

# The investigation on key success factors for enterprises importing ERP system

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ABSTRACT

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The application of information technology tools is indispensable for companies. Nowadays, enterprises can enhance their competitiveness with effective implementation of ERP systems.

This paper will discuss the key success factors for importing an ERP system based on five stages. The thesis applies a qualitative research method to answer two questions: (1) what are the key success factors for an organization in an implementation process of an ERP system from preparation to completion? (2) What are the difficulties and obstacles in each phase?

Finally, this thesis presents the key success factors for the five phases of ERP implementation, summarizes the difficulties and obstacles in each phase and introduces solutions to these.

**Key Words: ERP, key success factors, introducing ERP, Five phases of implementation**

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## 1 INTRODUCTION

The development of an enterprise resource planning (ERP) system makes business operations easier. Through an ERP system, an enterprise can provide support for sales work, market forecasts, and market strategies. With an ERP system, marketing personnel and production personnel can get cooperation opportunities. Sales staff inputs orders in an ERP system can get accurate information from the system, which will help to get the order from making order commitments to customers in time. In addition, through the plan level and control tools of this system, such as the production planning, master production scheduling, material requirements planning, capacity requirements planning, not only improves the enterprise production management level and working quality but also improve product quality. Enterprise resource planning (ERP) system integrates the systems of enterprise's basic purchase, sales, inventory, production, finance and human resource, bring out instant information and analysis the results, to help enterprises in the shortest possible time to react. So, the different functions between different departments, such as planning and scheduling, purchasing, production, financing and other critical data and communication message will be integrated together. And this kind of integration is often cross-regional, across different product lines, distribution channels, and cross-functional department. The department can be more attentive to the company's overall goal by timely, correct and consistent information.

An enterprise must clearly define the goal of the importing an ERP system. An ERP system integrates upstream and downstream information. Therefore, it is very important to share information with suppliers and customers. As a result, the enterprise not only can easily understand the products or specifications that customers required, but it can also easily win customers' trust. The tailored service provided by ERP systems help enterprises to maintain long-term relations with customers and suppliers.

### 1.1 Research question

Defining research question is perhaps the most important step in research (Yin, 2003, 7). Because of the increasingly competitive business environment, it is important for enterprises to import ERP systems successfully. Therefore, the research question is the key success factors for enterprises introducing ERP system.

### 1.3 Research objectives

This thesis will focus on the key success factors of importing an ERP system, the main purposes of this study can be summarized as below:

- 1) The key success factors in introducing an ERP system
- 2) The difficulties and obstacles in every stage and solutions

### 1.4 Research limitation

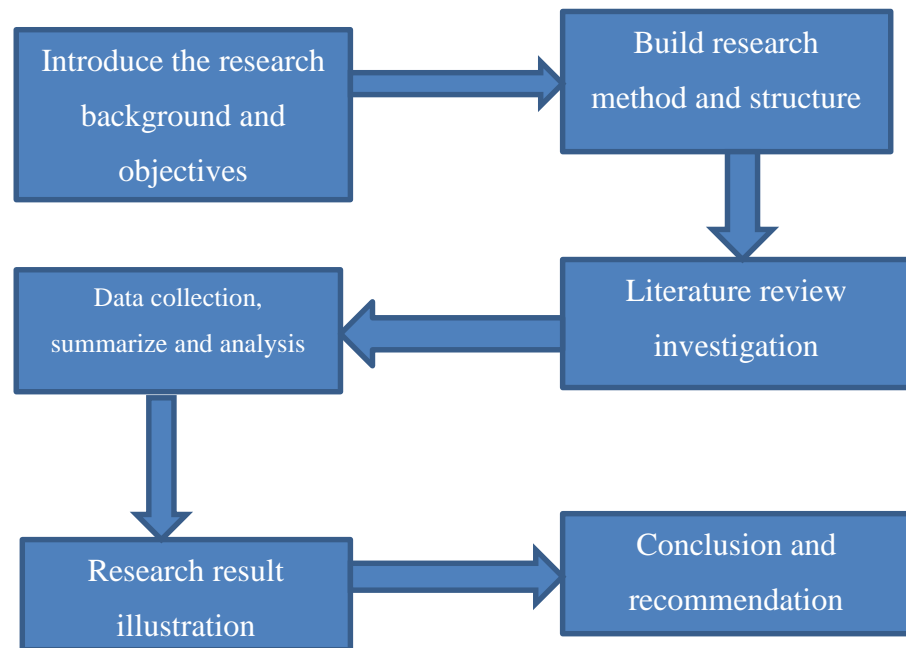
Based on the topic of this research, the information and data are collected in face to face interviews with employees of two enterprises. As noted, the researcher will interview the employees of two organizations, but such a sample cannot represent the research object in its entirety.

In addition, since the enterprises have invested material and human resources in implementing an ERP system, their company's strategy and business secrets limit their answers. Moreover, since the respondents' educational background differs, this affects as to how each of them understands the interview questions.

Finally, the researcher may misunderstand the interviewees' answers which can affect research results.

### 1.5 Research process

A qualitative research method will be utilized in this study, and the process is illustrated below:



**Figure 1: Research process**

## 1.6 Structure of this thesis

There are 6 sections in this thesis. Section 1 presents the research background, research questions and purpose, research process and research structure. Section 2 describes the research method and research design, and it describes the conceptual framework and how the research design is done in this thesis. Section 3 is an overview of the literature, which relates to the introduction of ERP systems. Section 4 illustrates a case study. In section 5, the data related to the key success factors for enterprises introducing ERP systems and the introduction process will be analysed. Section 6 aims to conclude the research results and give recommendations for future research.

## 2 RESEARCH DESIGN

This chapter illustrates the research method that this study adopts, which includes research approach, research purpose, research strategy, research method choice, data collection and analysis and finally the validity and reliability.

### 2.1 Research approach

There are two main research approaches: a deductive and an inductive approach. The characteristics of deductive approach are testing a theory or a hypothesis and operating concepts in a way that enables facts to be measured quantitatively (Saunders et al., 2009, 127). On the other hand, “the inductive approach emphasis building theory based on the results of collected data” (Saunders et al., 2009, 129). According to this thesis purpose, which is the researcher want to investigate the key success factors that enterprises importing ERP system, and select two different companies to do the case study, then bring out different findings to summarize the result, therefore, the researcher choose a primarily inductive approach.

### 2.2 Research purpose

The research purpose, which is the way that approaching research questions, can be classified as descriptive, explanatory and exploratory purposes and methods (Saunders et al., 2009, 138). Robson (2002) mentioned one research may have more than one purpose and the purpose may also change over time (Saunders et al., 2009, 139).

According to Robson explained, the descriptive study aims to “portray an accurate profile of persons, events or situations” (Robson, 2002, 59).

Which means the researcher require extensive previous knowledge of the situation, has been researched or described, then you will know which to gather information.

An explanatory study as the name implies, focus on studying a situation or a problem in order to explain the relationships between variables (Saunders et al, 2009, 140).

An exploratory aims to find out what happened, particularly in a little-understood situation, and seek new insights and generate ideas and hypothesis in different and future perspective (Robson, 2002, 59).

Saunders (2009, 140) specified ways of conducting exploratory studies include literature search, interviews with experts and group interviews in the subject.

The researcher based on the objectives of this study found the explanation and exploration study would fitting to the context research. Partly descriptive study also would be adopted, because the researcher intent to understand and explain the key success factors (KSF) on ERP system importing process. The researcher would focus on the deeper investigation for new insight about KSF and ERP adoption stage, and would make a short description about ERP at the beginning of this research.

### 2.3 Research strategy

Saunders (2009, 141) summarized the research strategy are the experiment, survey, case study, action research, grounded theory, ethnography and archival research.

According to Saunders (2009, 141) emphasised, there is no research strategy is inherently superior or inferior to any other, the important to choose the strategy is that it will enable the researcher to answer the research question and meet the objective. The appropriate research strategy has to be selected based on research questions and objectives, the extent of existing knowledge on the subject, the amount of time, other available resources, and the philosophical underpinnings of the

researcher. Each strategy can be used for exploratory, descriptive, or explanatory (Yin 2003, 3).

According to the objectives of this study, the case study strategy is adopted as the appropriate strategy, as Saunders et al has mentioned the case study has considerable ability to generate answers to the question why as well as what and how questions (Saunders et al. 2009, 146).

## 2.4 Research method

Qualitative research as an approach allows researchers to examine people's experience in details, by using a specific set of research methods such as in-depth interviews, focus group discussions, observations, content analysis and visual methods, etc (M. Hennink, 2010, 17). Furthermore, qualitative research is adopted to develop concepts, insights, and understandings from patterns in the data rather than collection data to assess preconceived models, hypotheses, or theories (S. Taylor & R. Bogdan, 1998, 7). Qualitative research is often described in contrast to quantitative research (Erikson & Kovalainen, 2015). Quantitative research is "Explaining phenomena by collecting numerical data that are analysed using mathematically based methods (in particular statistics)", as Aliaga and Gundson (Muijs, 2010, 1) explained, this is especially suited for testing hypotheses. If compared with qualitative research methods, quantitative research cannot deal with the social and cultural construction of its own variables (Erikson & Kovalainen, 2015). Moreover, compared with quantitative methods, qualitative methods are more flexible. Qualitative methods present "open-ended" questions rather than the "closed-ended" questions (Mack, N. & Woodson, C., 2005).

For the topic of this study, the researcher conducts in-depth interviews with two different case companies. The aim is to gather experiences regarding successes in introducing ERP systems in the companies, and then summarize the influence of key success factors in the different stages of introducing ERP systems. In consequence, the researcher focuses on explaining and exploring the phenomenon by applying open-ended questions in an unstructured interview. In short, this study applies a qualitative research method.

## 2.5 Research object

Yin (2009, 50) has explained that the case study has two types: a single case study and a multiple case study. This, however, does not affect the quality of research. The difference between the two types is that a multiple case study aims to generalize based on a cross-case analysis method whereas a single case study focus holistically on a single case. When the researcher starts to design the analysis unit, he/she needs to consider the research questions. For this study, the researcher chooses two different cases as the research object. When the researcher chose those cases, several standards were followed; for example, the enterprises have already imported an ERP system, and one of the companies is a large company and the other a medium-sized company, and they operate in different fields of business.

The chosen case companies are Tongwei co. Ltd. and Jinway Ltd. The reasons for choosing these two companies are that those two companies have already imported ERP system, which is suitable for this study's objectives. The researcher found out about Tongwei Ltd through a friend, who is working in this company. The other case company, Jinway Ltd, was chosen since the researcher has worked there as a summer intern. The interview for Jinway Ltd was conducted using media such as Skype and Wechat. The interview for Tongwei was conducted face to face in 2015. The key success factors of those two companies importing an ERP system provide background for the study.

The interviewees are introduced below:

| Interviewee | Organizaiton  | Position   | Interview time    |
|-------------|---------------|--|-------------------|
| Mr. Hu      | Tongwei group | Information systems department manager's assistant | 15 September 2015 |

|        |             |   |                     |
|--------|-------------|---|---------------------|
| Mr. Li | Jinway Ltd. | Information<br>systems<br>department<br>manager | 27 November<br>2015 |
|--------|-------------|---|---------------------|

**Table 1: Interview arrangement**

## 2.6 Data collection and analysis

The most commonly used sources of evidence in doing case studies can be documentation, archival records, interview, direct observations, participant-observation, and physical artifacts (Yin, 2009, 106).

