Improving ERP Project Success for SMEs
From the Perspective of SME and Multi-Case Study

Master's Thesis in International Project Management

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Figure referenced from the article "A Breakdown of Common Acronyms: MRP vs MRP II vs ERP?" Available at http://www.tapsoft.in/product_erp.html
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ABSTRACT

More and more large enterprises apply ERP system to improve integrated capability and efficiency, as well as small and medium-sized enterprises(SME). Some research report show that there still lots of ERP projects for SMEs are failure or not implemented as expected. The aim is looking into the main reasons of these ERP project failure in the specific SME scenario, and the resolution of improving the possibility of project success. It was illustrated within two aspects: Project Management and Knowledge Transfer.

Referring to the features of SMEs, the three main factors affecting ERP projects were introduced and analysed: Low Management Level, Limited IT Capability and Low Project Management Maturity. As for the knowledge transfer, the research process starts from identifying the influencing factors, active parties and mutual relation to summarizing the feedback from the users. The aim is improving the knowledge transfer effectiveness to secure that the users have the capability to transfer to the new system smoothly with considering the influencing factors. All the research results in resolutions on improving the integrated capability of SME and enhance the knowledge transfer and organizational learning.

Key words: ERP, SME, Project Management, Knowledge Management, Knowledge Transfer, Organizational Learning.

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Preface

This thesis research started in February 2016 and it was presented on 30th September, 2016. The main result has been carried out around the summer time. In this thesis research, it was starting with some difficulties on topic selecting and case locating.

It took a really long time for the primary study. Here I want to thank for the appreciated help from Professor Christian Koch and Mr. Sjouke Beemsterboer in Chalmers University of Technology. They have been devoted to helping with my thesis research in every stage offering guidance, instruction, methods and so on.

Since I worked alone in this thesis, I also want to thank the help from my best friends and their mental support has acted well. They also gave me some advices with my thesis. At last, I want to say I really appreciate the support from the companies. The owners and the consultants treated me as close friend and were willing to share and offer me sufficient information, which became the most important parts of this thsis.

Finally, I learned a lot in this process and I hope it benefits my future work and life.

Göteborg October 2016

Zhang Baiqiang

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1   Introduction

As a start, specifying the background of this research, this section will be a guide to the whole thesis including the research problem and sub-questions.

1.1   Background

During the last decades, the Small and Medium Sized Enterprises (SMEs) have been playing an essential role in the world economy. A report from the 'World Bank' made their statistics and stated that SMEs makes for 45 percent of total employment and 33 percent of Gross Domestic Product (GDP) in the emerging economies and these numbers are increasing rapidly. According to 'European Recommendation 2003/361', a definition of SME is simply illustrated as under 250 staffs or 50 million euros of turnover. It is easy to address that there would be many obstacles for an SME to develop because of limited resources.

Hence, an increasing number of SME owners start to applied Enterprise Resource Planning (ERP) system to improve their overall strength, especially on resource integration and allocation, management informatization and process and logistics handling. (Metaxiotis,2009) With a convincing impression, SMEs seems to be outdated and normally refuse to use the latest technology and the reason may be that hand-work is quite enough and in the owners' opinion, there is no need to invest that much money in the technology. (Berger,2016) SMEs are quite different from the large enterprises; however, many cases have proven that ERP systems do help with the SMEs' development. (Metaxiotis,2009)

> *Enterprise resource planning (ERP) is business process management software that allows an organization to use a system of integrated applications to manage the business and automate many back office functions related to technology, services and human resources. ERP software integrates all facets of an operation, including product planning, development, manufacturing, sales and marketin*g. (Quoted from Webopedia.com, 2016)

The quotation above gives a general idea of ERP. Moreover, ERP gains lots of attention because of its processed management and high integration and is recognized as a powerful weapon to improve business process and management level. Therefore, ERP becomes one of the strategic resource and necessary cost for modern business operation, which has been the highlight of enterprise informatization in last decades. Success ERP application brings in not only optimized business process and production planning, but also integrating the resource on the whole supply chain, improve the ability to adapt to customer needs and faster decision-making. As a result, the ERP system will improve the competitiveness of the enterprise. (Metaxiotis,2009)

Nevertheless, the process of implementing an ERP system requires high integration of cooperation and coordination within different relative parties: the client company, the project implementer and the software vendor. (Berger, 2016) One of the essential parts is to ensure that the knowledge transfer channel works effectively, which refers that each role in the process should enhance the mutual communication and knowledge management works. (Kostas, 2009)

1.2   Research Problem

The aim of this thesis is to pursue what SME can do to improve the ERP project Success within two aspects: Project Management & Knowledge Management. Furthermore, this paper hopefully can draw more attention on knowledge management methodology in ERP Projects, especially for SMEs.

Research Questions
This paper is starting from the basis of knowledge transfer process from the implementer to the end users, and emphasize studying following key problems in an SME scenario:
- What should be aware of when implementing ERP system in SMEs?
- What an SME can do to secure the success of ERP project?
- What are the knowledge items and critical factors in an ERP project?
- Based on the knowledge items and critical factors, what should the consultant and users do when transferring knowledge in an ERP project for SME?

1.3   Summary

ERP systems are supported by modern IT, and considering its complexity of various functions, the implementation process will be sophisticated, which means normally the user requires a third-party to get involved as a partner. The core tasks of an ERP project are not only the product and skill transfer, but also the knowledge transfer among the implementer, the users and the software vendor. (Kostas, 2009) The knowledge transfer becomes the bridge and the deepness of the transfer process would affect the result of the project and the management level that the user can develop. Overall, the study on how to push the knowledge flow will benefit on the success of ERP projects.

2   Research Method

This section illustrates the detailed process of research path from the selecting of the topic to how the conclusion is finalized.

2.1   Research Process

This Paper is targeted at the problem within the knowledge transfer in ERP projects, and emphasize the success of knowledge transfer and its criteria based on the literature study. ERP project cases will be introduced and connected to the literature study with a purpose of generating the research structure and theory hypothesis. With multiple ERP cases and their implementation processes, the specialties of knowledge transfer in SMEs will be discussed and analyzed. The expected outcome is to propose possible suggestions regarding knowledge transfer for SME who wants to install ERP system as well as the implementer of the system.

2.2   Research Methods

The methods would be introduced according to the different sections.

2.2.1   Literature Review

The theoretical part of this paper provides a basis for understanding regarding the keywords of the research questions. The main study areas include SME's features that may affect the project management, knowledge management and ERP implementation etc. The literature is professionally published papers and thesis with sound background online that is located via Google and other search engines, and with a thoroughly categorizing reading and analyzing, the literature offers a clear theoretical instruction on the research problem. In the meantime, this paper stresses on the knowledge transfer and its criteria from the feature of the knowledge and the process under the scenario of SMEs. In order to gain the thoroughly acknowledge of the targeted area, the main method in the literature study was finding the similarities and differences among different papers. The whole review followed a clear process from SMEs, ERP projects in SMEs, Knowledge Management in ERP projects in SMEs, which is getting deeper and deeper. The selected references contain both of qualitative and quantitative data that is more convincing, and the purpose is to find what should be concerned when talking about the knowledge transfer in ERP projects for SMEs.

2.2.2   Case Study

This thesis is to look into the knowledge management in ERP projects when it comes to SMEs. To secure the specific study area, there would be several cases to be introduced and cross-analyzed to generate the framework of knowledge transfer process to the end users. Therefore, a more solid conclusion can be proposed with possible solutions and suggestions. The multiple case study and interviews with the front project managers give not only support to the theory, but also could be the practical reference in the future ERP implementation project.

This thesis is more located at SMEs, and the cases described in the empirical study is based on the interviews with the owner's or top managers in the SMEs, as well as the project managers in the consultant companies and information referenced to the

Internet. To reduce the influence of the objective elements on the accuracy and authenticity, such as different industry, location or size, the SMEs were selected in the same industry and country (Sweden), with similar size.

After the industry being selected, several car part manufacturers were highlighted. In order to ensure the universality of the studying result, different ERP software vendors and different consultant companies were taken into consideration. The following diagram shows how the companies and cases were settled.
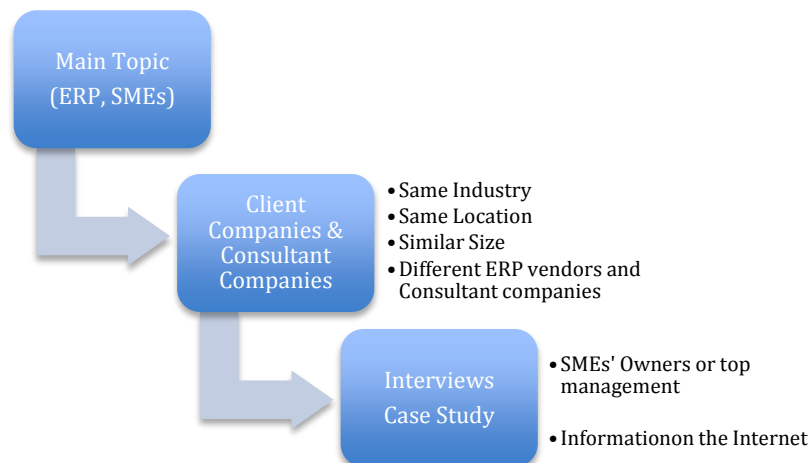
Figure 1.1 Locating the research cases

The primary resource to find cases was from Google search regarding the following key words: Manufacturing industry, SMEs, ERP. After several companies had emerged, they were got contacted via Email and phone calls to find out the possibility of interview or case data sharing. 5 Companies confirmed the request and 15 interviews were conducted. The interviews were distributed into 3 categories: Top Management, Consultants (Project Managers) and End-users of the ERP software. After the interviews being conducted and primary data analysis, finally, 3 companies were highlighted and deeply analyzed later on. Outline of typical questions was listed according to the Project Management Process before the interviews, and the questions will be spanned and going deeper to grasp the whole management process.

In the process of the case interview, both qualitative and quantitative data was collected. The qualitative data mainly based on the face to face interview and some documents provided by the companies. From the interviews, the interviewees gave their opinion and express their idea according to the premade interview questions, moreover, some questions came up along the conversations' going. The document was main project plan, system specification, internal questionnaire results. As for the quantitative data, a premade questionnaire was made and distributed to the interviewees to find out their feedback on the knowledge transfer effectiveness in each stage of the project implementation. The interviewees would give some quantitative data (grading) on how did they feel when they were receiving the knowledge from the consultant. In the interviews, some questionnaires were distributed to the interviewees to evaluate the feedback from the users. Some of the data was quantified to indicate the percentages. For example, when it comes to evaluating the user's understanding of Consultant, it was scaled to five levels. The

percentage would show how many people chose fully understand, basically understand or not at all.

2.2.3 Discussion

The section of discussion is divided into two parts. First is looking into how the feature of SMEs affects the ERP project based on the literature and empirical study. This mainly relies on the quantitative data and several critical success factors were selected for a further discussion. After that, in consideration of uniqueness of SMEs, there would be some suggestions referring to improving the project success.

The other part refers to Knowledge Transfer Effectiveness in the ERP projects for SMEs. In the literature study, some influencing factors were prompted and they were tested intentionally in the case study. Based on the feedback from the users, some advice for both sides (consultants and users) will be illustrated within several different aspects.

2.3 Thesis Structure

This paper is divided into 6 main parts like following:
   i. Section 1 introduces the background of the topic, research questions and its purpose.
  ii. Section 2 mainly illustrates the whole process of this research including how to locate the references and how they were used.
 iii. Section 3 analyzes and summarize the literature study with a purpose of generating theoretical assumption. The main body consists of Knowledge management in ERP projects, KM in SMEs, the criteria of knowledge transfer in ERP projects and so on.
  iv. Section 4 aims at introducing the empirical study of related cases and interviews.
   v. Section 5 consists of detailed discussion on the criteria of knowledge transfer process and suggestions of improving the process.
  vi. Section 6 summarizes the whole thesis and includes the shortage and future study.

2.4 Ethical Consideration

This thesis research combines the theoretical and empirical study. The case study and the quotation from the interviews may contain some confidential information. To protect the information, the companies' names will be replaced with A, B and C.

2.5 Summary

The research method was also adjusting according to the real study process in order to be clear and specified. With the help of supervisors, the research process came to be the guarantee of thesis study.

3 Literature Review

The literature review was conducted focusing on several keywords and the connection amongst them that includes SME, ERP project, knowledge management, knowledge transfer and so on.

3.1 SMEs Features and the Effect on the Business Operation

In consideration of Knowledge transfer process in SMEs, it is necessary to understand the essence of the SME, especially the perspective that is different from the large organization. Digging the effect of the features upon the business operation gives a better understanding when taking the KM and ERP project into account.

3.1.1 Main Features of SMEs

The most common criteria to distinguish SMEs from others is the relatively smaller scale of the turnover and human resource. The Europe Commission defined SMEs as having less than 250 employees or 50 million annual turnovers. (Eurostat, 2016) An essential differentiator compared to large enterprises is that how the asset is held and who is taking charge, which is also can be defined as the organization structure. Normally, SMEs start with small and unique business or service with a flat hierarchy and integrated operation center that means someone may be in charge of several duties. Whilst Large Enterprises(LE) mostly preferring a matrix organization with several different divisions or business centers, they also have more layer of management. (Holátová. & Březinová, 2013)

The second differentiator is the organizational culture. When looking at the LEs, everyone, with a long development history and many ups and downs, has their unique culture to inherit by generations. For example, Volvo Cars has emphasized the safely driving and luxury enjoyment for decades, which requires the employees focus on the details and customer's feeling. The culture has a gradual influence on every employee. However, it seems that there is no clear culture-thing in SMEs, but more like the unique way of thinking and doing. (Kostas, 2009) In the meantime, the personality and individual charisma of the leaders has an enormous impact on the internal management and external communication with clients and suppliers.

