable on the video surveillance industry which means that it would require further theories to explain the historical development of the industry. According to us, the theory about Exploration and Exploitation was not fully able to give advice on how to tackle the rapid-changing industry since it focused too much on having a balance between explorative and exploitative actions. In our view, it was sufficient for the integrators to recognize the importance of engaging in both activities whereas reaching a balance seemed to be of less importance.

There are mainly two things that the theories included in our research failed to do. The first thing is, as previously stated, its inability to predict the future development of the industry. Even though this question is not included in our problem formulation, we mention it in the area of inquiry and therefore find it interesting to compare the respondents' thoughts with what the theories predict. The second thing is our theories' inability to consider non-cognitive

factors. We have included a few non-cognitive factors in our study but we would like to study the importance of several others as well. It would also be of interest to distinguish if non-cognitive factors have a direct effect on learning on their own or an indirect effect through explaining other cognitive factors that drive learning.

6. Conclusion

In this paper we have been trying to research how the integrators are interpreting, reacting and responding to the changes within the industry. We have also been looking at the history of the integrators and how they are acquiring knowledge. Apart from this we have been looking at factors that drive or hamper the IP-knowledge assimilation.

The technology shift in the video surveillance industry has been slower than many experts expected. Noticeable is that all the integrators in our study, despite their background and geographical location, have a shared view on the IP-technology, what is going to happen in the industry and the importance of being continually morphing, improving and learning. Even though the integrators differ somewhat in size, they all seem to have a very strong organizational code and a strong commitment among the members resulting in a shared perspective and vision. This in combination with flat and open organizations encourages active and inspired members to take initiatives and suggest improvements.

Based on the gathered information, we believe that the industry is in the very beginning of a new “era” with a faster transition towards the IP-technology becoming the standard in the video surveillance industry. A vital reason for this is that video surveillance has become more useful in several new areas and for numerous new customer segments which have meant, and still means, that the market for video surveillance is growing. The major part of this growth is constituted by IP-sales which mean that the analog technology has been stagnating in recent years whereas the IP-technology has grown a lot. The majority of this growth has, however, not been at the expense of the analog technology but rather from new sales. This is according to us the biggest reason that the analog technology has been able to hold such a big part of the market. We have also identified a tendency of the customers becoming more knowledgeable and IT-savvy resulting in them to a larger extent affecting the industry.

One of the main reasons of the slow adaption of the IP-technology is according to us the “old school” security managers. These managers perceive the IP-technology as a threat since their position in the organization might become unnecessary if the IP-technology is adopted. This in combination with their big influence on which technology their organization chooses to support and their lack of equivalent IP-knowledge make them hesitant to adopt the IP-technology.

We argue, that the fact that all the integrators constantly look for new methods, new technologies and new ways to differentiate themselves is a sign that the video surveillance

industry still is a high paced and constantly changing industry. This in combination with the respondents' totally different descriptions of how to stay competitive and the relatively low degree of standardization within the industry makes us believe that the industry is still immature.

All the integrators in our study focus a lot on training and have a hands-on mentality. This among other things, have made us believe that most of the knowledge possessed by the integrators is to be considered tacit. Since the industry is constantly changing, we argue that it is hard to transfer tacit knowledge into explicit knowledge. From what we have learned during our interviews, we believe that IP-knowledge is less tacit than analog security knowledge. Because of this we suggest that integrators working with IP-technology should try to make this knowledge more explicit making it possible to incorporate analog security knowledge in an easier way.

6.1 Suggested future research

During the research process we have encountered many interesting topics that for several reasons could not be included in this particular study. Out of these potential topics, we have identified three possible studies that we would find especially interesting.

The first topic is to study the non-cognitive factors driving learning. Are these factors driving learning on their own or do they affect cognitive factors that drive learning? Are there any non-cognitive factors that are particularly important and influential?

The second topic is to perform a similar study to ours on another geographical market and compare the results.

A third possible research area is to study the bigger integrators, those at the top of the integrators' pyramid. How do these larger players interpret the future and react to the ongoing changes within the industry?

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8. Attachments

8.1 Interview guide

1. Is your company working with analog or IP-solutions, or both? If both – how many percent of your existing sales is IP/Analog, and how many percent of your new sales are IP/Analog? Did you start off with the same technology or has it changed over time? Have you ever considered doing both/ starting with analog/IP-solutions as well? Why/why not?
2. If you are about to sell a new system to a client how do you make them choose IP over analog? Are you good at displaying the performance gains, show them that it is easy to use, useful?
3. How does your company acquire and generate knowledge?
4. What do you think will be the future development within this industry – especially concerning the technology? When this happens do you think that major/big integrators will dominate or will there be room for small firms?
5. IP technology is by many believed to be the superior/winning standard. Why has the industry been so slow to adapt? Why do you believe that the analog technology still dominates the market? Could it be that “an early start technology may already be locked in, so that a new potentially-superior arrival cannot gain a footing”? Do you think a development towards more usage of the IP technology will be quick? Why/Why not?
6. How do you plan and act to stay competitive? Would you say that you primarily refine or improve the skills you have today or explore new ways and new methods to do things? Is this an ongoing process or do you respond to changes as they come?
7. Is the history of your company an advantage or disadvantage when taking in a new technology and new work routines? Why?
8. Is the technology change within the industry driven by the customers or by the producers/developers? Are there customer segments that are more important to you than others and does this affect how you look at the technology development?
9. If you/your company observe something particularly good that a competitor has done in a different way than you usually do it, would you say that your company is good at changing your ways and adapting to this better way? Why/ Why not?

10. Do you believe that you and your colleagues are constantly looking for new ways to do things such as new technologies and taking them in? Why, why not? Does everyone do this or do you have any special group or individual doing this?
11. Would you consider your company being good at critically evaluating and questioning your work performance?
12. Would you consider your company being risk taking (trying new opportunities) and would you say that it is essential in your industry?
13. How do you keep yourself updated on new happenings within your industry?
14. What would you say is your company's most important quality? Which quality do you think you need to improve?
15. Would you consider most of the knowledge your company possess easy or hard to acquire and take in/learn for competitors? Why is it easy/hard to take in/learn?
16. Competitors from the "other side" argue that they can learn security/IP-technology very fast – what's your opinion?
17. What does your firm look for in a recruitment process? Are you looking for similar personalities as those already working in the company or do you recruit people with different skills? Is the employees in the organization in general specialized at one thing or do they have a more general knowledge?
18. How are employees trained and educated in your company? Would you say that people are autonomous or regulated in their work?
19. Would you say that you have a high personnel turnover rate?
20. Do you consider your company being good at using the quality of the staff and spreading that knowledge within the organization? Why, why not?
21. How do you and your staff generally work, in teams or individually?
22. What would you say about the working climate in your company? Do you feel that colleagues have the same perspective? If so, does that shared perspective evolve fast for a newly hired person? Would you describe the organization as flat or hierarchical?
23. Is there an ongoing dialogue between colleagues on how to do things and solve problems on a work set? Do you have handbooks, databases or other sources of stored information telling you how to solve problems? Do you have monthly/weekly meetings where you discuss problems/ideas etc?
24. What do you think about the IP-technology in the video surveillance industry? What do your colleagues think about it? Is it easy to use? Is it useful? Does it perform better

than an analog system? Are the eventual performance gains demonstrated? Are the views about it shared within the company and in the industry in general?