The sources of this study can be classified in three: documentation, interview and direct observation.

### 2.6.1 Data collection

Yin (2009, 118-129) mentions that the benefits gained from sources can be maximized if research follows three principles which can help deal with the problems of establishing validity and reliability of a case study. To collect data, the researcher adopted these principles:

#### (1) Principle 1: Use multiple Sources of Evidence

##### (a) Primary data

These data are normally observed or collected by a researcher directly from first-hand experience, for example, the information from interview, direct observation and surveys. The interviews and direct observation will provide primary data in this study.

##### (i) Interview

According to Yin (2009, 110) mentioned an interview is one of the most important sources of case study information.

The interviewees of this study are: the users, project manager, project personnel, consultants, executives and so on.

(ii) Direct observation

“Observation evidence is often useful in providing additional information about the topic being studied” (Yin, 2009, 113). The main activities of direct observation can be an observation of meetings, sidewalk activities, factory work, field visit, etc. (Yin, 2009, 113). In this study, the researcher will observe the situation of a case company introducing an ERP system, to make the resource be more objective and authentic.

(b) Secondary data

According to Saunders et al. (2009, 256) “the secondary data can provide a useful source from which to answer or partially to answer your research question, which includes the raw data and published summaries“. In this study, the secondary data can be gathered from:

- (i) The official introduction document of the case companies.
- (ii) The related information regarding the case companies from newspaper and websites.
- (iii) The materials related to ERP system implementation.

(2) Principle 2: Create a case study database

After data has been collected, the data should be summarized in a database. “The needed case study database will be a separate and orderly compilation of all the data from a case study, such data will go beyond narrative or numeric information and include documents and

other materials collected from the field.” (Yin, 2009, 123). The database in this study is described below:

- ◆ Case study record: interview record
- ◆ Case study document: the official introduction, news, reports and so on.
- ◆ Form database: the materials about introducing the situation.

### (3) Principle 3: Maintain a Chain of Evidence

According to Yin (2009, 127) the aim of maintaining a chain of evidence is to “increase the reliability of the information in a case study based on a notion that allows an external observer (the reader of the case study) to follow the derivation of any evidence from initial research questions to ultimate case study conclusions, moreover should be able to trace the steps in either direction “.

In order to reach the requirement of maintaining a chain of evidence in this study, the researcher thinks that the database should have an adequate citation (Yin, 2009, 127). Furthermore, the database should show clear evidence. For example, each interview should clearly record the date, place, and name of the interviewee. Lastly, the researcher plans to classify the relation between the research question and conclusions.

During the whole research process, the first stage is secondary data collection and literature review. Based on the analysis of secondary data, the researcher builds the interview questions for primary data collection.

#### 2.6.2 Data analysis

After the process of searching information and collecting relevant data, the researcher needs to start analysing the empirical findings from that data. Saunders

(2009, 479) has described that the main approaches of data analysis are qualitative and quantitative. Saunders (2009, 480) mentioned “qualitative data refers to all non-numeric data or data that have not been quantified (non-standardised) and can be a product of all research strategies, which can range from a short list of responses to open-ended questions in an online questionnaire to more complex data such as transcripts of in-depth interviews or entire policy document”. The analysis of qualitative data is conducted through the use of conceptualization, and allows the researcher to develop theory from collected data. In contrast, quantitative data is collected as numerical and standardized data, and the researcher conducts the analysis through the use of diagrams and statistics.

In this study process, the researcher has chosen to apply the qualitative data analysis method. The qualitative data were used for the investigation of the key success factors for every phase of importing an ERP system. Based on the work of Miles and Huberman (2014, 12), the analysis of qualitative data can be divided as follow: data reduction, data display, drawing and verifying conclusions. Miles and Huberman (2014, 12) outlined the aim of data reduction to include summarizing and simplifying the data for the final conclusions drawn. In this study, the production of the interview, observation summaries, and document summaries will be used for the data reduction. A data display is used to organize data and list data into matrices or networks. The researcher will create matrices that list the key success factors of introducing an ERP system in the two case companies. Hair&Celsi (2011, 275) described conclusions need to be drawn and verified, which involve deciding what the identified themes and patterns mean and how they help to answer the research questions. The researcher need to check and recheck the data to ensure the initial conclusions credible. From the data reduction and those reduced data displayed, the data conclusions could be drawn and verified, in the conclusion part of this research, the explanations, and explored results would be drawn.

## 2.7 Validity and reliability

Yin (2009, 46) has listed the four tests of validity, which include construct validity, internal validity, external validity and reliability. These four validities

should be used to establish the quality of any empirical social studies research. In this thesis, the researcher focuses on three tests to ensure the quality of this study.

### 1) Construct validity

Construct validity identifies correct operational measures for the concepts being studied, and the tactics for increasing construct validity can be as follows: the use of multiple sources of evidence, establishing a chain of evidence, and having a draft case study report reviewed by key information. (Yin, 2009, 46)

In order to make sure the construct validity of this study, the related strategies are used:

- (a) Data collection: *build a multiple sources of evidence from the information of case companies, and interviews.*
- (b) Data organization: *establish the coherence of the data, and organize the data according to the different stages of information.*
- (c) After the data organization, *review the whole original data again, and make sure there is are no misunderstandings or information lost.*

### 2) Internal validity

Internal validity is mainly a concern for explanatory case studies when a researcher is trying to explain *How* and *Why* questions. Also “the concern over internal validity, for case study research, extends to the broader problem of making inferences” (Yin, 2009, 47). In this study, the results of the key success factors from the case studies will be compared with the key success factors from the literature review, which will help to increase the internal validity of this study.

### 3) Reliability

The goal of reliability is to minimize the errors and biases in a study (Yin, 2009, 48-49). To increase reliability, the researcher adopted the following methods: detailed recording of the collected information; decreasing mistakes by rechecking data; detailed recording of the interviews; maintaining authenticity and integrity.

### 3 LITERATURE REVIEW

Depending on the research purpose, the researcher gathers related literature materials in this section. These materials are divided into four parts. Firstly, the author outline definition of ERP system and its evolution in the different stage. Secondly, the author investigates the phases and process of enterprises importing ERP system. Thirdly, the researcher will continue to investigate the key success factors when importing ERP system, meanwhile, summarize those success factors. Lastly, the author will briefly overview the benefits of ERP system introducing.

#### 3.1 ERP system

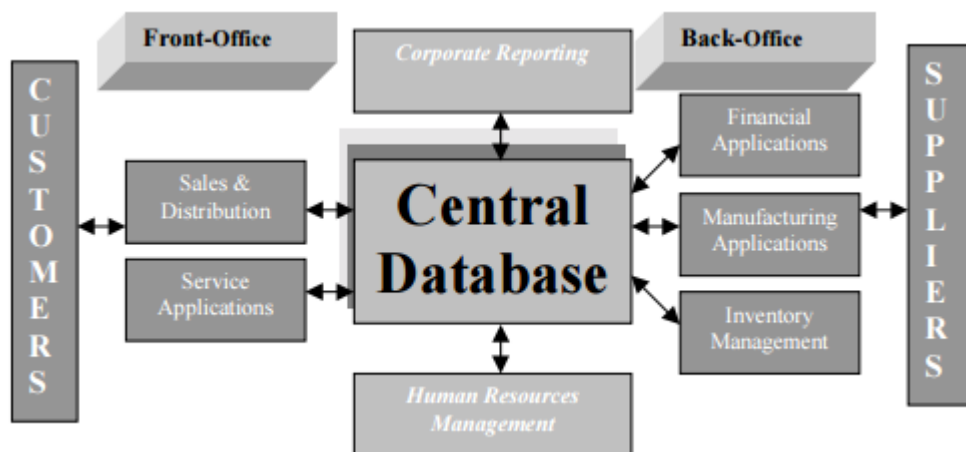
The term ERP was coined to describe an emerging category of hardware and software solutions that expanded upon and extended the scope of traditional manufacturing resource planning (MRP) systems (Al-Mashari, 2003; Arif, et al. 2004), Today, ERP encompasses all integrated information systems that can be used across any organization (Koch et al., 1999).

##### 3.1.1 Definition

The ERP system was developed to create integrated tool for managing different functions within an organization. Watson and Schneider (1999) describe that Enterprise Resource Planning (ERP) is a generic term for an integrated enterprise computing system. They define it as an integrated, customized, packaged software-based system that handles the majority of an enterprise's system requirements in all functional areas such as finance, human resources, manufacturing, sales, and marketing. It has a software architecture that facilitates the flow of information among all functions within an enterprise. It sits on a common database and is supported by a single development environment. Until now there are various definitions and descriptions of ERP system in the literature. American Production and Inventory Control Society (2001) has defined

ERP systems as “a method for the effective planning and controlling of all the resources needed to take, make, ship and account for customer orders in a manufacturing, distribution or service company.”. “ERP (enterprise resource planning systems) comprises of a commercial software package that promises the seamless integration of all the information flowing through the company—financial, accounting, human resources, supply chain and customer information” (Davenport, 1998, 135 ). For this research, the definition from Klaus, Rosemann, and Gable (2000) is adopted as below:

“Enterprise Resource Planning (ERP) systems are software applications that use a single information architecture design to integrate a range of business functions in order to acquire an overview of the business” (Klaus, 2000). They can link different areas of an organization, such as manufacturing, order management, financial systems, human resources, suppliers and customers, into a tightly integrated system with shared data and visibility (Chen, 2001). The illustrated diagram of ERP system as blow:



**Figure 2: the concept of ERP system (Hossain, L., Patrick, J.D., Rashid, M.A., 2002)**

O’Brien & Marakas (2007) mentioned: “the main benefits offered by companies using ERP systems are increasing in terms of quality and

efficiency in processes, cost reduction, support to decision-making phases, and better enterprise agility”.

### 3.1.2 The evolution of ERP system

Along with nearly half a century development, ERP system has experienced 4 stages:

#### (1) MRP I (1970s—1980s)

Material requirements planning to boom in the 1970 s, in this stage, Enterprise in competition is mainly to put production cost as a high priority, so companies use standardization and automation of production process to reduce the production cost, then the material requirement planning technique was born. The earliest MRP system started with the production plan, use the bill of material (BOM) to calculate the quantity of material needed to purchase. American Production and Inventory Control Society (APICS) Advocated content material requirement planning, enterprise began to through the integration of the Master Production Schedule (Master Production Schedule, MPS) and the information of content data list (BOM), to produce the original data of procurement, storage, transfer and Production plans, try to make the overall Production cost of the enterprise become lower. So in this phase, the main target for the information system is to grasp the inventory and management of materials. The core base is to establish the traditional Economic purchase amount (Economic Order Quantity) and fixed complement point plan (the reorder point planning) concepts. The theories on these technologies belong to the passive enterprise inventory management.