The last different factor selected here is the IT requirements. An SME may not have a precise demand on IT division, in particular for start-ups. The root reason is that they have a small scale of business and little need of IT infrastructures. (Holátová. & Březinová, 2013) Furthermore, SMEs usually hire a third-party and the IT infrastructures that are outsourced. Nevertheless, LEs have bigger needs of IT solutions covering as many work steps as possible to reduce the human error. (Eurostat, 2016)

There are many researchers studied the features of SMEs and tried to find a systematic way to describe. With a study on some literature of different resources regarding SMEs characteristics, the list following illustrates the key findings.

Key Words: Modest Financial Resources, Limited human workforce, Limited Management Level (These key words showed in most of the related references with a relatively high frequency of being mentioned)

Ownership, Management and Decision Making
- ☐ Owner usually is the CEO [1]
- ☐ Time constraints of owner –managers [3]
- ☐ Fewer management hierarchy [1]
- ☐ Centralized decision-making [2]
- ☐ Short-term strategy [4]
- ☐ Driven by short-term profit [1]
- ☐ Owner's personal charisma and characteristics [1]
- ☐ Start-up business [3]

Organizational Structure
- ☐ Flat, simple and clear structure [2]
- ☐ Flexible structure and easy to adjust [2]
- ☐ Single-targeted [3]
- ☐ Unclear responsibility, multi-job holding of managers [2]
- ☐ Low degree of employees' clearance and specialization [3]

Organizational Culture
- ☐ Strong and unified culture [2]
- ☐ Influenced by personnel [3]
- ☐ Less feeling for employees [1]
- ☐ Open for new concept, idea and technology [1]
- ☐ Borrowlism (Blindly follow successful cases) [3]

Business Process
- ☐ Simple and clear process [2]
- ☐ Single process [1]
- ☐ Usually as supplement for bigger organization [1]
- ☐ More flexible, adaptable and adjustable processes [4]
- ☐ Informal procedures [4]
- ☐ Lack of standardization [4]

Marketing
- ☐ Mainly local or regional markets [2]
- ☐ Clear target customer [4]
- ☐ Restrained by mighty partners in the supply chain [2]
- ☐ Unstable market [2]

IT Application
- ☐ Limited Knowledge and usage scale [4]
- ☐ Lack of IT specialist [4]
- ☐ Lack of proactive use of new IT tools [4]
- ☐ Lack of strategic planning of IT [4]
- ☐ Rely on IT third-party or partners [4]

Reference Note:
1. *Kostas, 2009*
2. *Supyuenyong.V, Islam,N & Kulkarni. U, 2009*
3. *Opengroup, 2013*
4. *Holátová. & Březinová, 2013*

3.1.2 The Effect on the Business Operations

The SMEs are active in the world business, and recent years, an increasing number of start-ups, especially the specialized internet companies, step into people's daily life, urge to develop and share the market. The huge amount of the business proves that the small and medium-sized business is suitable for the present world. One of the biggest reason is that most of the SMEs are specialized on certain area, customer-driven and incredibly flexible to the update of technologies. (Holátová. & Březinová, 2013)

Some researchers also addressed that those features have a negative impact on the business operations. First of all, because of the limited management level, it will be dangerous when a LE starts to provide the same product or services with a lower price The creator of a start-up maybe genius of technology, but it does not mean he/she is a master of management. That is a rational reason why many LEs acquire many start-ups or become the major of the stakeholders. In other words, the management level may not keep up with the business expanding, especially within an extremely competitive environment. (Kostas, 2009)

Second, centralized decision-making and short-term strategy could be the vital factors in the development. In the report of Opengroup. org (2013), these factors are referred the strong personnel dependency. When the leader is self-sufficient, it will be hard for him/her to listen to other's opinions, especially the different voices. Furthermore, the leader's vision also affects the future of development. Most of SMEs pursue the short-term payback and might not be willing to invest money easily. As a result, it may cause the enterprise falls behind the similar ones and may be swallowed by the competitors.

The last but not least, some SMEs has weak IT infrastructures as long as the system can support the main tasks. It also mainly depends on the decision of the leader, which refers the willingness that the leader has to invest money on IT and share the burden of human labor. From the human resource perspective, hiring an IT specialist is costly, and the knowledge of using latest technology is limited, which makes that the enterprise need invest an extra budget to train the people. (Opengroup, 2013)

3.2   ERP Projects in SMEs

With the enormous development of IT in last decades, more and more enterprises including SMEs want to take advantages of informatization management tools and systems such as Office Assistance (OA), Customer Relationship Management (CRM), Email system, databases, cloud service, etc. ERP solution, as a highly-integrated system, is getting more attentions and it does help with planning, allocating and controlling the production material, human labor, budget and other resources. The system is installed to realize management of procurement, production and selling with high quality and efficiency. (Kostas, 2009) According to the study of Van, Everdingen et al. (2000) and Moller (2004) on ERP application in SMEs, the brief conclusions are:

● ERP has been a prevalent solution for the business, mainly on Financial and production part.
● ERP solution is the trend.
● ERP market has been saturated and matured.
● The project mainly is outsourced.

Although the ERP seems popular and promising in SMEs, lots of problems still exist because of the limitation of the nature of SME.

3.2.1   ERP Implementation in 2015

Although ERP system can offer a new view of management and optimize the core competitiveness, ERP application would increase the operation cost and generate new problems such cooperation among departments if the system fails. (Wang, 2011) As a result, it will be delicate to balance the benefit of Information System and its cost. (Tarn, Yen & Beaumont, 2002) According to 2015 ERP Report from Panorama, 58 percent of recorded ERP projects were stated as success and 21 percent of projects were failure. The most interesting phenomenon is that the rest of respondents (21%) are vogue or even responded: 'do not know if their project was a success or not'.
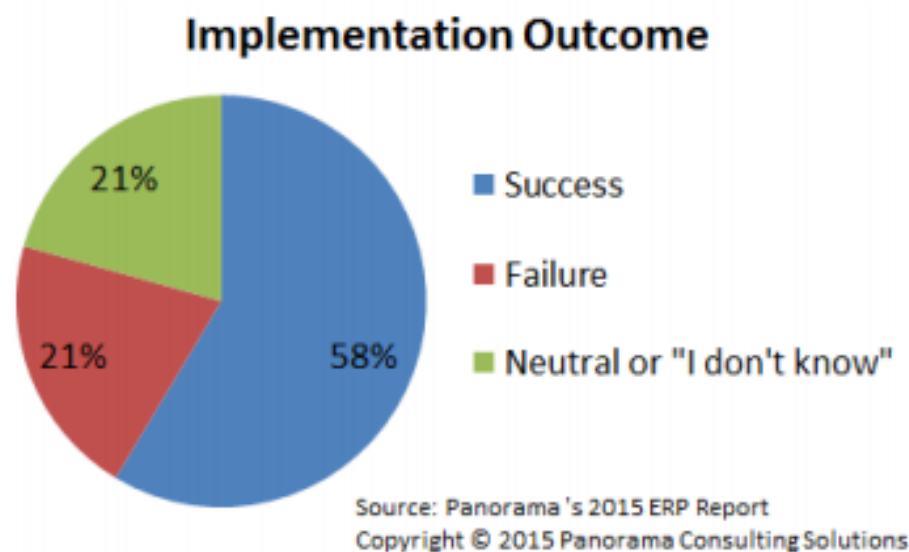

Figure 3.1 ERP System Implementation Outcome (Panorama, 2015)

The report also addresses the main reasons why some users use 'neutral' or 'I do not know' to describe their ERP system. The main points are stressed as ignoring the

importance of software selection, business case justification, benefits realization measurement or post-implementation audits

3.2.2 The Outcome of ERP Projects in SMEs

Nowadays, the daily need of people is more refined and specified, which prompts the business of professional and specialized companies. In the development of SMEs, their shortage of management exposes gradually on the quality problem, too much cost of production, increasing material waste and so on. These problems are not only the obstacles for SMEs to expand, but also have a harmful impact on the impression and expectation from clients. Research by Ondrej, Bjorn et al. (2012) on exploring the influences of the SMEs on ERP implementation stated that some organizations pursue improving management level via bringing in ERP system, which also stimulates the development of ERP market.

ERP is considered as a configurable information software package and has developed over 50 years. (Metaxiotis, 2009) It would be convincing to say that it should be accepted and applied in the major of business world. Based on the study of Maguire et al. (2007), some key points for SMEs to using ERP solution were:
● Most of the SMEs try to upgrade their internal system by acquiring ERP solutions.
● There are many brands of ERPs being purchased by SMEs, and one of the reason could be that they want to invest as less capital as possible.
● Some SMEs' owners are new to ERP systems.

SMEs pursue short-term turnover and wished the ERP system can act magically and instantly (Nilsson, 2009), which may cause that the owner would not like to emphasize post-implementation services offered by the implementer. The knowledge from the implementer cannot be conveyed to the users effectively, which means there is no effective process for the knowledge transfer between the implementer and user as well as some large enterprises.

3.2.3 Critical Success Factors(CSF) for ERP Implementation in SMEs

ERP implementation involves internal and external factors and it is quite different from traditional IT projects. (Somers & Nelson, 2001) The main reason is that the implementing context varies a lot for different size and different industry. Also, the requirements or expected outcome of clients are different, which have a huge impact on the ERP solution and the implementation. (Alleman & Ridge, 2005)

Ahmad and Cuenca (2013) defined the main CSFs and stated their relationship based on previous literature within a SME context, which is showed as a table below. (Figure 3.1) They also categorized the CSFs into operational and organizational perspectives, and with a classification of 3 levels that are basic, critical and dependent as followed.
• Basic: Project management skills, Professional and experienced project manager, Context and information analysis
• Critical: Cultural difference, Consultants, Support from top management
• Dependent: Cooperation and Coordination, Project governance and delivery, Communication

Furthermore, they studied the relationships based on the classification of the CSFs like followed. (Figure 3.2) From the diagram, the factors interact by a complicated way, and they work as a unit to have a successful ERP project.

ID	CSFs	Occurrence (%)
ID1	Good project scope management	26.32
ID2	Management expectations	21.05
ID3	Formalised project plan/schedule	63.16
ID4	Project management	68.42
ID5	Steering committee	26.32
ID6	Legacy systems	36.84
ID7	Cultural change/political issues	57.89
ID8	Business process reengineering (BPR)	78.95
ID9	Experienced project manager-leadership	63.16
ID10	Project champion role	47.37
ID11	Adequate resources	42.11
ID12	Trust between partners	15.79
ID13	Interdepartmental communication	84.21
ID14	Interdepartmental cooperation	73.68
ID15	Project team composition/team skills	78.95
ID16	Empowered decision makers	15.79
ID17	Management support and commitment	100.00
ID18	Monitoring and evaluation progress	68.42
ID19	Appropriate use of consultants	57.89
ID20	Vendor's tool	21.05

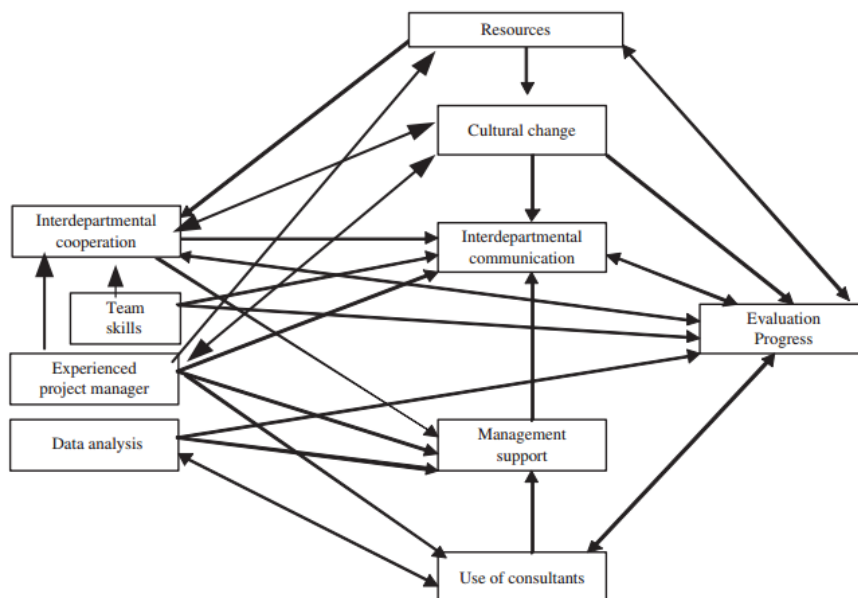Figure 3.1 Identification of critical success factors (Ahmad and Cuenca,2013)

Figure 3.2 Relationship of CSFs (Ahmad and Cuenca,2013)

3.3 Knowledge Management in SMEs

With an overview of knowledge management, this part will be devoted to the relation between SME and KM.

3.3.1 Overview of Knowledge Management

There is plenty of research on the Knowledge and Knowledge Management and its core objective is that utilize the organization's knowledge to guide decision-making, which requires locating, representing, transferring and storing the knowledge. (Kostas, 2009) Davenport and Prusak (1998) defined the knowledge management as followed:

> *Knowledge management is concerned with the exploitation and development of the knowledge assets of an organization with a view to furthering the organization's objectives. The knowledge to be managed includes both explicit, documented knowledge, and tacit, subjective knowledge.* *(Quoted from Davenport & Prusak, 1998)*

With a specific explanation of Knowledge itself, Newell et al. (2009) defined the term of knowledge with three dimensions: Knowledge as possession, process and practice. When looking at the knowledge inside the enterprises, Buser (2015) gave some examples as followed:
- Experience, competences and know-how of employees
- Designs and processes goods and services
- Files of documents (digitally, on paper or both)
- Plans for future activities, such as ideas for new projects

Kostas (2009) claims some reasons why enterprise should enhance the KM, which is listed as followed:
- Asset management intelligence
- Efficient business operations
- Customer and competitor management
- Continuous development
- Organizational learning
- Innovation in products and services
- Marketing strategy

He also stated that the knowledge management is the foundation of surviving in nowadays harsh competitive environment, which helps with generating the advantages of uniqueness, especially for the SMEs who rely on the specialized business scope and strategy.

