



FACULTY OF ENGINEERING AND SUSTAINABLE DEVELOPMENT
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Materials management of Chinese SMEs in processing industry

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Abstract

The purpose of this thesis is going to investigate the main problems regarding materials management of Chinese SMEs in processing industry, and then analyze the reasons that cause these problems through the questionnaire survey and interview in order to find out the effective approach to improve material management. Based on the feedbacks of the questionnaire survey and case study, this thesis has identified some problems regarding materials management: Chinese SMEs in processing industry encode the materials while warehousing; the applications of ERP and ABC classification are not extensive in Chinese SMEs; Material quality could not be guaranteed; Chinese SMEs pay less attention to stocktaking and most SMEs in China perform stocktaking once a year or after project finished; High costs of materials management in Chinese SMEs. High inventory, wrong encoding, ineffective quality control and a wide range of materials are four weaknesses of Chinese SMEs in materials management.

This thesis has also explored the reasons that cause the problem of materials management of Chinese SMEs in processing industry, including high inventory, wrong encoding materials, a wide range of materials, ineffective quality control and lack of management and control. Thus, it is necessary for Chinese SMEs to take effective measures to solve these problems in order to develop more efficient materials management.

In order to solve these problems, some recommendations are proposed as follows. Firstly, encoding the materials should be taken by R&D department in order to solve the problems of wrong encoding, shipping errors and receiving errors. Secondly, Chinese SMEs should apply ERP system and ABC classification for materials management. Furthermore, it is necessary for Chinese SMEs in processing industry to achieve both FAI in suppliers and warehousing inspections to control and manage the quality of materials in order to improve products quality. In addition, using common components is an effective approach for Chinese SMEs to overcome their weakness of list.

Keywords: Chinese SMEs, processing industry, materials management

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Notion

ABC: Classification Activity Based Classification

Case company: Yancheng Shangda machinery co., LTD

ERP: Enterprise resource planning

FAI: First Article Inspection

R&D department: research and development department

SMEs: Small and Medium-sized Enterprises

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1. Introduction

1.1 Background

According to Ibn-Homaid (2002), materials Management is the functions of business that are responsible for the coordination of planning, sourcing, purchasing, moving, storing and controlling materials in an optimum manner so as to provide service to the customer, at a pre-decided level at a minimum cost. The fundamental objectives of the materials management (called the famous 5 Rs of materials management) are acquisition of materials and services of the right quality, in the right quantity, at the right time, from the right source and at the right price. However, many issues identify while implementing materials management, such as high costs of materials management, incorrect bills of materials, shipping errors, receiving errors and quality problem.

As Li et al. (2009) presented, the processing industry is an integrated system, which establish in the current business. More and more companies have introduced advanced equipment, and standardized management to improve the technology of processing and product quality. However, there are some problems in the development of the aquatic processing industry, such as lack of compact industrial standards, security problems and weak industrial organization. In this thesis, the common problems and the challenges of the Chinese processing industry will be discussed by the author.

1.2 Purpose and research questions

The purpose of this thesis is to investigate the main problems regarding materials management of Chinese SMEs in processing industry, and then analyze the reasons that cause these problems through the questionnaire survey and interview. In addition, some practical recommendations would be given to improve materials management for SMEs in China. It includes two questions:

- What is the general problems regarding materials management of Chinese SMEs in processing industry?
- What is a useful process or approach to deal with these problems regarding materials management in processing industry?

2. Methodology

In order to the purpose and two research questions, there are five main methodology be used in this thesis. Because the case study is easy to understand the whole thesis for readers, the author chooses a representative company to analyze. On account of the consideration for easily case studies, the author chooses a company as the case study from my hometown in China. The following subchapters are detail research methods that are used in the thesis.