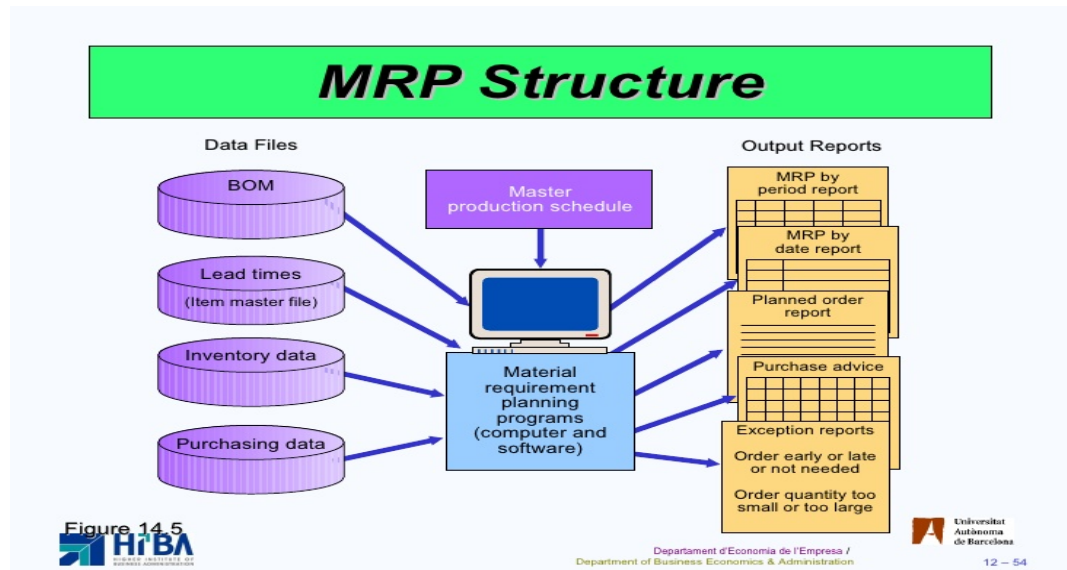


Figure 3: MRP Structure (source:"MRP Structure")

## (2) MRP II (1980s—1990s)

In the 1980s, the consumption patterns have changed, the low price products cannot attract consumers, then the producer start to focus on the diversity of production instead of the standardization of products. So during this period the Manufacturing Resource Planning (MRP II) system appearance for the management of diversified products and production methods. MRP II modified that MRP1 only consider the production planning rather than other aspects of a problem in production. In order to improve the original shortage, MRP II was extended to manufacturing, marketing, finance, personnel, and so on. The most important characteristic is to help enterprises to conduct the produce process validation and modification according to the actual situation and produce process planning, therefore, create higher production efficiency.

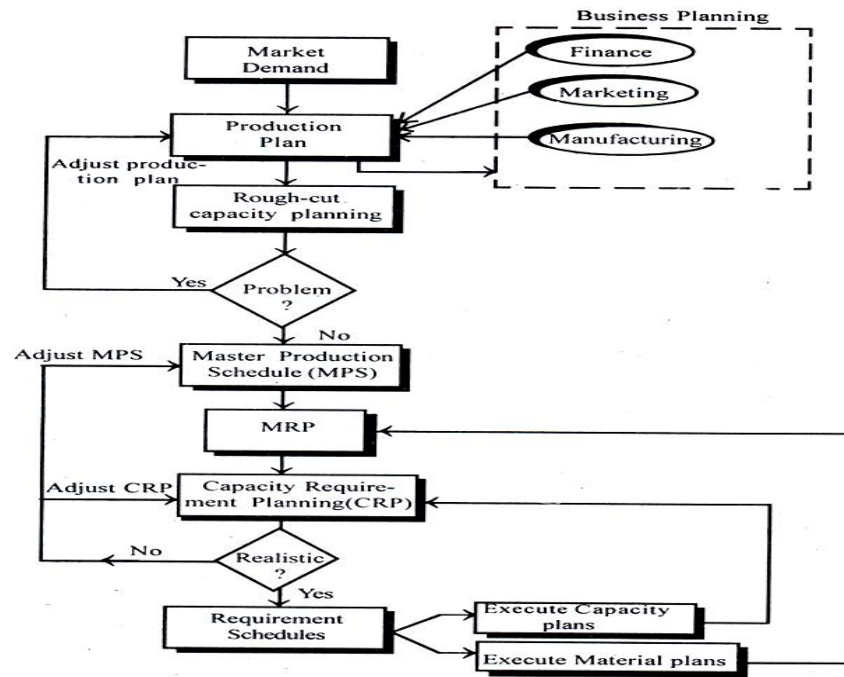
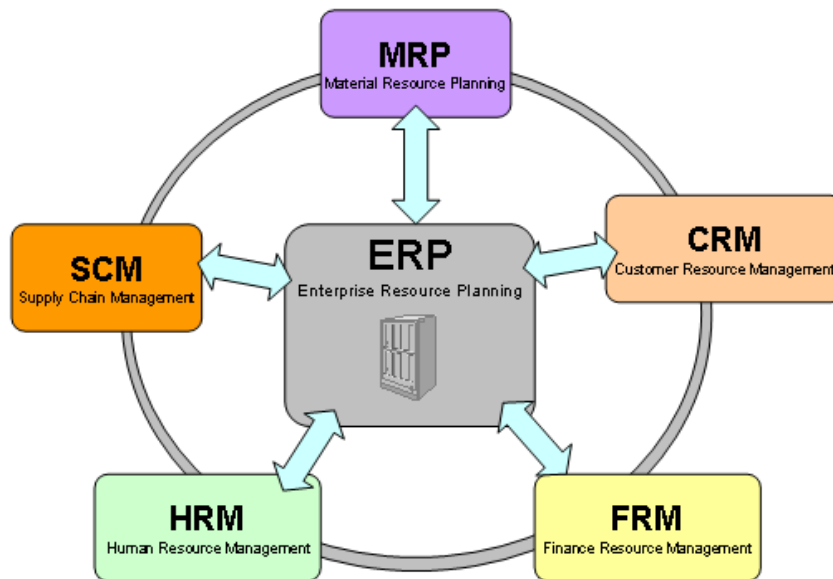


Figure 4: MRP II System (source: "MRP II")

### (3) ERP (1990s)

In the 1990s, the development of MRP II derived to enterprise resource planning (ERP) system, the reasons are that the old enterprise information system, mostly confined to a single enterprise internal integration, which is no longer enough to meet the overall business process, so they need to have more high-level integrated information system. Compare MRP, ERP system is an integrated information system that serves all departments within an enterprise. ERP system helps the organization complete the resource integration and process reengineering.



**Figure 5: ERP system structure (source: "Enterprise Resource Planning", 2010)**

#### (4) Extend ERP (1990s—2000s)

In the late of 1990s, because of the substantial advances in information technology and the competition pressure of globalization, the demand for the market focus is completely changed from the producer to meet the demand of diverse individual customers to create high additional value to the large amount of Customization (Mass Customization) mode of production. Nowadays, the enterprises mostly focus on how to make quick response under the competition trend of internationalization and diversification. And the proliferation of the internet has shown the tremendous impact on every aspect of the IT sector including ERP systems becoming more and more "Internet-enabled" (Lawton, 2000). This environment of accessing systems resources from anywhere anytime has helped ERP vendors extend their legacy ERP systems to integrate with new external business modules, such as supply chain management, customer relationship management, sales force automation (SFA), advanced planning and scheduling (APS), business intelligence (BI), and e-business capabilities. In fact, ERP is becoming the e-business backbone for organizations doing online business transactions over the Internet. Internet-based solutions are destined to improve customer satisfaction,

increase marketing and sales opportunities, expand distribution channels, and provide more cost-effective billing and payment methods. Compare ERP system functions, EERP added more functions, which include funds forecast, order management, remuneration rate analysis, and quality management and advanced reporting and monitoring tools. Meanwhile, EERP more emphasis on cross-regional, country, rapid response, and the overall resources effective application. (Amir, Mohamad, Shahnaz, 2011)



**Figure 6: ERP evolution (resource: Hossain, L., Patrick, J. D., Rashid, M.A., 2002)**

### 3.1.3 The basic functions for ERP system

In this section, the author would expound the ERP system functional areas in two parts: basic functions and extend functions. According to Davenport (1998, 169) mentioned: the main function of ERP system is that integrated all information system by information technology within the organization, at the same time, provide appropriate information to management class for decision-making analysis. Therefore, the basic functions of ERP system can be:

- Material management, which assists enterprises to effectively control information, to lower the inventory costs. The sub-module include purchasing, warehouse management, inventory management, and procurement information system.
- Manufacturing, it is one of the most important applications, which help the enterprises align their manufacturing and inventory process. The manufacturing module supply enterprises significant benefits, for example, enterprises reduce costs through efficient inventory management, streamline the production process with established goals, give company detailed report about critical business inventory, also help enterprises accelerate product circle. Sub-module briefly are Engineering, resource & capacity planning, material planning, workflow management, shop floor management, quality control, bills of material, and manufacturing process.
- Financial management, the finance tools of ERP system help companies maintain their financial information of the assets, accounts, budgets, and cash successfully. With the finance tools, the operation will be easier and a great deal of money will be saved, then the enterprises will improve productivity in long term.
- Sale and distribution, with the help of this module, the enterprises can quickly grasp the market information for the rapid response to customer demand. The sub-module consists transportation management, order management, and sales activities management.
- Enterprises information management system, besides the above modules, the information management system also play an important role, which provides instant and useful information for decision makers within the organization. The

sub-module include decision support system, operating planning and budget planning system, and central accounting system.

- Human resource management, HR module of ERP system include Recruitment, benefits, compensations, training, payroll, time and attendance, labor rules, people management.

#### 3.1.4 Benefit and pitfalls of importing ERP system

Schatz, A., Egri, P. & Sauer, M. (2011) specified: “Importing ERP system entails a number of advantages but also disadvantages, since the most systems are designed on best practice, and integrated all activities process, so enterprises adapt these systems result in improved productivity and performance. The process focus on the value chain improve and customer service. Due to the integration of database, the data consistency is enforced, so no need for synchronization between separate application. The ERP system increases data visibility and transparency and facilitate effortless communication across departments”. However, as F.F.H.Nah (2001) mentioned “the high expectation of achieving all-round costs savings and service improvements is very much dependent on how good and choose ERP system fits the organizational functionalities and how well the tailoring and configuration process of the system matched with business culture, strategy, and structure of the organization”.

According to F.F.H.Nah (2001), the benefits that ERP system can bring to organization and the disadvantages that organization needs to overcome for reaping the benefits can be summarized as below tables:

| What benefit                         | How   |
|--------------------------------------|---|
| Reliable information access          | Common DBMS, consistent and accurate data, improved reports.  |
| Avoid data and operations redundancy | Modules access same data from the central database, avoids multiple data input and update operations. |
| Delivery and cycle time reduction    | Minimizes retrieving and reporting delays.  |
| Cost reduction                       | Time savings, improved control by enterprise-wide analysis of organizational decisions.               |
| Easy adaptability                    | Changes in business processes easy to adapt and restructure.  |
| Improved scalability                 | Structured and modular design with “add-ons.”   |
| Improved maintenance                 | Vendor-supported long-term contract as part of the system procurement.                                |
| Global outreach                      | Extended modules such as CRM and SCM.   |
| E-Commerce, e-business               | Internet commerce, collaborative culture.   |

Figure 7: ERP benefits (source: F.F.H.Nah, 2001)

| Disadvantage                    | How to overcome   |
|---------------------------------|---|
| Time-consuming                  | Minimize sensitive issues, internal politics and raise general consensus.   |
| Expensive                       | Cost may vary from thousands of dollars to millions. Business process reengineering cost may be extremely high.                                   |
| Conformity of the modules       | The architecture and components of the selected system should conform to the business processes, culture and strategic goals of the organization. |
| Vendor dependence               | Single vendor vs. multi-vendor consideration, options for “best of breeds,” long-term committed support.  |
| Features and complexity         | ERP system may have too many features and modules so the user needs to consider carefully and implement the needful only.                         |
| Scalability and global outreach | Look for vendor investment in R&D, long-term commitment to product and services, consider Internet-enabled systems.                               |
| Extended ERP capability         | Consider middle-ware “add-on” facilities and extended modules such as CRM and SCM.  |

Figure 8: ERP disadvantage (source: F.F.H.Nah, 2001)

### 3.2 The phases of importing ERP system

In this section, several approaches and phases of importing ERP system for the organization would be briefly introduced.