Most of the researchers are convinced with categorizing the knowledge into two different types, tacit and explicit knowledge. (Koch, 2003), (Buser, 2015) The tacit knowledge refers personal experience and usually cannot be codified, stored and transferred via physical media, whilst the explicit knowledge can be conducted with those mechanics. (Hasen, Nohria & Tierney, 1999) Some other researchers made another classification based on whether the new knowledge contributes the existing one or substitutes it with a new knowledge, in other words, the knowledge is divided via the criteria: Additive or Substitutive. (Lech, 2009) Lech also claims that this way

of classification helps people to understand the difficulty when the knowledge is completely replaced, which usually means the receiver need external help.

There are plenty of authors studied the knowledge management activities and most of them are willing to illustrate them with a 'cycle-process'. The following diagram shows how the knowledge goes within a practical environment.
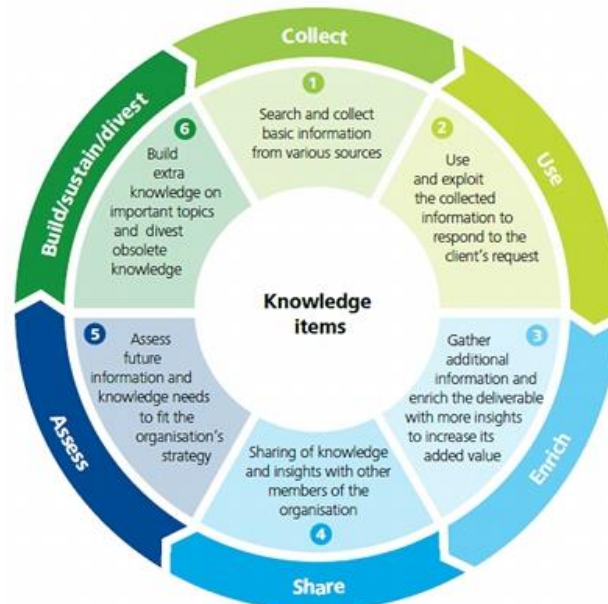
Figure 3.3 Knowledge Cycle in Organization

Kostas (2009) focused on the two parts of the cycle. One of them is creating, organizing and refining the knowledge. He introduced a clear way of knowledge generation that knowledge is collected from different sources and ten organized via several criteria or elements. Therefore, the knowledge would be filtered based on the content value and linked each other with a certain relationship. The refinement process occurs when the receiver uses the knowledge and add or cut to make a systematic knowledge archive. Another one is the presentation process, which refers to how the knowledge is be displayed and received by the users. Kostas (2009) emphasized that the type of knowledge affects the way of delivering, which may sometimes make the receivers find it hard to understand and digest knowledge from different sources.

Buser (2015) mentioned another important issue was the knowledge sharing. The knowledge cumulates more and more when the knowledge is shared. Nowadays, some knowledge management software is fully used to avoid this phenomenon, especially the internet and intranet make it easier to share the knowledge and normally stored and updated automatically.

3.3.2 Knowledge Management in SMEs

Knowledge plays an essential role in driving the business operation and development. (Kostas,2009) DJI, as the fastest growing SME in China, who is the leader of Camera Drone producer, also became successful because they have the unique core technology and knowledge. Knowledge management has become the most important factor for a successful enterprise without considering its size. (Okunoye & Karsen, 2002)

As mentioned above, SMEs lean on their unique and specialized product and service, whilst this kind of uniqueness is realized by several core specialists or talents. In other words, a few people possess the most important knowledge. (Kostas,2009) The several personnel is usually highly-paid, and the SME' development depends on them. (Wickert & Herschel, 2001) As a result, it will be a huge loss of knowledge if any of the knowledge owner leaves the company. Apparently, the enterprise will lose their competitiveness in the market once the particular individuals leave the company. Another restraining factor is that most of the SMEs are not aware of the importance of KM. Normally, the SMEs just use, but not utilize the knowledge, which means they do not transfer the knowledge to the other employees. (Kostas, 2009) Furthermore, those knowledge owners make a living on his/her unique skill and may be not willing to share too much with others. At this circumstance, the SME owner must get them motivated via different ways such as higher wages. (Desouza & Evaristo, 2003)

The research of Nunes et. al (2006) suggested that SMEs seems not believe the advantage of KM, and they also explained the two reasons that are the short-term investment is much more important than long-term one and most of the SME owners prefer investing the visually profitable project rather than the underlying ones.

Another research of Maguire et al. (2007) may fully describe the situation of SME using KM. The authors claimed that under 10% of SMEs are good at KM and the operation is over-rely on an certain individual, which leads none can resolve the problem once the individual is not accessible. Some SMEs do conduct some knowledge work, but they do not have a united and standard process. At last, SMEs are not willing to share the knowledge each other and hide them as the secret weapon. (Bozbura, 2007)

Overall, it seems the SMEs lack the concept of KM and main reasons can be summarized as followed:
* Emphasize short-term investment and instant profit
* Capability of recruiting and holding the experts
* Over-rely on particular individuals

3.4　ERP and Knowledge Management Integration in SMEs

From the previous literature study, the integration of Knowledge Management and ERP system has been proven to be necessary for SMEs. (Kostas, 2009) KM can improve the both visible and invisible competence, which refers, for example, new technology and positive enterprise culture. (Nilsson, 2009) Kostas, 2009 also mentioned that ERP system can help with improvement of comprehensive capability by integrating several or the whole parts of the organization and improve the employee's work efficiency. This section will illustrate the connection of ERP, KM and SME.

3.4.1　The Model of ERP and KM

In an organization, Knowledge Management works as a system (KMS) which controls all the activities including knowledge acquisition, store, transfer and regenerate. Kang et. al, 2012 defined the conceptual and logic models of KM and ERP as followed:
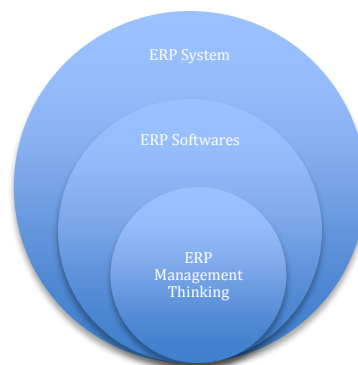
Figure 3.4 Conceptual Model of Knowledge Management
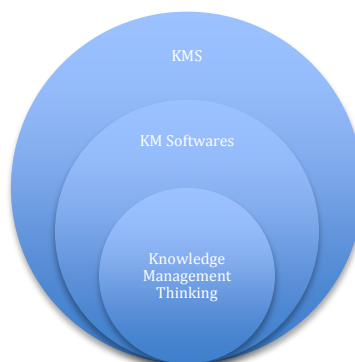
Figure 3.5 The Conceptual Model of ERP

The authors emphasized the importance both the cores of the systems: ERP management thinking and KM thinking, which is the basis of system development. It is easy to find out that the two models have similar characteristics and layers. The structure of Venn diagrams illustrates that the core of managerial way of thinking leads the development of the software and form a refined system taking the environment and other objective conditions into account. This similarity of two systems gives a basic possibility of combining the ERP and KM systems.

When Reddy. T & Indira. M., (2016) was exploring the combination of ERP and KM systems, they also introduced the conceptual design of two systems like following:
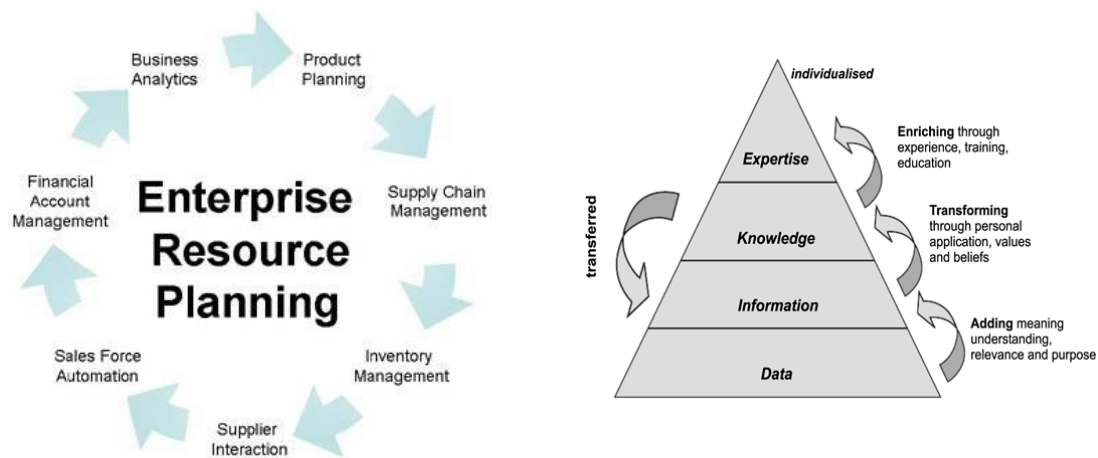
Figure 3.6 Conceptual Model of ERP and KM Systems (Reddy. T & Indira. M., 2016)

The authors argued that every step of ERP system contains the knowledge management process from basic data acquisition to the output as an instruction for next step. For the logic level, ERP and KMS are similar, which appears when the management thinking occurs, the process of data handling is almost same. On the other hand, the data resources used in the ERP systems can be reused and refined in the KM systems, which gives enough condition to combine the two systems.

3.4.2 Knowledge Management and ERP Combination in SMEs

Kostas, 2009 mentioned a basic combination model of KM and ERP systems and it shows like followings:
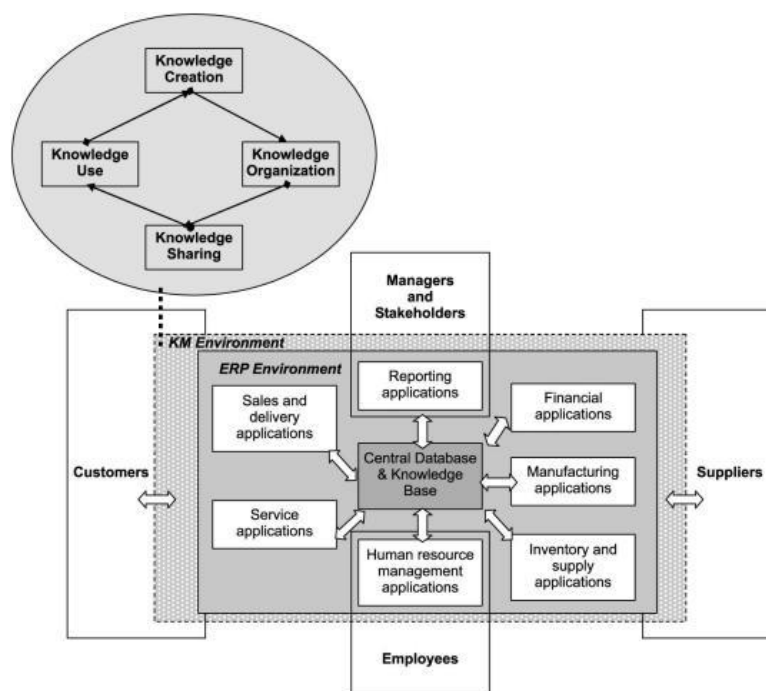
Figure 3.7 Basic Combined Model of ERP and KM Model (Kostas,2009)

Kostas, 2009 claims that this combined model was built under the condition of SME, which refers traditional business process and basic IT infrastructure. As the model shows, ERP stands for the integrated business process and the arrows shows the information flow among different functions. Furthermore, at the center, a database store, process, and transfer all the information in the business operations. KMS share the same database with ERP system, which means the data will be updated automatically when the data changes in the ERP system.

3.5 Knowledge Transfer in ERP Projects

After introducing the background of ERP, KM, SME and their connection, this section illustrates the how the knowledge is transferred in ERP project from the consultants to the end-users

3.5.1 Knowledge Items in ERP Projects

The PMBOK defined a basic project lifecycle and it mainly contains 5 stages from Preparation/Initiation to Delivery and Support. Ehie and Madsen, 2005 took the KM into account and mentioned how the knowledge is processed in an ERP project as followed:

Project Initiation: The tasks mainly are fundamental defining the target, scope, team-building, schedule, communication, document layouts and other structural elements. The KM work in this stage for the clients is getting involved and taking necessary training.

Project Planning: Based on the fundamental elements mentioned above, a detailed project plan and management plan should be designed, including the design of system. The clients should acknowledge the ERP product.

Project Execution: The main knowledge in this stage is the newly-designed system, which includes some documents such as system configuration and user manual.

Project Delivery: The new system is ready to run, and the users should be trained as knowledge transferring.

Project Support: Normally, the users will locate the consultants to solve some problems regarding the system. The consultants keep in touch with users closely.

As mentioned in previous parts, the knowledge is usually divided into two types: Tacit and Explicit. When the consultants try to transfer the knowledge product to the users, it will be better to classify different kinds of knowledge and choose the most effective way to conduct. (Lech, 2009)

Jayawickrama et. al, 2014 argued that there is no need to transfer every single knowledge item to the users and the way of transfer should be adjusted according to the type of knowledge and the receiver's position. They classified the knowledge into two dimensions. The first dimension is based on knowledge as process. In the company with new ERP systems, the users have to acquire two processes that are ERP system process and business operation process. The second dimension is knowledge as possession, which includes declarative knowledge, procedural knowledge, knowledge reasoning and integration. The table below shows a detailed classification with some examples.

Dimensions		Knowledge as Possession			
		Declarative Knowledge	Procedural Knowledge	Knowledge Reasoning	Knowledge Integration
Knowledge as Process	ERP Process Knowledge	Knowledge of ERP concepts, functions etc.	How the system will be carried out	The user should understand how the system works	The knowledge is transferred between consultants and users mutually
	Business Process Knowledge	Business target, main process, main products. Etc.	Business information flow from ordering to delivery	Business process has been refined and why it looks in the certain way	The business process is integrated in the ERP process.