2.1 Quantitative and qualitative approach

There are three main methods for design of quantitative research, survey method, correlation method and experimental method. Survey method is an old research method. It is contributing to achieve the goal of vision. Making a plan to collect some aspects of the research object of various materials and then analysis them comprehensively to get a conclusion of the research methods. Correlation method is aim to explore the relationship between independent variable and dependent variable through the use of research methods. Experimental process refers to the manipulation of one or more than one variable, and control the environment, to measure the causal relationship between the dependent and independent variables and the research methods. Experiment process has two kind types one is natural experiment process, and the other is a laboratory experiment process.

As Feng (2008) pointed out, the quantitative research and qualitative research are two opposing social science research paradigms that are significant different in research goals, objects and methods.. First of all, the research target, quantitative and qualitative research on predictive control attaches high importance to the understanding of the meaning. Secondly, the research object, the objective reality of quantitative research emphasis on facts and emphasize object subjective intention of the qualitative research. Third, research methods, quantitative research is the focus on construction experience confirmed, and qualitative research pays attention to explain.

In order to reach the goal and answer the research questions clearly, the author chooses qualitative approach and quantitative approach together.

2.2 Literature review

Literature review helps the author familiar with the area of the existing research results about this thesis' topic, provides some reference for the research thought and research methods and makes the perspective of the research questions, the strategy and specific methods. It also provides background information to explain the research results.

The primary articles are published in scientific journals. They are found in Google Scholar through the method of keywords searching. In this thesis, literature review is the foundation of the theoretical framework to compare with case company and draw a decision.

2.3 Case selection

Xie (2009) indicates that the case study is a research method by using the historical data, documents, interview, observation and other methods to collect data, and then using reliable technology to analyze the data for making general conclusions. Case study can be divided into normative case studies and empirical case study. Normative case study should include study design, data collection, and data analysis and research report. The criteria of case selection are related to research objects and research questions. It determines what kind of property can bring meaningful data for case study.

The author chooses a company called A (because of the requirement for anonymity) for case study because it is a general SMEs in processing industry and the author have access to this company for interview and data collection.

2.4 Interview

Table 2.1 Basic information of meetings

	Meeting 1	Meeting 2	Meeting 3	Meeting 4
The position of interviewees	Head of enterprise	Administrative manager	Procurement manager	Storekeeper
The number of interviewees	1	1	1	2
Methods of interview	Face-to-face communication	Face-to-face communication	Face-to-face communication	Face-to-face communication
Time of interview	2 hours	1 hour	1 hour	1 hour/person
Abstract of interview	General information & The materials management in SCM	Materials management in the process of executive decision	Materials management in the process of purchasing	Materials management in the process of storage

According to Kvale (1987), the results of an interview study must be validated in a concrete situation. A meeting should be held before the thesis starts. The manager of the case company was contacted directly because the company is in the author's hometown. Thus, face-to-face interview would be better than other methods. More than two meetings were arranged during the visits, and the interviewees are the head

of the company, an administrative manager, a procurement manager and two storekeepers. Table 2.1 introduces the basic information of the meetings.

2.5 Questionnaire

Questionnaire survey is one of the most effective quantitative research methods and the questions are developed according to the objectives research. The main benefits of questionnaire survey could be explained as follows. Firstly, the researchers could collect the appropriate data about the research topic. Furthermore, questionnaire survey would make the data comparable and amenable to analyze (Ferguson, 1994). Moreover, questionnaire survey could reduce the bias of the respondents through larger sample size based on the structured questions. Thus, questionnaire survey will be worth to investigate the main problems regarding to the material management of Chinese SMEs in processing industry. The reasons that cause these problems would also be analyzed. The participants would be requested to response on the questions in the questionnaires.

The questionnaire would be designed to collected regarding to the basic participants' information (e.g. old, gender and education) and the problems of materials management of Chinese SMEs in processing industry. The information could only be collected from the companies themselves. About 120 questionnaires have been sent to the potential respondents selected randomly from Chinese SMEs in processing industry through email and field trip. First of all, the questionnaires were sent to some Chinese SMEs in processing industry randomly through E-mail, and then the author got the results. The data collected from the questionnaire survey would be calculated and analyzed by Excel. The results of the feedbacks of the respondents from Chinese SMEs would be presented in the forms of the tables and figures in order to compare the frequency of each answer clearly.