### 3.2.1 The approaches of importing ERP system

S. Parthasarthy (2007, 35-38) emphasized there are three main different approaches for the ERP system importing: “big bang approach”, “location-wise approach”, and “module-wise approach”.

- The “big bang approach” means that the organization plan to import all the relevant modules at the same time, which will help the organization to obtain the whole benefits of ERP system, but, at the same time, the organization also need to take a high risk from the failure of implementation.
- The location-wise approach is normally applied by these organizations who want to choose a specific location, for example, the specific office, or factory, to utilize ERP system. Basically, this approach is a relatively safe way for organizations to import ERP system, since the organization does not need to experience the risk of failure implementation to the whole company, who can consider whether the further investment on ERP project for other departments of this company based on the feedback of the implemented ERP system department office. Furthermore, this approach also would help the organization to reduce costs, because the company does not need to pay the whole project costs.
- “The module-wise approach is another judgmatical way for the organization implementing ERP system. In this module, the organization chooses an individual module, for example, HR module, Finance module, material management module, for their organization operation”. S. Parthasarthy (2007, 38)

### 3.2.2 The phases of importing ERP system

The importing of ERP system would affect the organizations' management system and the adjustment of operation process, ERP system should be imported with systematic and procedures way. Crum (2000) cited six major phases of Oracle application for ERP system application importing to summarize:

- Definition phase – Plan the whole project, which includes determining objectives, verify the time, resource, budget limits of the project.
- Operations analysis – “Includes documents business requirements, gaps in the software (which can lead to customizations), and system architecture requirements”.
- Solution design phase – This phase basically used for designing the solutions of future business requirement and processes.
- Build phase – During this phase, project team do the coding and testing of customizations, finally bring out a working, tested solution.
- Transition phase – This phase mainly focus on the end-user training and support, management of change, and data conversions.
- Production phase – System goes live. “Users and the implementation team begin a series of refinements to minimize unfavorable impacts and realize the business objectives identified in the definition phase.”

SAP solution manager (N. Muir & I. Kimbell, 2010) as a tool helps companies manage the implementation of SAP ERP present five phases of implementation (E. Monk & B.J Wagner, 2009, 201):

- Project preparation – include organizing the technical team, defining system landscape, selecting vendors, defining project's scope.
- Business Blueprint – produces detailed documentation of business process requirements of the company.
- Realization – the project team members' works with consultants to configure the ERP software in the development system.
- Final Preparation – testing the system throughput for critical business processes, setting up the help desk and operation of the production system and transferring data from the legacy system, training the end-user.

- Production usage and Support – the company begins using the new ERP system.

Sean W. O'Donnell has indicated a well-designed implementation plan is a key to success, the 5 steps of implementation should be considered:

- Strategic planning – “assign the project team, examine the current business process and information flow, set objectives, develop a project plan”.
- Procedure review – “review software capability, identify manual processes, develop standard operation procedure”.
- Data collection and clean-up – “convert data, collect new data, review all data input, clean-up data”.
- Training and testing – “pre-test the database, verify testing, train the trainer, and perform final testing”.
- Production usage and Evaluation – “develop a final Go-live Checklist, evaluate the solution”.

Through the analysis of previous literature of ERP system implementation, this research would organize the phases of ERP system importing as: (1) project planning phase; (2) business requirements analysis phase; (3) solutions design phase, which is for business requirement and process; (4) Deployment management, this phase include build and transition phase, etc. ; (5) finally Production usage and evolution phase.

### 3.2.3 The analysis of key success factors for importing ERP system

Key success factors (or critical success factors) are defined as the factors that can affect the operation of organizations, which can improve organizations' competitiveness. Rockhart and Scott (1984) also mentioned that CSFs are the operational goals of a firm and the achievement of these goals will ensure the successful operation. Furthermore, the CSFs can be detailed as a small number of easily identifiable operational goals shaped by the industry, the firm, the manager, and the environment that assures the success of an organization (Laudon, 1998).

Since the ERP system becomes more popular, under the different type of industries, there would generate different key success factors, so how to identify the suitable critical success factors for the organizational characteristics seems to become important to the organizations. And the plenty of literature relate KSFs would be analyzed by the researcher as below:

Gargeya and Brady (2005) (Tavana, M., 2012, 76) suggested six key success factors for ERP importing: working with functionality scope; project team/management support/consultants; internal readiness/training; dealing with organization diversity; planning/development/budget; adequate testing.

According to Nah and Lau (2001), the critical success factors of successfully ERP system implementation are: ERP Teamwork & Composition, Top Management Support, Business Plan & Vision, Effective Communication, Project Management, Project Champion, Appropriate Business & Legacy Systems, Change Management Program & Culture, Business Process Reengineering (BPR) & Minimum Customization, Software Development, Testing & Troubleshooting, and Monitoring & Evaluation of Performance.

S. Parthasarthy (2007, 40) addressed the KSFs as: status of the company's legacy system; impact of new ERP system on their business process; whether all the business processes are well defined and could be delivered through ERP system; whether to go for a complete integrated system or to implement any one ERP module for the time being; Duration of the ERP project and expect service from ERP system to the customers; Level of cooperation from the top management throughout the project; resource availability; project scheduling and change management.

Brancroft (1998, ) considered the KSFs of ERP system implementation are: understand the enterprises' culture; build process reengineering; top management support; appropriate communication and coordination; have a project manager of competence; the project team of user department and information system department; select the optimal import method; appropriate training; change management.

Bingi (1999) thought the KSFs include: top management support; the enterprises re-engineering; the content of integration; the ERP system consultant and cooperation; import time used; the import costs; the ERP system supplier selection; the appropriate personnel; staff training; the employees' cooperation, correct and fast information and rapid decision making and application

The opinions of Hong & Kim (2002) are the organizational fit of ERP system (clear organizational structure); Top management support; and agreement of reform from all the employee.

Gale (2002) indicate the KSFs of ERP implementation: grasp the reasonable operation process; clear organizational structure; optimizing business processes.

Tavana (2012, 76) points the KSFs as project management, top management support, change management, education, and training.

Through the above various factors from different authors, the researcher generalized the most representative factors that were perceived really important and closely related to the success of ERP system implementation and grouped some related factors as one main factor.

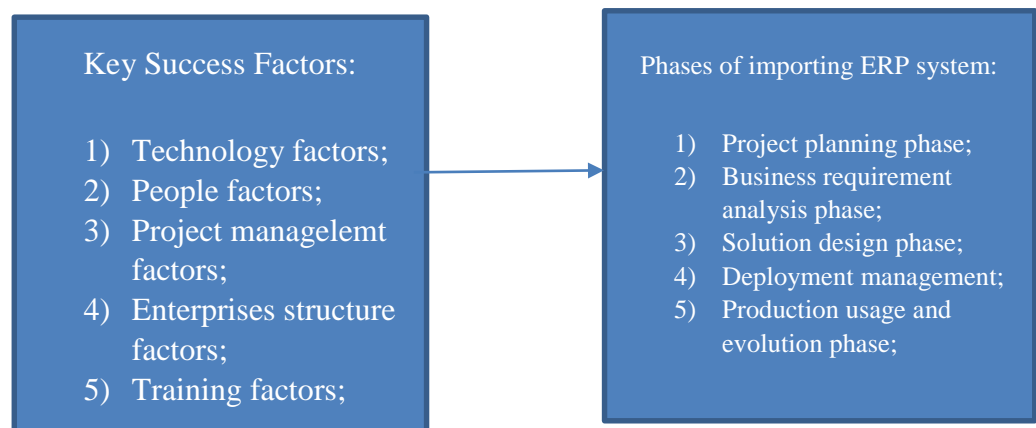
| Key success factors           | Attributes  |
|-------------------------------|---|
| 1. Technology factors         | 1) Software development<br>2) Business process reengineering<br>3) Testing & Troubleshooting<br>4) Optimal import method<br>5) System Customization<br>6) System supplier support<br>7) System integration<br>8) Information system quality |
| 2. People factors             | 9) Top management support<br>10) Appropriate communication and cooperation<br>11) Agreement and acception of ERP system   |
| 3. Project management factors | 12) The project management capability<br>13) The information system consultant competence   |

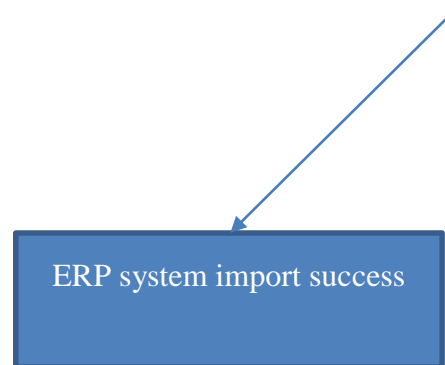
|                                  |   |
|----------------------------------|---|
|                                  | 14) Project team responsibility   |
| 4. Enterprises structure factors | 15) The explicit goal of organization<br>16) Change management<br>17) Importing costs and time usage<br>18) The long-term stratege of ERP system management<br>19) Correct and fast information and rapid decision making and application |
| 5. Training factors              | 20) Effective and complete training system<br>21) Production usage coordination   |

**Table 2: Key success factors of importing ERP system**

### 3.3 Conceptual framework

According to the main objective of this research, which is investigating the key success factors of importing ERP system and the influence of those KSFs on every phase during implementation based on different organization characteristics, the brief framework of his research as below:





**Figure 9: conceptual framework**

### 3.3.1 The phases of importing ERP system

The phases of importing ERP system in this research are summarized 5 parts. Actually, the phases and process are not fixed, the organization can choose the suitable phases according to the situation of their organization, but basically as below:

- 1) Project planning phase; before importing the ERP system, the organizations need to consider the objectives of their business operation, and also the budget of this project.
- 2) Business requirement analysis phase; when clear the budget and objectives, the next step for organizations is to build a project team, and together to measure the benefits of this importing project to the whole organization, then need to decide whether importing or not.
- 3) Solution design phase; when the organization decide to import ERP system, there are several methods for them to choose, they can decide to do this as outsourcing, or try to develop the suitable systems themselves, or try to consult to purchase the already solutions, for example, directly purchase warehouse management solutions of SAP.

- 4) Deployment management; after the organization making decision of solution design, the following step is the real importing period, during this period, the organization will face the problem about the analysis of the whole organization requirement and structure, the operation steps of importing systems, and the preparation of going live, then to do the training for the users.
- 5) Production usage and evolution phase; after the organization finished ERP system importing, they still need to get feedback from users for the future system improvement usage.