Table 3.1 Knowledge Identification in two Dimensions (Jayawickrama et. al, 2014)

3.5.2 Knowledge Transfer Orientations

After defining the knowledge classification in the ERP projects, it is also needed to know the procedures of knowledge transfer. Lech, 2009 illustrated two orientation of knowledge transfer within studying 10 ERP implementation projects. Exploring orientation, which requires that the users should take part in all the stages of the project, makes the consultants and users transfer the knowledge mutually in the project work. Another orientation is instruction, which means the users only need to attend the training sessions and do not have to be active all the time in the project implementation. The choice of different orientation mainly depends on the user's position or role in the project and the company. For example, an order receiver, as frontend user, just needs to know how to generate an order in the certain interface according to the customer requirements; Whist as a mid-level manager who manage and control some sub-process, he or she have to know the detailed process in some degree to ensure the process works smoothly. (Lech, 2009)

Different transfer orientation may lead a huge diversity on consultants' workload. The exploration orientation requires constant contact with the users, which means the workload could increase dramatically. On the other hand, the training sessions may be similar from project to project, which makes that it just needs to be adjusted according to the users.

3.5.3 Influencing Factors of Knowledge Transfer Process in ERP Projects

Regarding the research on the influencing factors in ERP knowledge transfer, one of the most outstanding one is the model developed by Dong Gil Ko in 2005. The figure below showed that he started with three main aspects: Communication Factors, Knowledge Factors and Motivational Factors.
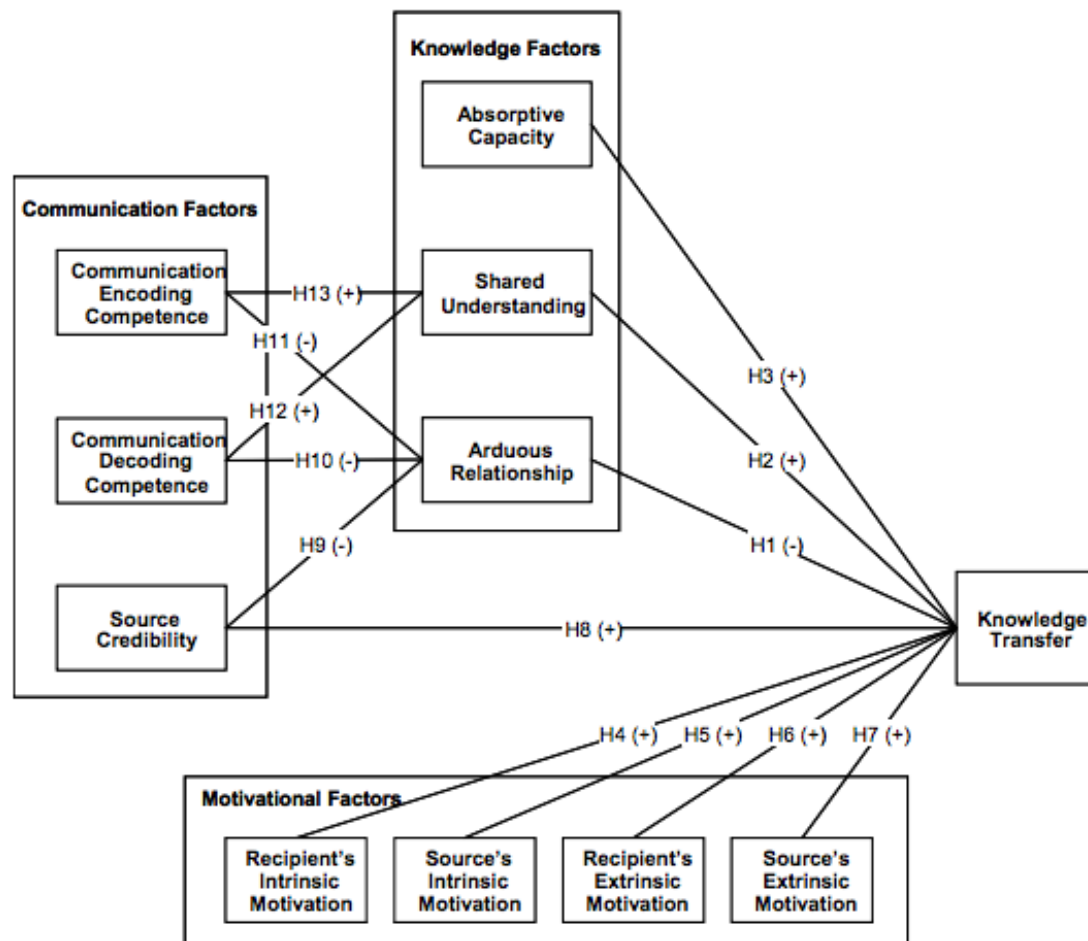
+: Positive Factors; -: Negative Factors.

Figure 3-8 Antecedents of Knowledge Transfer (Dong Gil Ko, 2005)

The result showed that the most outstanding factors were observability of the knowledge, the quality of the relationship between source and recipient, source credibility and recipient's motivation; Whilst the communicational factors and source credibility influence the mutual relationship directly, and then have the impact on the result of knowledge transfer indirectly. Dong Gil believed that

Q. Xu and Q. Ma, 2008 developed a model based on Dong Gi's research as followed. They focused on the determinants in ERP knowledge transfer between the key users and implementation consultants. With a considerable number of project data, the model was finalized based on four main factors: Knowledge source, Recipients, Knowledge-feature factors and Project Context. The authors believed that the knowledge transfer is influenced by knowledge tacitness, mutual relationship, transfer context and effective transfer activities that is first showed in the research.
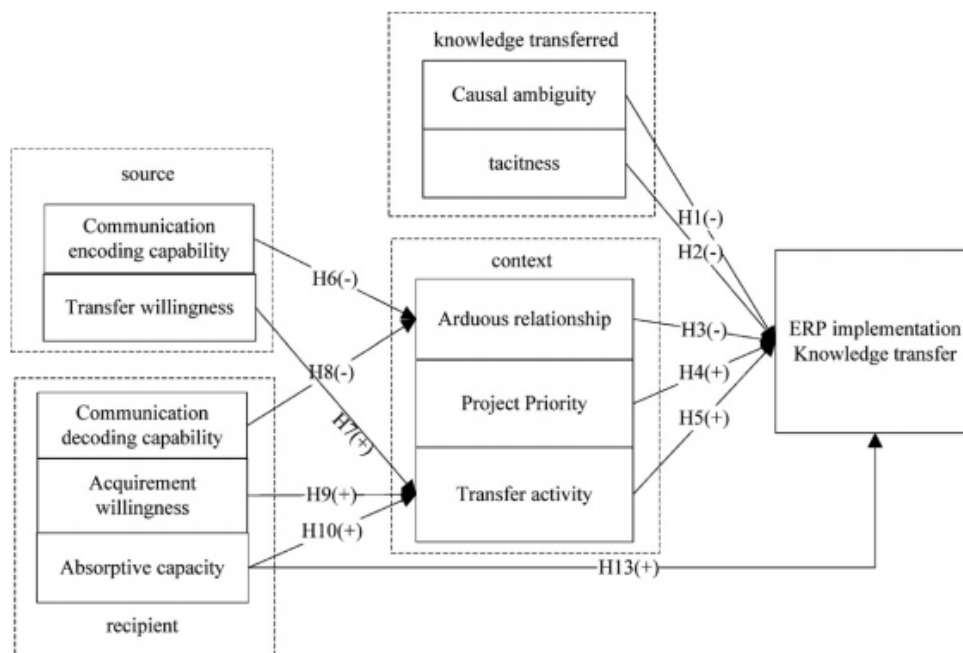
+: Positive Factors; -: Negative Factors.

Figure 3.8 Determinants of ERP Knowledge Transfer (Q. Xu and Q. Ma, 2008)

The following chapters will summarize two articles with 4 elements: Feature of the Knowledge, Origination, Recipient and Mutual Relationship.

3.5.3.1 Feature of the Knowledge in ERP Projects

Tacitness

According to Koch, 2013 and Buser, 2015, Knowledge Tacitness means that the knowledge cannot be expressed via language or words. Generally, explicit knowledge is easy to be coded and fully transferred via Email, memo and so on; Whilst tacit knowledge can only be acquired via observation, understanding or practice. (Buser, 2015) In the research of Q. Xu and Q. Ma (2008), the tacitness of knowledge is an obstacle of knowledge transfer. The knowledge transferred between implementation consultants and the client company consists of explicit knowledge that is easy to be coded (e.g. ERP system solutions, corporate business process, ERP techniques etc.) and tacit knowledge that is mostly personal experience (e.g. ERP management theory, problem solution etc.) In the mutual knowledge transfer process, explicit knowledge can be delivered via documents-related ways, while tacit one can be done by observing and practice.

Observability

The observability means the observability of the outputs after the knowledge being transferred. Dong Gil, 2005 indicated the importance of the observability, which means high observability would stimulate the recipient give good feedback on the transferred knowledge such as system process, technical knowledge of ERP and so on. He also pointed out that it will benefit the success of knowledge transfer when the recipient can easily feel the positive results of the solution. It is based on the evaluation of the recipient, in other words, the more obvious result of the knowledge, the more successful of the transfer. (Dong. G, 2005)

3.5.3.2 Source and Recipient of the Knowledge

Communicational Code Capability
Code capability refers communication skills of the knowledge source. Dong. G, 2005 define it as 'the ability to be easily understood'. He also found out that the code capability influences the mutual relationship between source and recipient and the success of the knowledge transfer indirectly. Q. Xu and Q. Ma, 2008 argued that for the most of the companies with ERP, the implementation of ERP will bring in the revolution of management, which makes the employees/users may feel anxious or suspicious when confronting with the new system. As a consultant/trainee who may directly be linked with the users, he/she should possess good communication skills to make the users receive the new knowledge easily and successfully. It is also a key factor of building up the bridge between source and recipient. On the other hand, as a user of the ERP system, improving own code capability helps the consultant with knowing the current business process and requirements, which is essential for the ERP system design and implementation. (Dong. G, 2005)

Transfer Willingness
Transfer Willingness means the source's intrinsic motivation. (Dong. G, 2005) In the research of Q. Xu and Q. Ma, 2008, the authors proved that bigger transfer willingness leads more active transfer activities via several cases, which means that bigger quantity of transfer activities ensure the result of the transfer. In the ERP projects, the consultant will be devoted to transfer their own tacit or explicit knowledge of ERP to the users in order to fulfill the project target; Whilst the users also need to explain more about the business process and requirement to meet the conjunction between ERP system and corporate business.

Absorption Capability
Absorption capability refers the ability of recipient to know, understand and apply the transferred knowledge, which ensures the effectiveness of knowledge transfer. Both of Dong. G, 2005 and Q. Xu and Q. Ma, 2008 believed that the absorption ability and the success of knowledge transfer are positive correlated. In the transfer process from consultant to the users, everyone has different ERP-knowledge background and different understanding level of ERP, which leads the diversity of absorption capability on the ERP knowledge.

3.5.3.3 Mutual Relationship

The relationship is between the consultant and the users. Dong. G, 2005 pointed out that it contains mutual understanding and connection: Mutual understanding refers the similarity on the view of value, regulation, problem-solving and work experience. The research showed that mutual understanding is not a significant influencing factor in the transfer process, but good mutual understanding benefits the communication. Q. Xu and Q. Ma, 2008 stated that ERP projects normally last over 1 or 2 years, and it quite requires the cooperation between the consultants and users. Undesirable mutual communication builds up an invisible wall between them and is the resistance of the knowledge transfer. (Nonaka, 1994) On the other hand, good mutual understanding helps to build up friendly work environment, mutual trust and source credibility, and as a result, the knowledge transfer will be improved.

3.5.4 Knowledge transfer in ERP projects for SMEs

Although the knowledge receiver could be changed from the large organization to the small or medium size ones, the knowledge itself regarding ERP projects are almost similar. The more important thing is that the implementer should be aware of the working methods and adjust according to the real situation. (Lech, 2009)

Wynn & Maryam (2015) illustrated the knowledge transfer in ERP projects in manufacturing SMEs from another angle. They argued that implementing a new ERP system will bring in the change in three aspects: People, Process and Technology. Limited by the volume and other features of the SMEs,

Process Change
The authors mentioned that the SMEs must understand the gap between the current operation process and the expected process. This is in the level of knowledge management and most of the SMEs are not aware of the importance of analyzing the processes. A good resolution is that getting understand the next 3-5 years of company plan and key targets as the beginning. Using process mapping to identify the current process path, especially the main processes. Adding up the planned changes to the process and adjust if there is any need of replacement. After selecting the ERP package, it is not obliged to follow every detailed stages of project management methodology since one of the main feature of SMEs is agile. Another point is that any improvement of the process should be realistic because, in an SME, the time and resource (workforce, budget and so on) are limited. It is critical to focus on the key process area.

People Issues
ERP implementation brings in the change of process, which means most of the employees will be going through the change of working practice, even work content. The employees are required to adapt to the new work environment. The authors indicated the key is making them feel the change. Some ERP projects fail in SMEs because most of the employees would not be following the new ways of working and they do not realize the changes. As a result, it is quite essential for the employees to feel the presence of the new system. Normally, the employees would be trained to use the new software, share the ideas, which means creating a shared studying scenario would be important. From the view of knowledge management, a training program is a useful way for the consultant to transfer the knowledge to the users.

Technology Change
Similar to the description of introducing the features of SMEs, the authors also mentioned the limitation of technology capability in SMEs. The ERP package is realized via updating of new technologies. In the post-implementation stage, people are required to be skilled using the new software. For the consultants, it is really important to identify the key users and their working software, thereby the training program could be effectiveness-oriented. For example, the logistic controller should learn the new stock management software to monitor the importing and exporting items.

In summary, to secure the successful outcomes of the new ERP system, it is important to keep all the key elements (Process improvement, People training and Technology

change) in balance. For the implementers or consultants, it is essential to set up the regular review and keep updates along the project implementation.

3.6   Summary

Knowledge transfer in ERP projects for SMEs mainly focuses on the knowledge transferred from the consultant to the users. Compared with the large organization, the features of SMEs make it more delicate to identify the key process, and be aware of the change in process, people and technology.