2.6 Research quality

In the section of methodology, the discussion on the research quality in terms of reliability and validity should be included. Morse et al. (2008) argue that reliability and validity remain appropriate concepts for attaining rigor in qualitative research.

According to Messick (1990), *Validity is an integrated evaluative judgment of the degree to which empirical evidence and theoretical rationales support the adequacy and appropriateness of interpretations and actions based on test scores or other modes of assessment.* Validity is a unitary concept; it requires both empirical evidence and theoretical rationale. In this thesis, author chooses a representative enterprise for case study, and interviews for employees in different positions. The interviewees are participating in the material management, so the information from them is valuable. Considering from the structure, author uses the scientific methods in the whole thesis.

The author chooses the companies for questionnaire survey randomly, so this study exists some limitations. At the same time, the author tries to minimize the errors on data collection and calculation, so the research is reliable.

3. Theoretical framework

In this chapter, theoretical framework would be set up to achieve the objectives of this study. In addition, this chapter would introduce some terms and definitions related to materials management, including supply chain and material management.

3.1 Supply chain

Over the past few decades, some scholars and management professionals have explored to define supply chain accurately. Ballou (2004) defined supply chain as the flow of products and services in terms of space and time. Ellram (1991) and Christopher (1998) defined supply chain as *“the processes and activities, the network of many upstream and downstream organizations that are involved bringing products or services to end users considering constraints of cost and time”*. Thus, the activities of supply chain management include inbound and outbound logistics, materials management, storing, transportation and distribution.

3.2 Materials management

According to Dey (2001), the costs for materials are around 60% of the product in most industries. Many evidences have been found that inefficient materials management would lead to high costs and low productivity. Thus, it is very necessary to take effective actions to manage materials in order to reduce costs and improve productivity. The main objectives of materials management are to buy at the lowest price, maintain a low inventory, maintain continuity of supply, develop reliable alternate sources of supply, minimize the overall cost of acquisition, develop and maintain good supplier relationships, achieve a high degree of cooperation and coordination with user departments. The fundamental objectives of the materials management (called the famous 5 Rs of materials management) are acquisition of materials and services of the right quality, in the right quantity, at the right time, from the right source and at the right price. However, some issues have been identified while performing materials management, such as high cost, incorrect bills of materials, shipping errors, receiving errors and quality problem.

In order to improve the efficiency and accuracy of materials management and reduce costs, many models and tools are proposed, such ERP system and ABC classification method. ERP is business management software that allows an organization to use a system of integrated applications to manage the business. Tarantilis et al. (2008) developed a web-based ERP system for materials management and it is a cost-effective and high efficient way to manage materials. Kelle and Akbulut (2005) found that ERP system plays a crucial role for material management in information sharing, cooperation and cost optimization.

3.3 ABC classification

According to Wei (2009), ABC classification system is to group items according to annual sales in an attempt to identify the small number of items that will account for most of the sales and they are the most important elements to control for effective inventory management. ABC classification process is to group items into three categories: A - outstandingly important; B - average importance; C - relatively unimportant as a basis for a control scheme. Each category should be handled in a different way with more attention to category A category, less to B and C category. ABC classification helps to manage the entire volume and assign relative priority to right category. However, B & C Categories might be neglected, a pile in huge stocks, susceptible to loss, pilferage and slackness in record control.