### 3.3.2 Key success factors

Based on the previous analysis of key success factors, the researcher generalized five factors of key success factors for this research:

- 1) Technology factors, this factor emphasize the technology level of this organization, for example, the type of information system hardware and software they already had, etc.
- 2) People factors also can be said participants factors, which means that in the organization, the workers have a strong agreement of importing ERP system, also the top management give support and think the ERP system can help the company to improve competence.
- 3) Project management factors, project team selection can be reputed as very important part of the entire phases. The efficiency management of project team which includes the team member selection with higher technology level and experience will give a positive effect to the benefits achievement.
- 4) Enterprise structure factors, this research will focus on the organization inner structures, for example, HR department, Accounting department, Inventory department, etc. to investigate the importing ERP system issues.
- 5) Training factors, through the final training, the users can use this system as soon as possible, which will save more time for the company to get back the normal operation, avoid the inner process suspended.



## 4 CASE STUDY

According to the previous literature review, the researcher will make deep research based on two case companies through individual case interview and observation. Those two case companies located in China, one company is Tongwei co. Ltd. and the other one is Jinway Ltd. The information and data of those companies used in this research come from the analysis of the published literature, direct observation and the face to face interview (or through internet communication) from the general manager, project manager, system end-users and project team member.

### 4.1 Tongwei co. Ltd

In this part, the researcher would focus on the enterprise of Tongwei co. Ltd. research.

#### 4.1.1 Tongwei co. Ltd introduction

Tong Wei group was estated in 1992, which is a large science and technology enterprise based on agriculture, new energy for the main business, and in the industries of chemical, pet food, construction and real estate also have rapid development. The group has more than 130 business points, subsidiaries all over the country and Southeast Asia, total has more than 20000 employees. It is one of the largest agricultural company in China's agriculture, forestry, and fishery sectors sales, the national aquatic feed market share exceed 20%, rank first in China for 20 years.

Tongwei is the firm developing agricultural staples, and make feed industry as the core industry, also extend and improve the fisheries and livestock industry and poultry industry chain. Try to become one of the world the best health and safety food suppliers through variety improvement, research, aquaculture technology research, and promotion, as well as food-producing, marketing, branding and service.

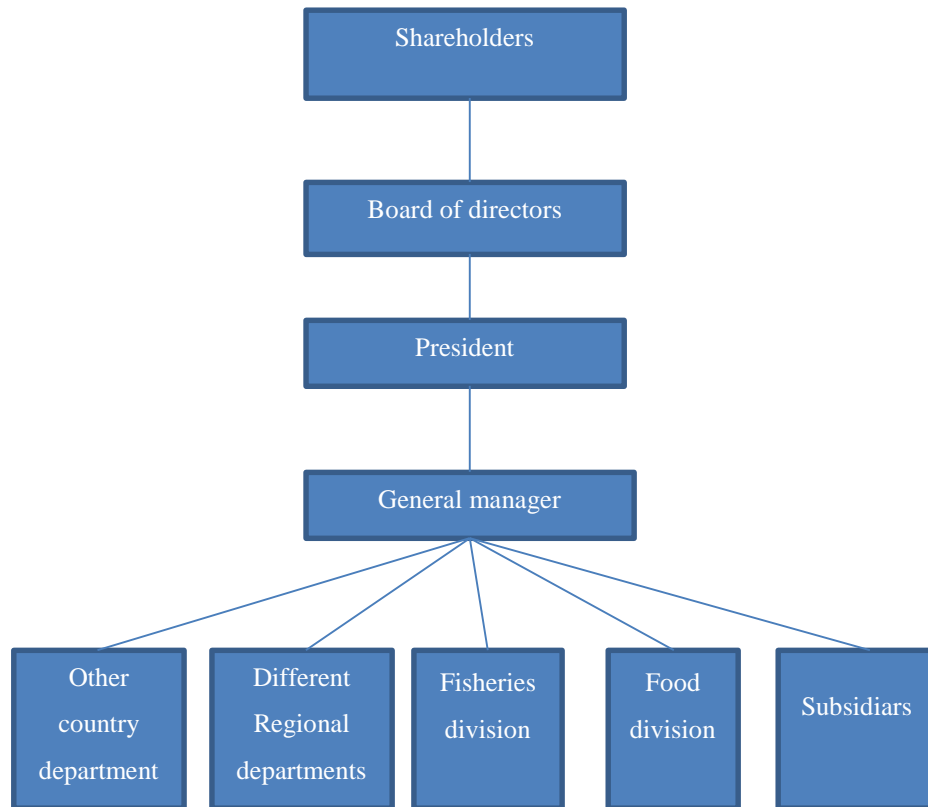
Tongwei co. Ltd is to speed up the layout and development of new energy industry. The polysilicon industry was planned as the core industry, also actively expand and improve the industry chain that from polycrystalline silicon, monocrystalline silicon, silicon slice production to the solar module, solar photovoltaic power generation and the integration of product research and development, promotion and application. Then try to create a world-class solar photovoltaic enterprise and world-class clean energy company. (About Tongwei co. Ltd, 2015)

#### 4.1.2 Technology intense

From the previous background content, we can see that the business domain of Tongwei Ltd is mainly about agriculture research and development, as well as the new energy industry. Those business normally are capital intense and technology intense industry, the research and development of agriculture, and new energy mostly depend on the professional workers.

#### 4.1.3 Organization structure

As mentioned in company background, Tongwei Ltd has more than 130 business points and subsidiaries all over the country. The organization structure of Tongwei was built depends on different business region and different functions. The different subsidiars in the different region can operate the business based on their own decision, which is helpful for the whole business. Based on their own decision can help the company become more flexible since different region and industry would have a different market and industry situation. The brief chart as blow:



**Figure 10: Tongwei Ltd. organization structure**

#### 4.1.4 ERP project description

In February of 2013, Tongwei group started to import ERP 3.0 system, after around 18 months, in 2014 Tongwei group complete the ERP implementation. The project experienced about 5 parts, around 6 months to do the preparation of importing ERP system. In August of 2013, they start to import ERP3.0 system in first 5 sub companies as pilots. In December of 2013, they made the first promotion within the whole company. And in January of 2014, they did the second promotion, and after that, they start the implementation step by step within the group. Until October of 2014, they complete the whole project of importing of

ERP 3.0 system. The solutions that ERP 3.0 provided is in accordance with Tongwei Group IT strategy planning, which achieved the requirements of rapid reproduction, effective integration, comprehensive support, flexibility to adapt, lateral cooperation, and longitudinal control.

This ERP 3.0 system was provided by Oracle Company. Until 2014, the implemented applications include manufacturing management, supply chain management, and enterprise performance management. For implementing that ERP system, except Oracle Company, also have IBM Company cooperated. Except those applications, In 2015 Tongwei Group imported human capital management, customer experience management system, and mobile collaboration platform system.

#### 4.1.5 Importing ERP system in different stage of Tongwei Ltd

The researcher in this section focuses on the success importing ERP system steps and the key success factors from literature review part to investigate the influence of different key success factors on every Deployment managements.

##### 1) Project planning phase

According to the summary of the interview, document, and direct observation, the researcher got that the factors of top management support; the explicit goals of the organization; project management capability; the optimal import method and equipment would be very important. The interviewee Mr. Hu said when they planned to build this project, the top managers have arranged several meetings for discussing the benefit of this project and detailed content of this project. And the information system department staff in that meeting mainly introduce the ERP 3.0 about more useful functions and show the difference and advantage of new system compare the old one, which will help to get more support from top managers. The main goal of this project was change management, optimize the inner management, and simplify the workflow, then increase the competitiveness. The project manager in this phase should know clearly about the details of this project and the schedule of different phases, make sure the progress. As Mr. Hu said if there have a very

small difference between new ERP systems working process with the original enterprises working process, the new system would be very easier to be online. Tongwei Ltd. chooses Oracle applications and imported the applications with the cooperation from Oracle and IBM Company, at this phase, the top managers should consider the costs.

Moreover, the factors of system integration; project member make efforts; the long-term strategy of ERP system management and the information system consultant competence also play an important role in this phase. Mr. Hu emphasised ERP 3.0 mainly for optimizing the applications, improving management, which depends on the capability of system integration, then improve the competitiveness. Project team members at this phase seem to have a heavy responsibility, because one side they need to focus on the new system development, the other side they also need to maintain other old systems. At this time, the assistance from top managers and cooperation of Oracle and IBM Company become more important. Those efforts that the project team members made would help the success importing of ERP 3.0 system. About the long term strategy of management, from the document of Tongwei Ltd, the researcher found that the president of Tongwei Ltd. has emphasised the future direction of applications improvement, which is the improvement of internal deep extension and the application extension of epitaxial. The internal deep extension is about the inner management improvement, application optimization, and mining the database value. The epitaxial extension includes ERP applications extension and speeding up to build Cloud platform.

## 2) Analysis phase

The key factors in this phase from the summary of the document, interview, and direct observation are factors of top management support, project management capability, project members make efforts, the information system consultant, change management, system integration and future development, long-term strategy management.

Mr. Hu emphasised “it is very important to get support from top management in this phase”, which means project members should make top manager clear about the benefits from the new system and differences compared with the old system and support this project during the first planning phase. Then in this phase project member can specify and detail the difference, after that they can continue the next step. During the project planning period, the project manager should urge the project progress, then improve the project management capability.

Similarly, the project members should make efforts to take own responsibility, for example, they need to analysis the difference between the new system with the old one with other relevant workers, and help to choose the suitable solutions. With the help of information system consultant, the project team can have a better choice of importing method based on the consultant earlier importing experiences. Change management in this phase also very important, since the project team needs to analysis the way to make workflow change.

The workers within this company have already used to the old system, but the difference of new system make the old working process to be changed. How to solve the contradiction become a significant question should be considered. The system integration analysis for the project is also an important responsibility of project members. The project team should analysis how to better integrate the information and functions from different departments. After the planning of long-term strategy, the detailed analysis of long-term strategy should be followed.

### 3) Solution design phase

The interview shows that the factors of system supplier support, project members make efforts, project management capability, and information system quality affect the Solution design phase. As Mr. Hu said, “during the Solution design phase, we need to get support from Oracle and IBM Company”, which because the Tongwei Ltd selected the applications from Oracle Company. For the project team, at this phase they need to take the responsibilities of software and hardware installation, then make the

construction be smooth. About the information system quality, if the company does not have good equipment of information system, they have to costs more to change the good one, which is kind of limitation of new system construction. But if the company already have good equipment, the ERP importing project would be very fast with less limitation.

#### 4) Deployment management

At this important phase, the factors of project management capability, effective and complete training system, Production usage coordination, testing & troubleshooting and project member make efforts are considered by the interviewee.

Mr. Hu said when importing the ERP 3.0 system, the project team have to balance the new system with the old system, which because the several old applications still are used in different department. Therefore, at this phase the project management capability should be improved. The education training at this phase aims to make the end users be familiar with this new system, then avoid the mistake. The role of project member at this phase is most professional technology staff. They need to do the whole system installation, which needs to make more efforts since any kind of bugs of new system would affect the working process. At the same time, the project members need to test the imported system. If there have bugs or other problem, they have to fix them.

#### 5) Production usage and evaluation phase

In the last phase, the factors of project management capability, long-term strategy of management, project member make efforts, effective training system, Production usage coordination and ERP customization would play an important role.