4 Empirical Study

This section will summarize the interviews with the consultants and other project managers referring to ERP projects in SMEs. The detailed case introduction and data analysis of three cases will be conducted from knowledge identification at each project stage and illustration of users' feedback on the transferred knowledge.

4.1 Introduction to the Cases

Company A

Group A is a leading car part and system supplier around the world and headquartered in German. Over 10,000 employees worldwide work in the factory or research center. Its product contains design and manufacturing the car parts and it ranges from the interior package, car seats and metal body to the electrical system, mirrors and plastic parts.

In 2009, the company decided to build a new car closure system factory in Sweden and it runs as a wholly owned subsidiary of Group A. For that time, less than 250 employees work in the closure factory A. In order to expand the production capability and optimize the management level, the CEO of the company A considered to apply a new ERP system in 2011. As for the ERP software vendor, the company decided to use SAP that the whole group used for a long time to ensure the information connection and financial data consolidation. The selected ERP system contains several modules including selling, purchasing, manufacturing, financing etc. After almost one year of negotiation, preparation and implementation, the ERP system was launched in July 2012 and has worked successfully for nearly four years. In the interview with the CEO, he mentioned that the system provided accurate and effective data regarding business operation and decision-making.

Company B

Company B produces car roof boxes and is a small sized enterprise and family-owned. It started in 1995 and is located in southeast of Sweden. The most outstanding characteristic of this company is that it offers both customized and standard roof boxes for various of cars. The company has its factory outlet and online shop.

In 2012, the owner decided to apply the ERP system of Microsoft Dynamic to improve management level and product quality, since the sales revenue decreased year by year after 2008. In the interview with a marketing manager in the company B, he introduced some outstanding changes that ERP system brought in: The invoicing time had decreased into minutes instead of hours or even days; It is easier to share data, especially the product design and configuration data; Customer feedback was getting great and the ERP software is easy to use and worked fast.

Company C

Company C is a car suspension system subcontractor and over 300 employees work in the company. It just produces the system according to the design from customer companies such as Saab and Volvo etc.

With the ordering quotation decreasing, the CEO and other managers found out that the delivery time is much slower than other competitors. They consulted with CGI, who is a famous ERP consulting and implementing company in Sweden, and decided

to apply CGI's solution to shorten the lead-time. This project started from January 2016 and it is still on-going. Based on the interviews with the consultants from CGI, the project target is not only using ERP system to replace the old separated system, but also realizing bar-code labeling, RF scanning and JIT. The foundation of the system is almost done and it may take more time since it requires other parties such as the labeling and scanning provider.

Overall, the following table summarizes the background of the companies and the ERP projects.

Company	A	B	C (On-going Project)
Employees	< 250 (in 2009)	~200 (in 2012)	>300 (in 2015)
Company properties	wholly owned subsidiary	Family-owned	Partnership
Industry	Car part manufacture	Car part manufacture	Car part manufacture
Main Products	Door closure systems	Car roof boxes	Suspension systems
ERP software vendor	SAP	Microsoft Dynamics NAV	Microsoft Dynamics GP
System Launch Time	July, 2012	September, 2013	Project started at Jan. 2016
Implementation Duration	9 months	6 months	-
Implementer	SAP (Supported by the Headquarter)	CGI	CGI
Number of Consultants	5	4	4
Activated/Expected Functional Modules	selling, purchasing, manufacturing, financing	CRM, Selling, Manufacturing	Financing, Manufacturing
ERP Running Time	2.5 yrs	1.5 yrs	-
Other attachment systems	-	-	Bar-code labeling and RF scanning

Table 4.1 Case Summary

4.2 ERP Project Management of SMEs

The start-up interviews were conducted from getting to know how the different parties thought on the ERP Projects in SMEs and the knowledge transfer within it. The parties included project managers on both sides, consultants, SME owners and some frontend users.

4.2.1 SME Owners

When the SME owners of the three cases confronting with the question how do they feel about launching an ERP project within the companies, the owners of company A&B first gave positive feedback on the new system. The owner of Company C was also confident about the benefits the system would bring in.

In the initial time after the project was delivered, there must be some hardships, but I can see lots of employees get rid of heavy work. We now have a clear business process from getting an order to manufacturing, and we are about to add-up the logistics function into the system. –Owner of Company A

It is so good to see that it is getting easier to manage customers. Before we were struggling with managing relationships with customers. Our customer pool was so complicated and we

might lose some potential ones when we did not take care of them. Now, the new CRM function does help us a lot and the information is easy to share with the different departments. —Owner of Company B

Some of my employees even managers are still doubting my decision on launching the ERP system. I am very certain and give full support to the project team. Changes always come with difficulties, but I believe it will benefit all the employees eventually. – Owner of Company C

According to the quotation from the SME owners and other description, they were showing their faith with building up the ERP systems and believe in what they can bring in. Their support ranges different areas from connecting software implementer, financing to taking into account employees' opinions. The owner of Company C did attend the training seminars with other employees, and he explained that he wanted to know how the employees react to the new system and ensure the training was working. However, they confirmed the difficulties when communicating with the consultants. When it comes detailed project management with ERP system, they confessed they did not have enough knowledge background and sometimes they would get lost talking with the consultants. The owner of Company A tried to be the project manager because he wanted to take care of as much detail as possible in the project process, but he had to give up and transfer the job to the provisionally employed IT Manager who had a long-time connection with the company.

In term of knowledge management and transfer in the ERP projects, the three owners clearly demonstrated that they all do not have specific concept or experience in these areas. However, either of them realized the importance of training people when bringing in new technology, especially ERP system that is covering so many changes in structure, management and process. The good thing was that they have the great attitude with the new things and the willingness to learn from the specialized consultants.

4.2.2 Project Managers in Client Companies

The project managers in client companies are fully responsible for the project running. Not only did they communicate with consultants directly, but also with the SME owners and users. The PM in Company B described that the task was like the bridge that was connecting between the consultants and the company. While the PM in Company C got the notification to start up an ERP project, he felt so much pressure because he knew how the damage would be if the project failed. The PM in company A was relatively confident because they had used an ERP system functions for years, but he also knew how importance it is for the whole company.

The PMs indicated that the hardest time was in the primary stage when communicating with the consultants. The first reason was that the PMs were not that clear about the business processes in companies. Especially for PM in Company A, he was provisionally employed and it took some time to digest the process mapping. Moreover, PM in Company B was an IT manager who was in charge of device maintenance and did not have that much experience on specific management. The solution was that the owner in Company B arranged another top manager to help the PM, but this also caused a problem that the users and the consultants did not know who was really in charge, and in other words, they did not have a clear responsibility separation. The PM in Company C was from top management and he had a full

understanding of the processes and expected ones. Although he did not use any ERP system or similar ones, he pre-studied/researched a lot and he was letting the consultant lead the project. The project running seems smooth, and the PM tries to give as much information as the consultants want.

As for knowledge management in the ERP projects, they all indicated that they would not create a KM process specifically, and they just want to be practically when it came to process mapping, data transfer and people training.

4.2.3   Project Managers/Consultants as Implementers

The project managers and consultants of implementers were from SAP and CGI who had lots of ERP project experience. It is precise to say that they have own project management methodologies and practices when dealing with different industries.

Working with SME is hard, for sure, because they have various styles. Sometimes, I would say, strange styles. However, if we want to overcome the difficulties, we have grasped the core firmly. The core is figuring out what do they really want to be with the ERP system and realize it. Sometimes, of course, we have to help them to discover the best solution, best process and best design. –PM from CGI

In Sweden, there are a lot of industrial companies with different sizes, but it is still hard to work with SMEs because of many obstacles such as low management level, too strong personal charisma of the owner, low level of IT infrastructure and project management maturity, especially for the traditional manufacturers. –PM from SAP

We want to help them and they did try to cooperate, but there still exist some different understanding. Preparation is really essential, I mean, the research on the how it works in the specific company. -- Consultant from CGI

Although it seemed difficult to build up ERP system for SMEs, the projects were successful in Company A&B. When the PMs and consultant were asked about how to resolve the problems as implementers, they shared several tips.

First is that the more the owners or top management get involved, the better. The PM from CGI said that the SMEs' owner and top management are the most important stakeholders, and they can offer information and budget support. The PMs of implementer also discuss risks with the top management, and then they can decide how to conduct with projects. Second is instant and effective communication. The PM from SAP mentioned: "Communication is essential, and we are willing to explain more and using simple theories and terms to make the clients follow-up." They also use different tools to communicate with the clients such as diagrams, 'post-it' for mapping and so on. Even some animation was used to describe how the ERP system works. "When we run into some troubles, we inform the clients instantly, and work it out together" One of the consultants from CGI said. The last but not least, listening to the users is also essential. The system design must take into account the user habit of software, the UI (User interface), the up and down link of the users and so on. (The up and down link means the users have to know where the instruction or case comes from and goes)

Referring to knowledge management in ERP projects for SMEs, the project team from SAP used the same way applied for large enterprise and made some adjustment

for the specific company. While the CGI has their specifically-designed knowledge management instruction for SMEs, which covers from meeting with top management and key users to user training. The practices of knowledge management in both SAP and CGI were almost same, and it will be introduced in following parts.

4.2.4   Users

The users refer to key users (mostly functional manager) and frontend users. They are not the direct implementer in the ERP projects, and they are more likely receive knowledge from the consultants. Definitely, they also transfer knowledge to the consultant, and the knowledge mainly is the business process and detailed tasks in the process.

The most apparent problem was that users generally had a low level of participation. In the interview with one of the employees in Company C, he said that he did not have the time to attend every group meeting and seminar and have too much work on his plate. This problem also happened to the other two companies, and it caused several joint troubles such as the consultant cannot receive the necessary information and feedback from the users in time, resource and time waste because they have to arrange extra or individual meetings and the users do not get a full picture and misunderstanding of ERP system etc.

Some users also reflected that it might take time to work out with the consultants. Although the consultants were experienced and specialized, it did not mean every consultant had very good communication skills. Most of the consultants were working according to the conventional process and when they were transferring the knowledge to the users, they seemed not pay much attention to the instant feedback. One of the key users in Company A said that the consultants were not taking care of 'special circumstances and they would not care if some key user did not attend an important meeting.

4.3　Knowledge Identification in each Stage

Based on the ERP project process and the three projects, the data analysis is divided into 3 stages: Initiation, Implementation and Launch-on. In the three cases, the main actors are implementation consultants and users and three of them had a similar team forming. Commonly, on the implementer side, the team consists of four to five consultants and one of them acts as project manager and the rest of them are respectively responsible for different modules such as Manufacturing, Logistics, Finance and so on. (Figure 4-1) While on the client company side, IT manager or top manager could be the project manager, and the functional managers and key users are in the second tier. At last, end-users are in the third tier. (Figure 4-2)
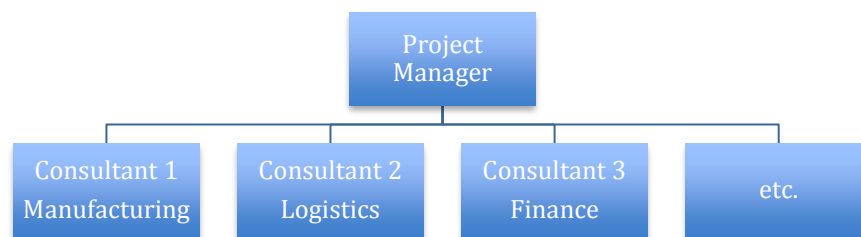
Figure 4.1 ERP Project Team-Implementation Provider
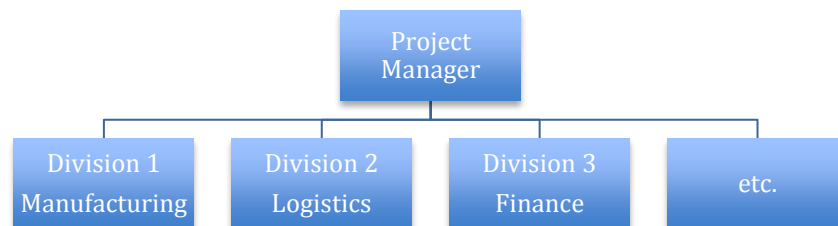
Figure 4.2 ERP Project Team- Client Company

4.3.1　Start-Up Stage

As mentioned above, all of these three projects are similar in initiation stage. The main process started from the several meetings between two project managers from both sides and settle the target and rough project schedule. After reaching the consensus, initiation meeting would be organized, and all the managers were informed to be attending. It is worth to mention that, in the interview with some managers or normal employees, they reflected that it was hard to follow and understand in the primary time, and even still confused later on. In the client companies, only did 'Company A' organize an internal training seminar to prepare the employees on the ERP system. In the meetings, some details were settled such as project target, scope, schedule and so on. The main content was identifying team members and responsible individuals.

After the project had launched, the implementer arranged a plan to research the corporate business process. CGI, who is the implementer in Company B and C, chose to send the research plan and outline to the managers and key users, which made them have the enough time to prepare and think about the business development requirements. SAP implementers were devoted to talking with the owner and other top managers. In the following meetings, the consultants and the key users discussed the business process and requirements and then the consultant would offer a primary

system scheme guided by the business process. At the same time, in project A, SAP implementer organized ERP system simulation to make the users confront with the system solution and check the matching degree between the solution and the business requirements.

Based on the description above, in the initiation stage, the knowledge was transferred between implementer and the client companies: ERP system target, Implementation methodology, Corporate business process and requirements and system solution. The following table shows the detailed information.