From the interview, Mr. Hu mentioned project team at this phase have to complete the new system importing, for example, the information import, the transition from old system to the new system. When there has some problem

after online, they need to find the solutions. After the new system Production usage, the end users start to use this new system, they will have some questions because of unfamiliar. At this moment, the project team member should make efforts to solve this questions. About the ERP customization, Mr. Li said from the feedback of end users, they found that the new system is very welcome, because the functions are satisfied their requirements, and user interface also very easy to handle for them.

## 4.2 Jinway mould Ltd.

This section will focus on Jinway mould Ltd. importing ERP system. Firstly, the researcher will expound the operation situation of Jinway mould Ltd. in recent years. Then, the researcher will describe the key success factors and the Deployment managements of ERP system when Jinway mould company importing ERP system.

### 4.2.1 Jinway Ltd introduction

Xiamen Jinway mould Ltd was founded in 1990, which is specialized in precision plastic mold design and manufacturing, as well as the production of precision plastics parts. Jinway headquarter is located in Xiamen, China. The factories set up in Xiamen, Shanghai, Zhuhai, and the factories plant area is around 50000 square meters. The number of employees is around 500, and over 100 persons are professional technology employees. Jinway Ltd is a high-tech enterprise in Xiamen, obtained ISO9001:2000 international quality system certification.

Jingwei has strong technical strength and quality advantages. The annual production capacity is about more than 1000 mould and 1000 tons of injection molding products. 95% of the products and moulds are exported to all over the world, also established a long-term cooperate relationship with many international well-known enterprises of USA. Japan, Germany, Spain, Mexico, Portugal, Australia, India, and other regions. Therefore, it has accumulated the wealth of experience in the design and manufacture of molds and plastic parts injection

molding process, involved in automobile, electronic, medical, communications, home appliances and other industries. (Jinway Ltd profile, 2015)

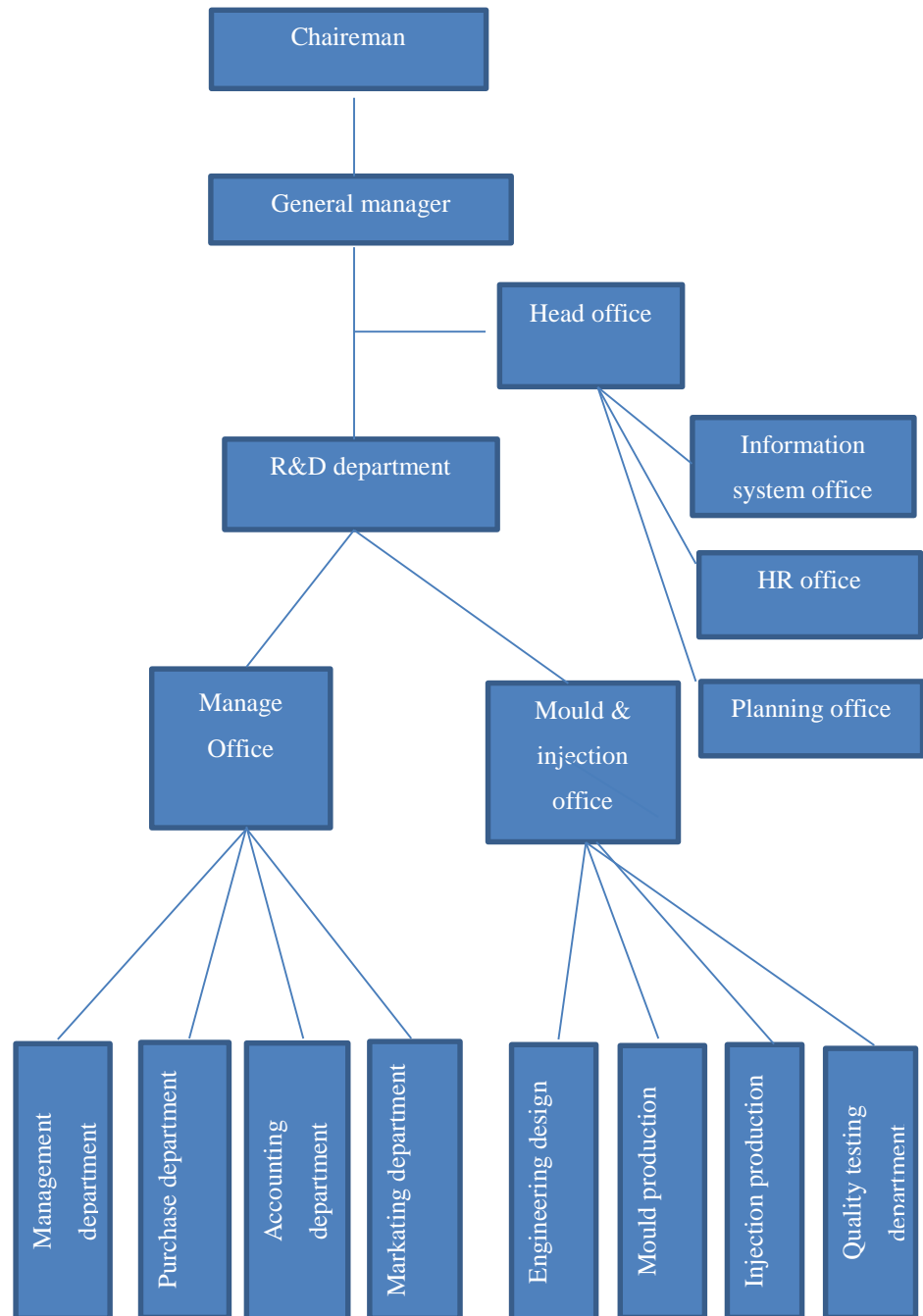
Moulds industry is a special industry with technology, capital intense and high additional value. It also is an important tool for a variety of electronic, electrical appliances, automobile parts products production, so mould is the key tool of components producing. And the level of mould manufacturing and technology will affect the industrial product quality, the efficacy usage of raw materials and the improvement of productivity.

#### 4.2.2 Organizational structure

As the previous mentioned Jinway Ltd has over 500 employees, and more than 100 of them are professional engineers. The headquarter department is in Xiamen, the four factories established in Xiamen, Shanghai, Shenzhen, and Zhuzhou.

The inner structure tends to classified methods for products of different departments. The segmentation approach is in accordance with certain type products to do division. Usually, the company adopts this way originally according to the different functions of the different department. But when the company scale expands, the daily management become more complex, and the manager fails to take consideration all unit of staff. At this time, the company prefers to choose the classified methods for products of different departments. The biggest advantage of this method is the ease of implementation of specialization. The costs and benefits are according to the products, then to establish the costs center, thus strengthening the development of high-profit products, replacing no profit product line. But this method also has disadvantage, for example, it will have the phenomenon that the investment of equipment may have a repeat, which will cause the waste of enterprise resources. Jinway Ltd chooses the classified method for products of the different department, which may result that the different department purchases the same raw material many times, or make accumulation because of the failure inventory control, those will lead to the waste resource repeated. Therefore, the manager of this company would like to import ERP system for the integration of producing raw materials, then decrease the

resource waste. The organizational structure of Xiamen was briefly integrated as structure chart from the research interview as below:



**Figure 11: Jinway Ltd organization structure**

#### 4.2.3 Project description

The ERP project of Jinway Ltd. was started in December of 2009, finished in October of 2010. The investment was not told to the researcher for some business reasons. The whole project includes the hardware and software upgrade, the ERP system development, importing, testing, evaluation and end users training. The main models of the new system include material management system, production management system, purchase system and order system. The reasons for developing this system themselves are that the company has its own working process requirements, the company does not want to make changes for the workflow management, and also they do not want to invest too much on it. So after comparison with other existing products in the market, they decide to develop the suitable system themselves.

#### 4.2.4 Importing ERP system of Jinway Ltd.

The researcher in this part focuses on the different phases of Jinway Ltd. importing ERP system based on the key success factors of literature review section to investigate the influence of key success factors on Deployment managements.

##### 1) Project planning phase

According to the summary of Jinway Ltd. documents, interview and direct observation, the researcher arranged key success factors. The project of importing ERP system get the strong support from top management. Mr.Li said, “Even Jonway Ltd. is not a big size company, but the company now still make an effort to become the competitive big size company”. Thus, he totally agrees the importing of ERP system would improve the competitiveness. The company also have its clear operation target. According to Mr. Li said, they want to import ERP system for the better integration of raw materials and

information management, and make every department can get correct information of raw materials consumer, also want to get the benefit of a fast and correct reply from ERP system. About the choice of ERP supplier, Mr.Li said, because they have their own business requirements, and they already used to the recent inner organizational structure management, do not plan to make changes, so they want to develop their own ERP system software rather than purchase the existing products in the market. Based on the limit size of this company, the self-develop method actually will not costs too much. Mr. Li also mentioned that when they started to develop the new system, they organized a plenary meeting within the whole company, which is for making everyone be familiar with this system.

## 2) Analysis phase

From the interview, the researcher arranged the key success factors in this phase as the project team making efforts, the appropriate communication and cooperation, system integration and importing costs & time usage.

Mr. Li said, “The project team choice is very important, and the project team need to analysis the whole business operation process, and find out the abuse and improve the original process”. About the appropriate communication and cooperation, Mr. Li thought the appropriate communication is very important. He asked the project team member to gather the end-users’ requirements of system usage through communication rather than their own thoughts. Also from this appropriate communication, the workers in other departments will have a clear view of benefits from the new system, which will help to achieve the target of this project. System integration and future development also are very important. As Mr. Li said, “the new system integrate many resources, which make the working flow and information share become more efficiency”. In this phase, the project

team also need to analysis the costs of this whole project and time usage.

### 3) Solution design phase

After the interview, the researcher got the key success factors in Solution design phase. The software development factor is very important for this phase because Mr. Li thought that the new system information increase result that the software and hardware should be updated, which means the consideration of these update costs should be taken into the measurement. The project team member should put effort on the new system development. Mr. Li said since the new system was designed by their own project team, thus, the project team member should take the responsibility for the integration of the related information, and test the new system. Another side is the information system quality in this company, Mr. Li said” the acceptance of this new system also depends on the level of workers’ knowledge of information technology. If the whole employees have higher level knowledge of information technology, the acceptance will be higher and time usage of being familiar with this new system will be shorter”.

### 4) Deployment management phase

During this phase, Mr.Li said the support of top management factor seems to be more important. At that time, the top manager asked the total employees to take the training, which gives help to the employees being more familiar with this new system. The project management also plays an important role in this phase. Mr. Li said, because of the new system development, the assignments of project team become more, there have a lot of emergency things happen, and then the company has to give more time for project time to handle. So when during the Deployment management, the project team should make an effort to handle every emergency things and ask other relevant workers to help to import the new system, which will save more time. The

acceptance of related enterprises, for example, the suppliers, Mr. Li said when they first use this system to make orders, the supplier company not really trust this system, still need to recheck, which because they have not familiar with this new work process. After several times, the supplier company was satisfied with this new system. The training and Production usage coordination are the last most important factors. Mr. Li thought after importing this new system and being online, the training would help the end user to know how to handle this system. At this time, the project member would show the specific system operation process to the end users.

#### 5) Production usage and evaluation phase

In the last phase of Production usage and evaluation, the key success factors are considered as the project management capability, testing & troubleshooting, ERP customization, effective training system and online coordination.

In this phase, the main responsibility of project team is to get the information about this new system operation and record the problem of operation for the future improvement. Testing and troubleshooting also under the consideration in this phase. Mr. Li said after the new system online and training, there still have some problem, for example, some function does not work. Those problems mostly because the end users are not familiar with the system. So at this moment, the project team member have to do the testing, solve the problems and also need to tell users the logical usage of this system. About ERP customization factor, as Mr. Li mentioned, the new system was developed by their own project team from their information system department.

Therefore, many functions such as the material management, production management, purchase and order management, should satisfy their own workflow requirement. Based on these the new system will have more extension systems. Another factor is correct and fast information and rapid decision making and application. After the

new system imported, the most benefit is the convenient workflow and rapid information reply, also decrease the mistake making compare the earlier work method.

#### 4.3 Data analysis

According to the interview, direct observation, and documentation, the researcher summarized key success factors on different stage and organized into one table as below:

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| Deployment management<br>Key success factors |   | Project<br>planning<br>phase | Analysis<br>phase | Constru-<br>ction<br>design<br>phase | Deployment<br>management<br>phase | Producti<br>on usage<br>and<br>evaluatio<br>n phase |
|--|---|------------------------------|-------------------|--------------------------------------|-----------------------------------|---|
| People<br>Factors                            | top management support;                       | © √                          | ©                 |                                      | © √                               |   |
|  | appropriate communication<br>and cooperation; |                              | √                 |                                      |                                   |   |
|  | The acceptance of related<br>enterprises;     |                              |                   |                                      | © √                               |   |
| Technology<br>factors                        | Software & hardware<br>development;           | ©                            |                   | √                                    |                                   |   |
|  | Business process<br>reengineering;            |                              |                   |                                      |                                   |   |

|                              |  |     |     |     |     |     |
|------------------------------|--|-----|-----|-----|-----|-----|
|                              | Testing & Troubleshooting;                       |     |     |     | ◎ √ | √   |
|                              | Optimal import method and optimal equipment;     | ◎ √ |     |     |     |     |
|                              | ERP Customization;                               |     |     |     |     | ◎ √ |
|                              | System supplier support;                         |     |     | ◎   |     |     |
|                              | System integration;                              | ◎   | ◎ √ |     |     |     |
|                              | Information system quality                       |     |     | ◎ √ |     |     |
| Project management factors   | the project management capability;               | ◎ √ | ◎   | ◎ √ | ◎ √ | ◎ √ |
|                              | the information system consultant competence;    | ◎   | ◎   |     |     |     |
|                              | project team make efforts;                       | ◎ √ | ◎ √ | ◎ √ | ◎ √ | ◎   |
| Enterprise structure factors | the explicit goal of organization;               | ◎ √ |     |     |     |     |
|                              | change management;                               |     | ◎   |     |     |     |
|                              | importing costs and time usage;                  |     | ◎ √ |     |     |     |
|                              | the long-term stratege of ERP system management; | ◎   | ◎   |     |     | ◎   |
| Training factors             | an effective and complete training system;       |     |     |     | ◎ √ | ◎ √ |
|                              | Production usage coordination                    |     |     |     | ◎ √ | ◎ √ |

**Table 3: Key success factors on five Deployment management**

According to the literature review and case study, the researcher highlights it's very important to get the knowledge about the key success factors on every different phase when enterprises importing ERP system. The above table shows that:

#### 1) Project planning phase

In the first phase of project planning, the key success factors that those two companies thought are mainly related to how to import ERP system after project planning. The training factors in this phase are not be considered as at this time the system not be imported yet, so there are lots of unknown situation for the following period. But the people factors, enterprises structure factors, technology factors, and project management factors are most important in this phase. During the project planning phase, both companies thought the top management support help the importing project process become smoother. They thought the factors of project management capability and the project team members making efforts play an important role in this phase. The project management capability includes how to design the project workflow, how to deploy the participants, and so on, and the project team member making efforts would help the project planning phase become perfect. But about the information system consultant, the two companies had a different opinion. Tongwei Ltd thought the consultant was important in this phase, but not Jinway Ltd. The reasons are Tongwei Ltd chose Oracle company's products, but Jinway chose the way that develops their own system themselves. Tongwei chooses to purchase existing products, which depend on the supplier's importing experience to make a decision.

Those two companies both consider the explicit goal of the organization as success factors. Since those companies started thinking about importing this system with clear goals, they want to optimize their management, then improve their competitiveness.

With this motivation, the importing project details become clearer. Tongwei highlight the importance of long-term management strategy, but not Jinway Company. As Tongwei is a big size company, had invested many different industries and has long-term development requirement, but Jinway Company not mention about the long term operation target, therefore Jinway Ltd. did not focus on this factor.

About technology factors, the two companies both thought the optimal import method and optimal equipment are important for the success importing. Because these two companies no matter the selection of existing system or self-develop new system, all need to firstly consider the import method and their hardware & software equipments in this planning phase. Furthermore, Tongwei Ltd. in this phase also account that the software development and system integration quite important, but Jinway Ltd did not. Because Tongwei Ltd imports Oracle ERP 3.0 based on the old ERP system, which needs the original software to be updated and system be integrated. But Jinway Ltd planned to develop this system themselves, the new required software would be considered as invest costs part, so the system integration and software development are not in the consideration in this phase.

## 2) Analysis

During the analysis phase, the emphasis of key success factors focus on the people factors, enterprise structure factors, and project management factors, but training factors are not really considerable. Since in the phase, the enterprises pay attention to the key success factors related to the enterprises' goals, analysis the construction of the new system and gather the employees' requirements. About training factors, as the system not be imported yet, so in this phase there is no need to consider this factor. The above table shows that the system integration as KSF has considered by these two companies, which because even Jinway Ltd. develop the system

themselves, in this phase they still need to do the analysis of system integration. The system integration factor includes integrating their previous limited system parts.

Beside the system integration, the same opinions of those two company on factors also include appropriate communication and cooperation, the project team making efforts and importing costs and time usage analysis. No matter self-develop system or existing systems, in the analysis phase, the responsibility of project team seems similar. Both of them need to communicate with related users, and analysis the project costs and time usage for the following Deployment managements.

But there still have some difference on influencing factors to compare these two companies. Tongwei Ltd also thinks over the factors of top management support, project management capability, information system consultant, change management and the long-term strategy of ERP management, but not Jinway Ltd. About Jinway Ltd. they do not change their management structure within the company, also not planned to build new factories abroad. And the main work in this phase for this company are about analysis the detail parts of developing the new system, so they do not need to think the factors same with Tongwei Ltd.

### 3) Solution design phase

During the phase of Solution design, the factors of project management and technology are important, but the people factors, enterprise structure and training factors seems not really important. In the phase, the enterprise mostly focuses on the technology within the company to design the construction with the help of project member making efforts. Thus the people factors, enterprise structure factors and training factors are not put into consideration. The table shows that Jinway Ltd. in this phase also need to consider the

software and hardware development of technology factors, which because the company chose self-develop ERP system. When project team makes Solution design, they would make the suitable software and hardware development according to their analysis of the new system. But Tongwei Ltd. already made this development in the planning phase, as they choose Oracle products which have its own requirements of software and hardware quality, so they can get the requirements earlier. Similarly, the supplier support for Jinway Ltd with self-develop ERP system is no need to consider. But for Tongwei Ltd., this factor in Solution design phase is quite important, they need to finish this work with Oracle and IBM company's coordination.

#### 4) Deployment management

The enterprises thought in the Deployment management, the factors related to people, project management, technology and training seem more important, but enterprise structure in this phase not be focused. In this phase, the project team's work is making the new system Production usage. Therefore, the project team member should make efforts to compare the new system with the old one based on the acceptance of related enterprises, if there have some operation problem, the project team should fix it. The training for end users also would be implemented, which would enable to make end users be familiar with this new system. After this phase, the new system would be online, so the Production usage coordinate works for these two companies are important.

But the system supplier support of technology factors for Tongwei Ltd still very important in this phase. Since the importing ERP project was assisted by Oracle Company and IBM Company, the detailed importing work would require the help of these two

company. Jinway Ltd developed the system themselves, so they do not need system supplier support.

#### 5) Production usage and evaluation phase

After the Deployment management, in this last phase of Production usage and evaluation, the main responsibility of project team is to conduct and inspect the business goals which set in the first project planning phase, and improve the operation system flaws. People factors in this phase are not considered, as the people factors are mainly for the first four-phase. The training factors in this phase still need to be considered. Even the end users have been trained in the Deployment management, but when in the real operating period, there still would have some problems related to the operation. At this time project team need to fix those problems and train the end users with correct operating methods. Also for Jinwei Ltd. need to continue to test the new system and fix problems, as the self-developed systems need to be optimized in the last phase. Both companies need to minimize the ERP customization for the easier user interface. All of those based on the project team member making efforts and project management capability.

## 5 CONCLUSION

In this study, the researcher explores the ERP system Deployment managements and the key success factors of importing ERP system with a dynamic view. Also according to the results of case company interview and secondary data collection with literature review, the researcher conduct the analysis of case companies and generalize the key success factors of different phases.

### 5.1 Summarize the conclusion

In this sections, the researcher would integrate the data analysis results. Then illustrate the key success factors of different Deployment managements, and the obstacles of different phase, as well as the related solutions.

#### 5.1.1 The influence of key success factors on different Deployment managements.

When the enterprises importing ERP system, if they pay attention to every key success factors during the whole Deployment management, it will take too much time and resources on the unnecessary session. But if the enterprises clearly grasp the key success factors on each phase referencing the above case study chapter, they could reduce a lot of time and waste of resource, and make the importing more smoothly.

From the data analysis result, the researcher found that in project planning phase, the enterprises need to consider the requirements within the company and enterprise object. Therefore, they focus on the factors of people, project management capability, enterprise structure, and information system quality, but not consider the training factors, as the system not be imported yet.

During the analysis phase, the enterprise started to analysis the benefits from new ERP system. So at this time, the enterprises mostly rely on people factors, project management factors, and enterprises structure factors. Using project team to clarify the differences between old and new system and gather the requirements of end users, then achieve the goal of the analysis phase.

In Solution design phase, the main target is completing a set of the system. Therefore, the enterprises emphasis on project management factors and technology factors. With the help of project team member, the system construction can be completed smoothly.

The main work of Deployment management is to make the system online and successfully operate within a company. The enterprises in this phase focus on the factors of people, project management, technology, and training. The goal of this phase was achieved by the project team making efforts and training. Through the training, end users would be more familiar with the new systems. Meanwhile, the project team will fix the problem related to the operation system.

Production usage and evaluation phase aim to evaluate the results and improve the new system. The enterprises in this phase attach importance to the factors of project management, enterprise structure, technology, and training, then achieve the main goal of this phase, which is the system can be used to help companies achieve the goal in the planning phase and to improve enterprise by the long-term competitiveness of the system.

#### 5.1.2 The obstacles and solutions of every implementation phase

From the interview data, the researcher briefly summarized the obstacles when those two companies importing ERP system, and the related solutions based on their experience.

##### (1) Project planning phase

- The importing ERP project makes the workload of information system department workers increase.
- ✓ About this problem, Tongwei Ltd and Jinway Ltd both of them had this problem. The relevant workers at that time always have to work overtime, so besides the extra payment, the top manager also arranged other departments to give help.