Activities	Meetings between project managers on both sides	Project Launching Meeting	Business process R&D	Offering the system solution
Knowledge	ERP system target	ERP system target; Implementation Methodology; ERP management Theory	Current business process; Development requirements	ERP system solution
Source	Project manager of client companies	Project manager of implementer	Key users	Consultants of Implementer
Recipient	Project manager of implementer	Project members of client companies	Consultants of Implementer	Key users
Transfer path/conveyer	Verbal instruction/Write Form	Verbal instruction	Verbal instruction/Write Form	Solution documents/ presentations
Influencing Factors	Communication skills; Client project manager's ERP background	Communication code capability; Acquisition motivation; Experience with ERP	Communication Skills	Observability of the document and presentations; Reaction of the key users
Result Evaluation	Check the coherence of ERP system target between both sides	Random interview with employees	Interview with key users	

Note: All the data were collected via interviews and observation

Table 4.2 Knowledge Transfer on ERP Project Launching Stage

4.3.2 Project Implementation Stage

After the project getting started, the project reached the most important stage - project implementation. In all the three cases, the implementing consultants were appointed according to the different ERP system functions. Therefore, the consultants arranged the individual meeting with their own key users in each function module. Based on the result and instruction in the project start-up meeting, the participants discussed every detailed key element. At the same time, they tried to appoint every step of the business process into every operation in the ERP operation., which formed the business operation process map in the system. Afterward, the consultants in each function module guided the system administrator, key users to finish the setting-up of

the system configuration. In order to secure the right configuration, they also tested step by step and arranged the system operation training for the key users.

The system training offered by CGI was set within two stages. The first one was focusing on the key users to make them understand the configuration and system operations. The next one was for the end users letting them learn how to use daily operations and reporting. While SAP arranged all the users to be trained together, and they believe that the key users and the end users can exchange ideas at any time in this way. However, all the consultants from CGI and SAP believed the importance of adjusting training frequencies and methods according to the feedback from the users. Normally after the training in one phase, the consultants would interview the users about the training. Furthermore, after all the training finished in each function module, all the users would be tested to do the system operation simulation to make the consultants have a better view of the user's acknowledging.

Based on the description above, in the three phases (System blueprint design, System configuration setting up and System training) of project implementation stage, the knowledge transferred between the consultants and the client companies are: current business process and expected improvement and ERP system technical knowledge as the table showed below.

Activities	Business blueprint design		System configuration and test	System Training
Knowledge	Current business process; Business development requirements	ERP system technical knowledge	ERP system technical knowledge	ERP system technical knowledge
Source	Key users	Implementing consultants	Implementing consultants	Implementing consultants
Recipient	Implementing consultants	Key users	Key users	Key users
Transfer path/Conveyer	Group meeting; Business process diagram	Group Discussion; System presentation; System specification documents	System presentation; System specification documents	Training; System presentation; System specification documents
Influencing factors	Willingness to send; Mutual communication capability	● Consultants' communication capability ● Source creditability ● Relationship ● Willingness to acquire ● Way of transferring		
Evaluation	Satisfaction on the system solution; Coherence between solution and business process	Users take system test to check the result of training		

Note: All the data were collected via interviews and observation

Table 4.3 Knowledge transferred in ERP Implementation Stage

4.3.3 ERP System Launching Stage

In the launching stage, the first problem should be resolved is the preparation of basic system data. For the company B and C, they never used any ERP system before, and they would not be concerned about switching from the old system to the new one and the problem caused by the double-system existing. In addition, because of the small business volume, there was not too much data to be transferred. As a result, both the consultants from CGI, and the company managers decided that some of the basic data was input by hand such as the information of suppliers, clients, parts, BOM (body of material), orders and so on. As for the other basic data such as product stock data, it would be transferred via EXCEL documents. For the company A who had used another ERP system for several years, the project team had to consider the data output and input between two systems. Because of the very difference of data format between two systems, the project team decided to transfer the basic data into EXCEL and then input to the new system. In the process of basic data preparation, the system administrator as the key users learned the basic system methodology, which came to be the basis of the future development.

Before the official launching, all the companies and the consultants chose to test-run the system for one month. In the test-run, the system used the real data, but only restricted to several certain products. In this way, the end users can transfer the knowledge into operation ability, re-chew what they have learn and improve their understanding and capability gradually. When it comes to some vague or blind point, the consultant could arrange specified training until every user possessed the necessary operation abilities. On the other hand, some problems and system bugs blasted in the test-run, and the consultants can respond instantly and make some adjustment. From the beginning of launching, the consultants and the system administrators monitored the status of the system running, and helped the users with some problems at any time. According to the monitoring log, it is easy to find that most of the problems or bugs occurred in the first month of running. After three months, the companies can operate the system independently.

The ERP launching stage could be divided into three phases: Preparation of basic data, Test-run and Official launch. The knowledge transferred between the consultants and client companies contain system implementation methodology, current business process and expected improvement, system techniques and the possible problem and resolution in the running. (Showed in Table 4.4)

Activities	Preparation of basic data	Test-run for one month		System maintenance after launching
Knowledge	Methodology- how to prepare the system basic data	Current business process and expected improvement	ERP system technical knowledge	Problem resolution and experience
Source	Implementing consultants	Key users	Implementing consultants	Implementing consultants
Recipient	System administrators	Implementing consultants	Key users	System administrators; Key users; End users
Transfer path/Conveyer	Discussion meetings; Documents-plan of basic data preparation	Group Discussion; Business process mapping	Training methods; System specification documents; Operation manual	Documents; 'words and deeds'
Influencing factors		Willingness to send;	Communication skills of consultants; Mutual relationship; Capability of absorption; Willingness to receive	Communication skills of consultants; Mutual relationship; Capability of absorption; Willingness to receive; Tacitness and explicitness of knowledge
Evaluation	Interview with the users; The result of basic data preparation	ERP running log; Interview with key users	Interview with the users	The number of problems and bugs; Repetition rate of the problems

Note: All the data were collected via interviews and observation

Table 4.4 Knowledge transferred in ERP Launching Stage

4.4 Users' Feedback on the Transferred Knowledge

After identifying the knowledge transferred in each stage of project implementation, it is needed to research on how the users feel about the knowledge and evaluate the result of knowledge transfer. The following part will illustrate the users' feedback on the knowledge and it will be presented via cross-comparison.

4.4.1 Start-up Stage

ERP System Target (Project Target)
ERP system target is a macroscopic concept and the finalized target was settled by the two project managers and it is an organic combination of ERP system function and expectation from the client company. In order to evaluate the degree of knowledge transfer, with some interviews conducted with different parties in each project, an evaluation model developed by Cummings and Teng (2003) was applied. The following table shows the knowledge transfer evaluation in initiation stage in three projects.

Evaluation Indicator	Dimensions	Project A	Project B	Project C
Perception of Recipient	coherence of ERP system target between both projects	Almost coherence	Half coherence	Half coherence
	User's understanding on the system target	40 users- Fully understanding; 18 users-Half Understanding; 2 users-Basically Understanding	25 users- Fully understanding; 14 users-Half Understanding; 1 user-Basically Understanding	30 users- Fully understanding; 25 users-Half Understanding; 5 users-Basically Understanding
Satisfaction of Recipient	User's satisfaction on the target	45 users- Fully Satisfied; 3 users-Half Satisfied; 2 users-Basically Satisfied	30 users- Fully Satisfied; 7 users-Half Satisfied; 3 users-Basically Satisfied	55 users- Fully Satisfied; 4 users-Half Satisfied; 1 user-Basically Satisfied

Note: All the data were collected via interviews and questioners
Number of questionnaire collected from the users: A-50, B-40, C-60
Table 4.5 Knowledge Transfer Evaluation on ERP System Target

In the interviews, there was an interesting finding that the two project managers had different opinions on the system target, even though the target were settled together. In the project A, it was quite easy for the two project managers to be on the same page, while the other two projects, there existed some obstacles for them to discuss smoothly. With a deeper discussion with the PM (Project Manager) of Company A, he reflected that Company A had used another ERP system for several years and he had a solid knowledge background with ERP system, which made it easier for him to discuss with the consultant and meet the mutual coherence. As for the Company B and C, the PM of the companies did not have any experience with ERP systems, which lead some deviation of understanding. It is easy to address that necessary ERP background is beneficial for the knowledge receiver to interrupt and decode the transferred knowledge, therefore, the effectiveness of communication would also be improved.

Another active reason was that the PMs (project managers) of the implementer had the different level of communication skills: Some of them were logic with his/her expression, and it helped the understanding of PMs of client companies.

I can fully follow his (PM of Implementer) points. He always is logic and willing to help me to understand. –PM in Company A

I took a big effort to get to know ERP before the meeting. However, I never used it, so it was still hard for me to follow on. -- PM in Company C

The last finding in this stage is that the support from the owners positively affects the users' attentiveness on the ERP project. Even though two of the three owners never used ERP software, their attitude on the launch meeting encouraged the PMs' determination. In fact, the support from the owners made the users more motivated.

Business Process and ERP Solution
In the stage of project start-up, the consultants from CGI and SAP offered not only ERP solution documents but also arranged ERP system simulation for the key users in order to make them catch up faster. The key users mainly experienced the system operation process from product planning, material purchasing, production to the delivery. CGI's simulation also included the financial function. With two days of simulation, most of the key users reflected that they grasped the highlights and key control points in the operation, which enhanced the later on communication.

The reason to put the evaluation on business process and ERP solutions together is because that business process and requirements are the foundation of ERP solution. Although the 3 companies applied different modules of ERP system, the feedback shows that all the system schemes can cover the whole business process. The following table shows the detailed data of the evaluations.

Evaluation Indicator	Dimensions	Project A	Project B	Project C
Business Process and Requirements				
Number of Knowledge Transfer	Number of business process paths	20	30	25
Perception of Recipient	Consultant' understanding on the business process	4 Consultants-Fully understanding; 1 consultant-almost understand	4 Consultants-Fully understanding	4 Consultants-Fully understanding
ERP System Solution				
Perception of Recipient	Easy interface	30 users-Highly 20 users-medium	35 users-Highly 5 users-medium	56 users-Highly 4 users-medium
	Easy to read the solution document	48 users-Highly 2 users-medium	35 users-Highly 5 users-medium	53 users-Highly 7 users-medium
Attentiveness of Recipient	Feedback on the Presentations	45 users-Good 4 users-Medium 1 user-Basic	36 users-Good 4 users-Medium	53 users-Good 5 users-Medium; 2 users-Basic
	Has you read the system specification document seriously?	40 users	28 users	40 users
Attentiveness of Recipient	Satisfaction on the system solution	42 users-Good 6 users-Medium 2 users-Basic	37 users-Good 3 users-Medium	55 users-Good 4 users-Medium 1 user-Basic
	Coherence between solution and business process	42 users-Highly 8 users-medium	35 users-Highly 5 users-medium	50 users-Highly 8 users-Medium 2 users- Basic

Note: All the data were collected via interviews and questioners
Number of questionnaires collected from the users: A-50, B-40, C-60

Table 4.6 Knowledge Transfer Evaluation on Business Process and ERP Solution

From the statically data, it is easy to find out that the knowledge transfer regarding business process was throughout, in other words, the client companies wanted to use the updated process in the ERP system to replace all the old ones. One of the key users in Company B said that:

We want all the process can be realized in the ERP system in order to cut down the handwork and re-organize the process structure to be more clear and scientific. We are quite motivated.

In the interviews regarding this area, another finding was that the communication skills of consultants and users affected the knowledge transfer dramatically. Some of them had strong expression capability and for others, decoding ability made them easier to understand others. The difference of communication capability had a big impact on the mutual understanding.

The PM in Company A mentioned that the importance of ERP system simulation that gave a whole picture of ERP operation to the users directly. The users can actually feel what benefits can the ERP bring into the process improvement. With a higher level of valuing ERP systems, the users were easier to devote themselves to the transferred knowledge and gained more willingness to receive the knowledge.

4.4.2 Implementation Stage

Business Process and Expected Improvement
Corporate business process and expected improvement are not only the root of process blueprint design, but also the foundation of ERP solution and the key to the ERP project success. One of the consultants for SAP said that the restructure of the business process is the first key to the project success. Therefore, the core of evaluating whether the knowledge of business process transferred successfully is the degree of satisfaction of the users and the matching degree between ERP system process and business process. The following table illustrates the evaluation on the transferred business process knowledge.

Evaluation Indicators	Dimensions	Project A	Project B	Project C
Number of knowledge transferred	Business process paths in blueprint design	30	42	38
Number of knowledge transferred	Expected improvements in blueprint design	10	12	13
Perception of Recipient	Consultants' understanding on the business processes	4 Consultants - Highly; 1 Consultant-medium	4 Consultants - Highly	2 Consultants - Highly; 2 Consultants-medium

Note: All the data were collected via interviews and questioners
Number of consultants in each case: A-5, B-4, C-4
Table 4.7 Knowledge Evaluation on Business process

From the table above, the business processes in every project increased over ten processes, which means the change within the business process would be thorough and covered all the old processes. According to the PMs in the companies, all of them hope that the ERP system can make effective changes such as cutting down handwork and standardizing the working processes.

Similar to the start-up stage, the communication skills on both sides still played an essential role in knowledge transfer in the implementation stage. The communication skills of key users can be interrupted as the ability to express business process and expected improvements, while for the consultants, it refers the capability to grasp the core and key points in the process, match with the ERP operation processes and finalize the adjusted system process.

ERP System Techniques

The knowledge transfer of ERP system techniques is one of the most essential items in the implementation stage and even the whole project. Its success will affect directly on the level of understanding and application of the ERP system. The consultants from SAP argued that the success of ERP projects is highly depending on the specialized implementation team and employee training. One of the consultants from CGI also believe that both of the key users and end users training are important, and he also mentioned that in most of SMEs, the maturity of the technology is quite low, which makes it harder to transfer the knowledge to the users. As a result, the following table will illustrate the evaluation of the ERP system techniques.