- The top managers are not familiar with ERP system, then they cannot make a clear goal of this project.
- ✓ Top managers normally are not good at technology, they may not be famous about the details of ERP system. So before making a project plan, the project team can make a report of ERP system usage or have a meeting with top managers to introduce ERP system, then get their support.

## (2) Analysis phase

- Analysis how to design the suitable workflow within the company.
- ✓ Jinway Ltd met this obstacle when they doing the importing project. Mr. Hu told to the researcher that they tried to compare with old workflow and system, then make improvement of working flow.

## (3) Solution design phase

- How to install ERP system in the existing hardware and software?
- ✓ For this problem, the interviewee said in this phase, when they found those kinds of problem, they tried to check the software and updated them.

## (4) Deployment management

- How to make the training more efficient?
- ✓ Both of those two companies had those of problems that the training process was not going well, the end users acceptance of knowledge is uneven, the training period is long and users' attendance is not high. For those difficulties, these two companies finally made an arrangement of training, which includes making a suitable training schedule according to the users'

acceptance of knowledge, trying to make the instruction more simple and easy to understand and asking top executives' help to improve the attendance.

(5) Production usage and evaluation phase

- The end users still have problems with several functions usage.
- ✓ When the end users start to use the new system, they may make mistakes about system operation since they are still not familiar with the new system operation. At this time, the project team member should take the responsibility of handling those problems and arrange some special training for some complicated functions usage, then improve the users' operation skills.

### 5.1.3 Summary of key success factors for every Deployment managements

There is a lot of materials about key success factors for importing ERP system, but not every key success factors can work for every Deployment management. Clear basic key success factors of every Deployment management would help enterprises save a lot of time and resource. The researcher summarized key success factors as below table:

| Implementation Phases | Key success factors       | Specific KSFs   |
|-----------------------|---------------------------|---|
|                       | People factor             | 1) Top management support   |
|                       | Project management factor | 1) The project management capability.<br>2) The information system consultant competence.<br>3) Project team make efforts |
|                       | Technology factor         | 1) Software & hardware development  |

|                        |                              |   |
|------------------------|------------------------------|---|
| Project planning phase |                              | 2) Optimal import method and optimal equipment<br>3) System integration   |
|                        | Enterprise structure factor  | 1) the explicit goal of organization<br>2) the long-term strategy of ERP system management                              |
| Analysis phase         | People factors               | 1) top management support<br>2) appropriate communication and cooperation   |
|                        | Technology factors           | 1) System integration   |
|                        | Project management factors   | 1) The project management capability<br>2) The information system consultant competence<br>3) Project team make efforts |
|                        | Enterprise structure factors | 1) Change management<br>2) Importing costs and time usage<br>3) The long-term strategy of ERP system management         |
| Solution design phase  | Technology factors           | 1) Software & hardware development<br>2) System supplier support<br>3) Information system quality                       |
|                        | Project management factors   | 1) The project management capability<br>2) Project team make efforts  |
| Deployment management  | People Factors               | 1) Top management support<br>2) The acceptance of related enterprises   |
|                        | Technology factors           | 1) Testing & Troubleshooting<br>2) System supplier support  |
|                        | Project management factors   | 1) The project management capability<br>2) Project team make efforts  |

|                                       |                              |  |
|---------------------------------------|------------------------------|--|
|                                       | Training factors             | 1) An effective and complete training system<br>2) Production usage coordination |
| Production usage and evaluation phase | Technology factors           | 1) Testing & Troubleshooting<br>2) ERP Customization                             |
|                                       | Project management factors   | 1) The project management capability<br>2) Project team make efforts             |
|                                       | Enterprise structure factors | 1) The long-term stratege of ERP system management                               |
|                                       | Training factors             | 1) An effective and complete training system<br>2) Production usage coordination |

**Table 4: summary of key success factors for every Deployment managements.**

## 5.2 Future study

This research aims to investigate the key success factors in different Deployment management. But because of the research limitation, there have a lot of possibilities for the future research. The researcher can choose different research method to verify the conclusions, also the future researcher can find other research direction to investegate this topic.

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## APPENDENCES

### Appendix 1. Interview with Jinway LTD. – Mr. Li

#### Information about interviewee

**Position in the company:** Information system department manager

**Description of daily tasks:** handle the daily manage work of information system or computer related work.

#### Information about importing ERP system

##### **The reasons for importing ERP system?**

We decided to import ERP system because we want to have better integration of raw materials and information management, and make every department can get correct information of raw materials consumer, also want to get the benefit of a fast and correct reply from ERP system.

##### **Which ERP supplier you choose?**

For the ERP supplier choice, we decide to develop the ERP system ourselves. Because we have our own special business requirements, and we already used to the recent inner organizational structure management, do not plan to make changes. Also, the investment of the new system make the better choice as develop the new system ourselves.

##### **What approach used to importing ERP system?**

We develop the new system divided different modules, according the requirements, we developed the HR module, purchase module, finance module, and material management module.

##### **How many team members in the project team?**

The original members of information system department are 6, but for this project we got 2 helper from other departments. So total members are 8 within this project team.

**For the project planning phase, how was the ERP project planned? What are the key success factors for this phase? What kind of difficulties and the related solution?**

When made the decision of developing the new system, we organized a plenary meeting to help everyone to be familiar with the ERP system, and clear the goals of our organization. The key success factors can be the top management support, because in the planning phase, the manager support is very important for the whole project starting. Then need to make sure about the import method and required equipment. The explicit goal of organization, also in this phase project team work is quite important. The difficulties in this phase are quite much, the project managers are usually not familiar with this new system, so the project team need to make a very clear presentation for the top managers and other workers, and because this was the starting period, the team workers at that work always need to work overtime, so the top managers arranged other department workers to help.

**In business analysis phase, what are the key success factors for this phase? What kind of difficulties and the related solution?**

In the business analysis phase, the key success factors of project team's hardwork was really important, the project team choice is very important, and the project team need to analysis the whole business operation process, and find out the abuse and improve the original process. The appropriate communication and cooperation, system integration and importing costs & time usage were also important. During the project, the team members were arranged for gathering the end-users' requirements of system usage through communication rather than their own thoughts. The new system integrate many resource, which make the working flow and information share become more efficiency. In this phase, the project team also need to analysis the costs of whole project and time usage.

**In solution design phase, what are the key success factors for this phase? What kind of difficulties and the related solution?**

The software development factor is very important for this phase, the new system information increase result that the software and hardware should be updated, which means the consideration of these update costs should be taken into the measurement. The project team member should put effort on the new system development. Since the new system was designed by their own project team, thus the project team member should take the responsibility on the integration of the related information, and test the new system. The acceptance of this new system also depend on the level of workers' knowledge of information technology. If the whole employees have higher level knowledge of information technology, the acceptance will be higher and time usage of being familiar with this new system will be shorter.

**In deployment management phase, what are the key success factors for this phase? What kind of difficulties and the related solution?**

The support of top management factor seems to be more important. At that time, the top manager asked the total employees to take the training, which give help to the employees being more familiar with this new system. The project management also quite important, because of the new system development, the assignments of project team become more, there have a lot of emergency things happen, and then the company have to give more time for project time to handle. But the response of our suppliers and customers for the new system affect processing, when they first use this system to make order, the supplier company not really trust this system, still need to recheck, which because they have not familiar with this new work process. After several times, the supplier company was satisfied with this new system. After importing these new system and being online, the training would help the end user to know how to handle this system.

The difficulties in this phase seems like the project team had tried to make the training to be more efficient. The team member had made a clear user instruction and arranged workers to take training of usage.

**In production usage and evaluation phase, what are the key success factors for this phase? What kind of difficulties and the related solution?**

After the new system on line and training, there still have some problem, for example, some function does not work. Those problems mostly because the end users are not familiar with the system. So at this moment, the project team member have to do the testing, solve the problems and also need to tell users the logical usage of this system. The new system was developed by their own project team from their information system department. Therefore, many functions such as the material management, production management, purchase and order management, should satisfy their own workflow requirement.

In this phase, even the end users had been trained, and all the system had been installed, but there still had several usage problem and system bug. Then the project team had to arrange the training again.

## Appendix 2. Interview with Tongwei LTD. – Mr. Hu

### Information about interviewee

**Position in the company:** Information system department manager assistant

**Description of daily tasks:** The assistant of information system manager, take the responsibilities of computer related work and so on.

### Information about importing ERP system

#### **The reasons for importing ERP system?**

We decide to import ERP 3.0, which is update of our previous ERP system, the ERP 3.0 is in accordance with Tongwei Group IT strategy planning, which achieved the requirements of rapid reproduction, effective integration, comprehensive support, flexibility to adapt, lateral cooperation, and longitudinal control.

#### **Which ERP supplier you choose?**

Oracle Company

#### **What approach used to importing ERP system?**

We started to import ERP 3.0 system first in 5 sub companies as pilots, then made the promotion within the whole company.

#### **How many team members in the project team?**

The total workers in our department is 13 workers.

#### **For the project planning phase, how was the ERP project planned? What are the key success factors for this phase? What kind of difficulties and the related solution?**

When we planned to build this project, the top managers have arranged several meetings for discussing the benefit of this project and detailed content of this project. And the information system department staff in that meeting mainly

introduce the ERP 3.0 about more useful functions and show the difference and advantages of new system compare the old one, which will help to get more support from top managers.

**In business analysis phase, what are the key success factors for this phase?**

**What kind of difficulties and the related solution?**

It is very important to get support from top management in this phase, also our team had made really much effort to take the responsibility, as we need to analysis the difference between new system with the old one with other relevant workers, and help to choose the suitable solutions. Also we got help from IBM Company and Oracle Company to choose the right solutions for us. In order to use the new system within whole company, we had made several changes of the workflow.

In this phase, the difficulty our team met was how to better integrate the information and functions from different departments. According to this problem we've made a deep analysis about the new system workin process and our old workflow.

**In solution design phase, what are the key success factors for this phase?**

**What kind of difficulties and the related solution?**

During the solution design phase, we need to get support from Oracle and IBM Company. Our team have measured the software and hardware of our company then had meeting to discuss if we need to update the equipement or not.

The difficulty of the phase was the specific plan of installing the new system. For this problem, our team tried to evaluate our old software, and tried to find the right version of software and hardware for the requirement of the new system.

**In deployment management phase, what are the key success factors for this phase? What kind of difficulties and the related solution?**

When importing the ERP 3.0 system, the project team have to balance the new system with old system, which because the several old applications still be used in different department. Meanwhile, our project team start to arrange some training

of new system usage for the end-users of different departments. Also the team members started to test the new system and fixed the problems.

The difficulty of this phase our team faced was how to make an efficient training of the end-users. We have made different training plan, and choose the better one, if it did not work well, we tried to change another plan.

**In production usage and evaluation phase, what are the key success factors for this phase? What kind of difficulties and the related solution?**

During this phase, our team had to complete the whole importing process. The team needed to fix all of the problems that they met. Also need to complete the whole information transition from old system to the new one. And still need to continue the training. At the same time tried to get the feedback of the new system experience from the end-users.

In this phase, the team members found that they still met the problems about the new system usage, which because the end-users were still not familiar with the new system, and sometimes made operation mistakes. For this problem, the solution of our team was continue to train the end-users.