Evaluation Indicator	Dimensions	Project A	Project B	Project C
Satisfaction from Recipient	Users' satisfaction of system training [1]	44 users-Good 4 users-Medium 2 user-Basic	38 users-Good 2 users-Medium	50 users-Good 5 users-Medium; 5 users-Basic
	Users' satisfaction of system operation[2]	48 users-Good 0 users-Medium 2 user-Basic	38 users-Good 2 users-Medium	50 users-Good 5 users-Medium; 5 users-Basic
Feedback on the knowledge	Users' evaluation on the ERP techniques[3]	43 users-Good 4 users-Medium 3 user-Basic	20 users-Good 2 users-Medium 18 users-No answer	10 users-Good 23 users-Medium; 27 No answer
Devotion of Recipient	Devotion of users to system training	20 users-Good 14 users-Medium 16 user-Basic	27 users-Good 13 users-Medium	20 users-Good 23 users-Medium; 17 users-Basic
	Devotion of users to system meetings	44 users-Good 4 users-Medium 2 user-Basic	38 users-Good 2 users-Medium	50 users-Good 5 users-Medium; 5 users-Basic
	Devotion of users to system presentation	44 users-Good 4 users-Medium 2 user-Basic	38 users-Good 2 users-Medium	50 users-Good 5 users-Medium; 5 users-Basic
Degree of Application(Recipient)	Masteries of deploying ERP knowledge into business operations from test result	45 users-Good 3 users-Medium 2 user-Basic	27 users-Good 13 users-Medium	27 users-Good 13 users-Medium; 20 users-Basic

Table 4-6 Knowledge Evaluation on ERP System Techniques

Notes:
1. Training method and the communication skills of consultants
2. System operations and ERP processes
3. Source credibility

All the data were collected via interviews and questioners
Number of questionnaire collected from the users: A-50, B-40, C-60

From the table above, one of finding is that the users in the three companies are not that motivated to attend the system training. In discussion with the users, some of them cannot leave the daily work away and make the time to attend. Some of them did not think the training would be useful and believe that they can catch up with others after the official launch. One of the consultants from SAP explained that the users may think ERP system is beneficial, but they did not realize the importance of the training. At the same time, some of the top management prioritize the daily work, not the training. Another finding is the obvious difference in the degree of application. The main reason is that Company A had used ERP software for several years and most of the users had known how to use and how the system works, while the users in company B and C did not have that much experience about ERP operations. In other words, the degree of application in the test was determined by the individual absorption capability for the knowledge. According to the PM in Company A, forty percentage of the users had quite a good ERP background and seventy percentages of them had used ERP software.

The consultants from CGI were devoted to building up relationships with the users, even personal ones, which enhanced their mutual trust and as a result, the users were motivated to communicate with the consultants. At the same time, the communication skill still played the important role in the knowledge transfer. In other words, the consultant's coding ability means to express the idea clearly and logically. The different capabilities among the consultants reflected at the users' selection of consultants. The users were willing to discuss with the consultant who had good communication skills since they can get a better feedback and solid answers.

4.4.3 System Launch stage

System Implementation Methodology
ERP system implementation methodology is the guidance for the consultants within project implementation. It does not refer to the whole knowledge package transfer, but that the system administrators learn from the consultant's implementing ERP projects and transfer into own ability and enhance the possibility for the future development and deeper application of ERP systems. After the official launch of the ERP system, the consultant would withdraw from the project, and at the same time, most of the companies are willing to let these administrators carry on the rest of the project work. Especially for the SMEs, in this way, they can save a considerable amount of consulting fees. Therefore, in the ERP projects, developing own specialized ERP project managers seems to be really critical and possible to conduct. From this point of view, the knowledge transfers from the consultants to the system administrators is quite valuable. On the other hand, the responsibility of the system administrator is to understand the basic data preparation plan, guide the users to collect data and get to know the methodology along the project process. In order to evaluate the methodology transfers, the following table shows several aspects:

Evaluation Indicator	Dimensions	Project A	Project B	Project C
Satisfaction from recipient	Satisfaction of the methodology	Good	Good	Medium
Perception of Recipient	Understanding level of the methodology	Good	Good	Good
	Motivation	Medium	Good	
Recipient's evaluation on the knowledge	Recipient's evaluation	Medium	Good	Good
Recipient's application of the knowledge	Degree of application	Good	Good	Medium

The result comes from the interview with the system administrator

Table 4.8 Knowledge Evaluation on Implementation Methodology

From the interviews, the client companies gave a very good feedback on the implementation methodology, and the administrators were willing to spend time on observe, learn and practice the methodology. The administrator from Company B kept a close relationship with the consultants from the day one and played as a bridge between the company and the consultants. After digesting and absorbing the knowledge, he volunteered to be the project manager to implement several minor projects in addition to the ERP system such as eBanking, PDA wireless scanning system and so on that are now most essential parts of the daily business operations. This proves that internal motivation of the administrator (as a knowledge recipient) made the methodology get updated and developed.

Experience on the Problem-solving/Methods

It is inevitable to run into problems and system bugs caused by wrong operation or system configuration after system launching. In the primary time of system running, the consultants or system supporters can help to resolve, but the more important point is that the system administrator and other users should learn the resolving methods and experience and improve the effectiveness of problem-solving and secure the system's smoothly running. The following table shows the evaluation of the problem-solving knowledge.

Evaluation Indicator	Dimensions	Project A	Project B	Project C
Number of knowledge transferred	Number of problems or bugs occurred (first month)	Over 100	130	148
	Number of problems or bugs occurred (second month)	-	98	130
	Number of problems or bugs occurred (third month)	-	45	58
	Number of problems or bugs occurred (after three months)	-	23	41
Recipient's anticipation	Willingness to receive	High	High	Medium
Application of the knowledge (The ability to absorb)	Number of repeated problems or bugs (first month)	-	6	15
	Number of repeated problems or bugs (second month)	-	3	9
	Number of repeated problems or bugs (third month)	-	1	6
	Number of repeated problems or bugs (After three months)	-	0	3

Table 4.9 Evaluation on problem solving knowledge

Note: The blank in project A is because of lacking data. Company B and C kept records of the problems and bugs.

Although some data of Company A is missing, it is still easy to find out that the problems or bugs decreased gradually. The PM in Company A also confirmed that the problems were getting less and less. This proved that the consultants were sharing their knowledge or experience regarding problem-solving with the users in the companies. The PM from Company B said that they were so happy to see the bugs going away and the system being steady. He also emphasized that he and other users experienced the process of problem-solving and gained the methods. Moreover, the top management was also satisfied with the situation that the users could resolve the

ordinary problems independently. After three months, the repeated problems decreased to almost zero, which also proved that the users had the ability to operate the system avoiding the problems and bugs.

Another finding is that Company C had more problems all the time compared with Company B. The PM in the Company C explained that the system administrator and himself did not pay much attention to the problem solving and almost all the problems were resolved by the consultants all the time. While for the Company B, they kept a close relationship with the consultants and had the motivation to learn more about the ERP system. In addition, as mentioned above, the system administrator from Company B is very capable of absorbing knowledge and applied into practices.

4.5   Cross-Analysis

After introducing the general and individual information about the three cases, it is needed to compare and cross analysis them to find out their similarities and differences. The following table shows the comparison results out of three cases. It is divided into two aspects: Project Management and Knowledge Transfer. The next layer indicates different sub-items in each aspect.

Division/Case	Detailed Issues	A	B	C
Project Management	Support from Top Management	Medium	Medium	High
	PM Specialist	Limited	Limited	Limited
	IT Infrastructure	Limited	Limited	Limited
	Business Process	Clear	Messy	Medium
Knowledge Transfer	ERP Experience	Yes	No	No
	Knowledge Transfer Standards(Consultant)	Yes	Yes	Yes
	Communication with Key Users	Good	Medium	Medium
	Users Participation	Low	Low	Low

Table 4.10 Comparison of Three Cases

Referring to the Project Management in the three cases, the overall project management maturity was quite low. Although the implementing basis was limited when it comes to Project Management specialist and IT infrastructure, the solid support from the top management remitted the dilemma to some extent. For a top manager or the owner of the SME, not only can he/she give the financial support, but also support the employees mentally. The owner of Company C did attend several training sessions accompanying with his employees, and as a result, the owner showed his determination of implementing ERP when communicating with the employees. As mentioned above, Company A had used an ERP system for some years, and it made their business process clearer compared with the other two companies.

As for the Knowledge transfer, although the implementer(consultants) all had the knowledge transfer standards/instructions, the communication with the users were not that as good as they expected. One of the reasons, according to one of the consultants from CGI, could be the most of users did not have the sufficient ERP knowledge background. It makes it hard to communicate with some users, especially in the primary stage when bringing lots of new concept and methodologies. This point also was proven in Case A, in other words, the communication in Case A was relatively smooth considering that most of the users had more or less ERP knowledge. The big problem for all the three companies was that the participation of users was quite low. This dilemma was manifested as some line/function managers were over-occupied.

4.6   Summary

After the inspection and research on the three cases, it is easy to locate the obstacles in ERP project management for SMEs and what should be aware of when transfer knowledge to the client company as an implementer. However, every project has its uniqueness that depends on the involved parties.

5   Discussion

This section will illustrate the problems may occur in ERP projects and possible solutions. What should the project team be aware of when it comes to knowledge transfer and the way of improving the effectiveness of Knowledge Transfer will be discussed.

5.1   Influence of SME's Feature on ERP Projects

Based on the literature study and empirical study, it is precise to say that the ERP project management determined by the unique feature of SMEs. The following headlines describe the four main elements regarding endangering ERP project success in SMEs.

5.1.1   Weak corporate management level

First of all, the organization lacks talented managers. ERP project is a combination of the corporate management and the information technology. The implementation process requires the manager of corporate level, the front-end manager, the IT specialist and the strategic decision maker. However, the business scale and limited resource of SMEs determines that the organization cannot provide sufficient human resource, especially the managers. In the meantime, the decision-making depends on the top management and some mid-level managers usually play a role of executor, but do not understand the critical points, while the top management is occupied by other business task and cannot guarantee the participation at any time. Some owners and the top management of the SMEs are lacking to systematic knowledge. In the process of receiving changes, it is considerably hard for them to receive, understand and generate following strategies. The lack of mid-level managers and IT specialists causes the insufficiency of the project team, which enlarges the project risk. For example, the need of expected function is vague, which may lead the system progress does not match with real needs.

Second, the management maturity of SMEs is relatively low. Normally it reflects on the unclear position responsibility, lack of regulation and standardized business process. Connecting with project management, it will be hard and time-costing to figure out expected functions, the present and future process, which is vital to an ERP project. In the implementation, it is possible to have lots of delays because of unclear duty partitions. Furthermore, a new ERP system will bring in a large scale of revolution on the process rebuilding, which leads office politic conflict. The uncertainty and the risk increase dramatically if the team cannot guarantee the team cooperation, schedule planning and quality management.

At last, SMEs normally lack IT strategy, have little using coverage of IT applications, and the business data is hard to collect. External environment affects the business operation that is flexible, and sometime some SMEs do not have a clear development strategy. ERP project emphasizes the integration of internal and external resources and mixture internal official function and business process. Lots of SME cannot be balanced between long-term strategy and short-term profit. Because the complexity of ERP project, the project team cannot promise that payback or reduced cost would be realized instantly. Also, the raw and original data are vital to the ERP projects. A number of SMEs have a chaotic product and other operational data or even none. As a

result of ignoring the basis operation management data collecting, analysis and saving, the ERP system cannot include the complete and accurate data, thus the system may be out of track and useless. In summary, it is important to plan the data transferring in the early stages.

5.1.2 Insufficient IT Technical Skill

First, the IT infrastructure in SMEs is relatively worse than the LEs. Several batches of hardware procurement and low amount of software purchase make the work environment more complex. For the normal employees in SMEs, the technical skill on computers still stay at a basic level, which mainly reflects on don't know how to set up computer configuration, low awareness of internet security and so on. Another point is that some employees do not emphasize learning IT skills or cannot find the effective way of applying. ERP is designed with a standard work process with sophisticated functions. In the implementation phase, the key users of the system may need more time to get familiar with the new process, whilst the enterprise should spend more time on process optimization and being friendly to users.

Second, SMEs lack ERP related technique reserve. ERP projects include a lot ranged from network configuration/set-up to the understanding process, function module, database and internal logic relations. Regarding a huge amount of professional knowledge, a considering number of SME owners get the fearful feeling of ERP. Thus they may let the consultants be in charge of most of the decisions. Some owners only focus on the advertised function and the prices to select the ERP product, ignoring the most important factor whether the system has the consulting capacity of resolving corporate management problems.

Third, compared to the ERP system in the large enterprises, it is needed to be agile and flexible to fulfill some specific expectations when bringing new ERP system into an SME. Therefore, SME's ERP system is less complicated, but it requires more business extensions on dealing with the different size of customer orders, customized production, and short-time delivery. To resolve these needs, an SME should be armed with excellent IT techniques. The consultants of implementer may help with these demands, but they cannot acknowledge the business of SME easily.

In conclusion, the insufficient IT techniques will directly influence the SMEs' understanding of business expectations and IT capability, which also lead misplanning when it comes to project scope, quality control of implementation, project scheduling and budget.

5.1.3 Low maturity of Project Management

Seldom does an SME have the reserve of project management talents. ERP project management requires a leader with a comprehensive ability on leading cross-functional departments. A project manager also is demanded to possess multiple perspectives of knowledge and skills to gain the trust from top management. However, the functional managers are the core power of SMEs, and they barely have the opportunity to lead multiple departments. The tasks of the project team members are huge and the most of the positions are temporary, which makes the team unattractive. Furthermore, any ERP project levers the complex process, roles,

standards and other thoroughly changes, which is a top-down revolution that needs the active participation of top management. The top management in SMEs may put the project aside once the project manager is nominated, which makes the project manager lose the power of controlling and being a leader, and as a result, the project would be delayed and the quality cannot be assured.

Second, most of the SMEs do not have the project management process and regulation. In other words, the organizations lack a set of documents defining the whole project management works such as united module, key data and duties of key members. Company C over-relied on the consultants and lost the dominating authority in the project; The control from the top management may be restrained within schedule and budget used, and the project scope is decided by the functional managers; As for the project quality and risk, it is controlled by the third-party and the SME itself barely take a part in. Sometimes, the quality of project will be sacrificed and the target will be compromised in order to secure the schedule and budget.

5.1.4   Low level of User Participation

This problem did occur in all the three cases described in the last chapter. The main reason is that the users (including key users and top management) always are occupied with daily work. It is hard to demand a user attend every meeting and seminar. As a result, it is easy to cause information or knowledge imbalance: The consultant cannot gather the needed feedback from the users, and the users will not get a whole picture of how the ERP works. Furthermore, some users would not like to try a new system, even feel threatened because the system replaced almost all the tasks he/she does every day. Some of them prefer the traditional ways of working and they are confident that the traditional ways are more efficient because they have worked in an certain way for years. In other words, big changes are brought in with the new ERP system, and it hurts for almost every employee because it takes time to learn and to adapt to. This phenomenon occurs when the top management does not publicize to the employees enough or even some of the top management do not embrace the new system.

Overall, the four key factors have a huge impact on the ERP project in SMEs, and they cannot be considered separately. The ERP implementation in SMEs mainly lacks clear developing target, management regulation. Low degree of informatization and project management also threatens the result of the ERP system.

5.2 Securing ERP Project Success Based on SME Features

As described above, those main factors act mutually and it is impossible for an SME to improve every part instantly. In every ERP projects, it requires the highly effective cooperation between the consultant company and the client. From the perspective of client company, it is recommended to improve the maturities on different areas of management and IT techniques with implementing the ERP projects or before the implementation

5.2.1 Improve Management Level

Aiming at ensuring the ERP project success, improving management level could consist of six main areas:
1. Generate informatization strategy and plan meeting up with three to five years' business development
2. Publicize the knowledge of ERP to the employees
3. Review the current business process and summarize the downsides.
4. Prepare the basic and accuracy data including customer, supplier, material, production and so on.
5. Bring up project management specialists
6. Prepare for the coming changes (Bring in and publicize advanced management concepts such as Kaizen, TQM, Lean Production and so on)

These six areas mainly emphasize the improvement before launching the ERP system, and it includes from management idea to business operation, which will help with improving corporate management level and eliminate as much threatens as possible for the ERP project. On the other hand, it also prompts the SME's subject consciousness and responsibility. However, it cannot guarantee to avoid all the negative factors. The management development is still influenced by internal environment (organization structure and business pattern etc.) and external environment (product market, competitors, logistics etc.) It will take a long time to get the development. On the other hand, resolving the underlying problems of business should be the main target of the project, while it should always focus operation management and informatization builds-up.

5.2.2 Improve IT Strength

In order to prepare the IT strength and capability, the SME can be improved within following three areas:
1. Increase investment in IT infrastructure and IT specialists
2. Selecting ERP vendor and vendor's information (e.g. vendor's market share, customer feedback etc.)
3. Generate the service offered by the consultant company including service standards, maintenance and so on.

The IT infrastructure and specialist are rigid criteria and it requires considerable cost and long-term development. The company, as a client, may not get the full understanding of ERP system and would not modify the ERP software or configuration logically, which is also the reason why the SME need a third-party consultant who has specialized services. In addition, the SME can hire an outsourcing IT service for the database service and internal communication.

5.2.3 Enhance Project Management Ability

The consultant company will help with the project management. However, it would be much better that the SME has its own mature project team who has a better understanding of business operations, specified needs and project control.

First, lack of labor, especially talented ones who may be already over-occupied, make it hard for an SME to organize a project team. Most of the functional manager will be a member of the team, but some of them think the project work should be belonging to the consultants. As a solution, it is needed to formulate a selection standard including different criteria such as position, experience, capability, knowledge on ERP and so on. At the same time, in the project implementation, the original occupation arrangement should be re-deigned or adjusted temporarily according to specific demanding. Second, ERP project quality control is always hard to conduct. Because of ERP's concealing feature, everyone has a different psychological expectation and there are no objective measurement standards. The more important is that project quality refers final application after the ERP system is finished, which makes it harder to evaluate the immediate quality. Basically, the quality would be reviewed via specific task and user's feedback. Third, scheduling control and budget control are essential to project success. For the SMEs, the schedule and budget are controllable if the project scope task destruction are clear. The main investment is the consulting fee that is also controllable when using some project management tools like Earned-Value Method. Fourth, for an ERP project, it is a combination of process rebuilding, IT development and other changes in addition to the weak management level of SMEs. There exist lots of risks in the project implementation. Project risk management should be taken into consideration. The most important thing is to categorize the origin and importance of the risks and the specific content includes generate risk management plan, regular risk report and evaluation tools.

In order to maximize the possibility of successful ERP project, the SMEs should be aware of the uncertainty of time, budget and quality. With the help of consultants, the SME could bring up own project management team and gradually learn the project management methodologies and tools to reach the target.

5.3 Knowledge Transfer in ERP Projects for SMEs

As mentioned in the literature study above, the main factors that affect knowledge transfer effectiveness are features of ERP project knowledge, knowledge source and recipient and mutual relationship. These factors were also tested intentionally via three case analysis in the empirical study. The feedback on the transferred knowledge from the users indicated that these factors were reacting together and it would be impossible to describe the factors separately. The three factors form a rounded knowledge system that can be illustrated with three questions:
- What knowledge is it? → Knowledge Identification in each Project Stage
- Who is involved? → The Consultants and Users (including the owners, key users etc.)
- Where is it? → Relationship among the involved Individuals

5.3.1 Dealing with Tacit ERP Knowledge

The knowledge identifying aimed at finding out the feature of ERP knowledge in each project stage and its influence on the whole knowledge transfer process. As described in the cases, the ERP project includes both tacit and explicit knowledge, which also makes the consultants use different ways to transfer it. The explicit knowledge, such as system specification that can be codified and documented, is easy to transfer to the users, and the users could digest the knowledge gradually along with the project going through different functions, processes and individuals. Moreover, the explicit knowledge should be documented or codified 'reader-friendly'. Some users are not willing to read the wordy instruction and as some users in the case reflected they did not have the spare time to read and follow step by step. At the same time, there are some other ways to present the knowledge, such as animation, simulation and so on that are more visual and direct.

The more complicated activity is to transfer the tacit knowledge such as practices of using ERP system, or in other words, experience. For the employees in SMEs who might not use ERP software before, it would be much harder to keep them on the same page, especially in the circumstance of lacking conceptual and integrated vision of ERP system. The tacit knowledge in an ERP project can be divided into two categorize. One of them is the tacit knowledge from the implementer such as advanced ERP management concepts, problem-solving experience and methods etc. The aim is to externalize the tacit knowledge and make it easier for users to absorb and digest. Another one is the discrete individual tacit knowledge inside the SME such as individual learning experience and tips that can be shared with other users. The tacit knowledge cannot be codified and broadcasted via documents or other tools, and it mainly relies on communication based on language, gesture, emotion, demonstration and their combinations. In others words, it depends on social networking and makes the receivers learn to do.

The employees' social networking benefits their acquiring tacit knowledge, and the employee who has a stronger network relationship has more channels and easier to receive the tacit knowledge. Therefore, in the implementation of ERP projects, the implementers should document the ERP knowledge as much as possible. The system administrator and key users should summarize what they learn into the internal-use document to share with other users via online document share tools. On the other hand, the SME should emphasize the informal social networks and forming company culture of learning and sharing, thus simulating the sharing of tacit knowledge.

5.3.2 Improve the Transfer Willingness of the Sender

Based on the analysis of the empirical study, the transfer conduct only occurs when the origin of the knowledge has the motivation and willingness to transfer. In order to secure the success of ERP project, the consultant has very strong willingness to send, therefore the improvement of transfer willingness here mainly refers to the motivation the individuals in the client company have to transfer the knowledge of business operation process and instant feedback from them. Although the business process is relatively explicit, it is still hard to peel off from the individuals and codified into documents. Thus, it is needed to encourage the individuals to share more knowledge via incentive mechanism.

The SME can generate effective incentive strategy to stimulate the individuals such as making the individuals know the positive benefit of transferring knowledge via system demonstration, internal sharing and other methods. The benefit can be integrated data system, systematic process control and reduction and hand labor. On the other hand, good relationship between consultant and user also benefits the motivation of transferring knowledge. Enhancing mutual communication is also a possible strategy. For example, the consultant can lead the user to feel the system running and its benefit in training courses or system simulations.

5.3.3   Improve the Absorption Capability of the Receiver

After the knowledge sender has the enough willingness to transfer, the determining elements transform into the absorption capability of the receiver. An effective transfer is based on the mutual participation. Specifically, the client company can develop within fowling aspects: First is gathering the individuals with ERP knowledge and arrange them to be project team members and key users. Their ERP knowledge cannot be ignored, and it will be the model to show others how the ERP system works and its benefits. Second, the consultant and the SME should invest into education and training. Only do the users understand how the system works, then they can prompt later on application. As for the low level of participation in the training, the consultant and the SME should adjust the individual occupation and apply the flexible training plan to try to cover as many users as possible. At last, if possible, it would be more promising to generate organizational learning culture and encourage the users to form learning group. In one word, the company should try to build-up comfortable learning environment.

5.3.4   Build-up Good Relationship and Communication

In the former part, it has been mentioned that good relationship between users and consultants benefits the knowledge transfer. Good communication and psychological thinking are also important. Some users may have a shadow understanding of ERP system and it will make the individual useless once the ERP system replaces all the work. Therefore, this feeling will make the users unsecured and be transformed into resistant emotion upon the ERP system. The consultant should be always aware of the user's attitude and try to think as a user. After that, the resistance emotion can be eliminated via good communication and eventually it will improve the transfer effectiveness.

On the other hand, instant feedback mechanism should be built-up. Normally, the key users and the consultant should monitor the status of users' receiving knowledge and their feedback will determine the next move of knowledge transferring such as trying different ways, individual communication and so on.

5.3.5   Build-up the Environment of Organizational Learning

In the implementation of ERP project, the knowledge transfer between the consultant company and the client company is just accomplishing the primary target. The more important is realizing the knowledge transfer inside the SME after they absorb the knowledge from the consultants. This internal transfer refers to knowledge transfer from key users to the frontend users and application on other ERP modules. To realize these the process from absorption and digesting to reuse in other areas, it is necessary to build-up refined organizational learning environment. Normally, effective learning

mechanism includes three levels: Individual learning, Group learning and Organizational learning. These three levels cannot be separated and work mutually. First, individual learning is the foundation because every kind of learning eventually results in individual absorption and digesting. Whilst group learning and organizational learning is more systematical and easy to arrange.

Specifically, individual learning can be conducted via set-up some user as learning model or send out for training. The SME also should encourage individual sharing and reward with some informal ways such as commendatory email or comment on the meetings. It also can be combined with some formal rewarding such as setting up the Most Valuable Employee rewards. As for the group and organizational learning, the SME can organize some individual knowledge-sharing seminars, small knowledge contests and so on.

Overall, the consultant company and the client company should build-up the platform for knowledge sharing and exchange. This platform will play the essential role in knowledge transfer activities.

5.4 Summary

The success of ERP project requires the great efforts on the both sides of Implementer and Client. For the client company and as an SME, it is necessary to locate their management level and IT capacity and development the downsides intentionally with the help of consultants. As for the detailed knowledge transfer in the ERP projects for SMEs, it is essential to build-up useful transfer platform and learning environment to stimulate the senders and the receivers.

It is important to mention that an SME cannot be demanded to fulfill all the recommended measures listed above because the resource is limited. The better option could be consulting with the external agencies to analyze the strength and weakness before the start-up stage. Moreover, it also can help with determining the future development and what methodology is suitable for the company.

6 Conclusion

This section will combine the research questions and the main results. Meantime, it also includes the limitation of this thesis research and future development.

6.1 Research Summary

In modern industry, with the continuous change of customer's requirements and demands, shortened product lifetime and more and more intense global competition, all the enterprises including small and medium ones are facing increasingly competitive pressure. Lots of enterprises choose to use ERP to integrate their business processes and improve efficiency, and so as some SMEs. Other than the large enterprises, SMEs are faced with more challenges implementing ERP systems because of limited resources, low management level and other soft or hard power. In order to improve the possibility of ERP project success for SME, this thesis research aims at two main aspects, project management and knowledge transfer management in ERP projects.

With the literature research and empirical study on three cases, the thesis first located the unique features of SMEs compared with large enterprises. Looking at the presence of ERP projects in SMEs, some critical factors were addressed. Combined with the later interviews, four main features of SME were selected to describe how these features influence the ERP project success. The proposed resolution aimed at integrated improvement including management level, IT capability and project management maturity. It is worth to mention that the comprehensive development is not a short-term progress, but a continuous process that requires all the roles in the SME to cooperate.

Moreover, this thesis also addressed the importance of knowledge transfer in the ERP project implementation. The research on knowledge transfer in ERP projects started with knowledge identification and influencing factors in three main stages. With a discussion on that, this thesis primarily focused on the features of the knowledge, capacities of knowledge sender and receiver and their relationships. In addition, the organizational learning was also mentioned in order to improve the internal knowledge sharing, especially for the tacit knowledge.

6.2 Limitations and Future Research

The thesis focused on the two main aspects when it comes to ERP project success in SMEs. Restrained by the research circumstances, there are several limitations regarding this thesis research.

First is that the research area was located in car part industry specifically, and it cannot stand for all kinds of SMEs. The three cases included two ERP vendors (SAP ERP and Microsoft Dynamic), two consultant companies (SAP Partnership and CGI), which also affects the research result to some degree. Second, referring to the project management analysis, there are more aspects should be considered such as risk management, change management and so on. The last but not least, the research only

focused on two main parties in the knowledge transfer and did not mention other external influencing factors such as software vendor, outsourcing IT consultants and so on. Third, an ERP project requires the cooperation among at least three parties: Software vendor, Project implementer and the SME. This thesis only considered the acting factor from the SME's perspective, which may lead the result to be lacking comprehensive research background.

Based on the limitation of this thesis, the future research may be directed based on these limitations in order to supplement the integrity of the result. First is expanding the research area within the different industries, different organization structure or culture and their influence on the knowledge transfer and ERP project success. It is worth to mention that SMEs have very different organization structure and culture that based on the owners' preferences. Second, the future investigated parties of knowledge transfer process can be including software vendor, management consultancy company and project supervisor etc. At last, the research target also can be developed more specific such as aiming at the post-implementation stage, how the timing of consultants' withdrawing affects the knowledge transfer and so on.

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