3.4 Inventory costs

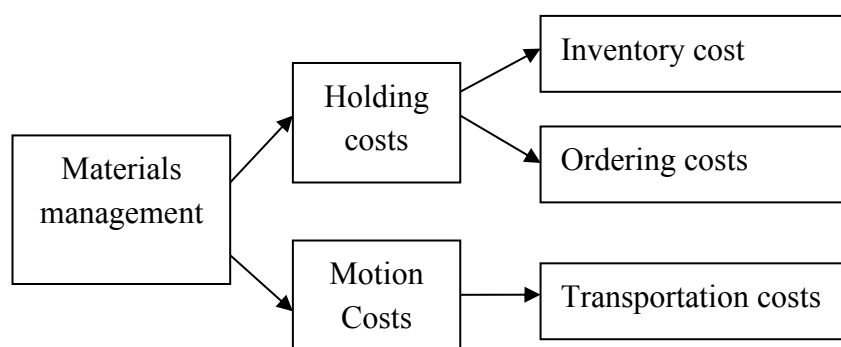


Figure 3.1 Material management costs in terms of time and space

In terms of time and space, materials management costs can be divided into two parts: holding cost and motion cost (Zhang, 2012). As shown in figure 3.1, holding cost can be divided into inventory cost and ordering cost, and motion cost also called transportation cost. Chopra and Meindl (2007) found that transportation costs are around four percent of the total cost for most products. Thus, the companies should not only focus on reducing transportation costs to reduce the costs of materials management.

3.5 SWOT Analysis

According to Bradford (2000), SWOT analysis is also famous as environmental analysis. It is presented by a professor of management at the University of San Francisco in the early 1980s. As shown in figure 3.2, SWOT represent internal factors that can be classified as **S**trength or **W**eakness, and the external factors that can be classified as **O**pportunity and **T**hreat.

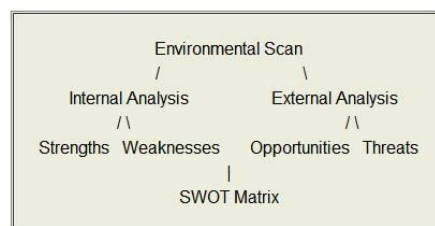


Figure 3.2 SWOT Matrix

4. Findings

This chapter will analyze the data collected from the questionnaire survey. The main problems regarding materials management of Chinese SMEs in processing industry would be investigated and the reasons would be analyzed. In addition, a case study would be conducted to achieve a deep understanding on the problems regarding materials management of Chinese SMEs in processing industry and figure out how to deal with them.

4.1 The profile of participants

Table 4.1 The summary of demographic profile of participants

Demographic profile	The participants and percentage (n = 80)	
Gender		
Male	32	40%
Female	48	60%
Age		
Under 22	4	5%
22-28 years	17	21.25%
29- 36 years	25	31.25%
37-40 years	16	20%
over 41 years	18	22.5%
Education		
High school	45	56.25%
Bachelors	29	36.25%
Master and above	6	7.5%

About 120 questionnaires are sent to the potential respondents selected randomly from Chinese SMEs in processing industry. 80 questionnaires are returned and effective. As shown in table 4.1, 40% of the respondents are male, and 60% of them are female. Thus, most employees in materials management are female. Regarding the respondents' age, 5% participants are below 22 years old; 21.25 percent (22 - 28 years old); 31.25% (29 - 36 years old); 20% (37- 40 years old) and 22.5% (above 41 years old). In addition, around 43% of the participants have the experience of higher education and 7.5% of them have a master degree.

According to the feedbacks of the questionnaire survey, 48% participants 5-10 years

working experience in the field of materials management as shown in figure 4.1 and about 18% respondents have more than ten years working experience.

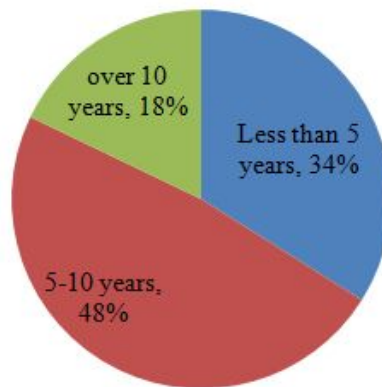


Figure 4.1 Working experiences of the participants

4.2 Findings

4.2.1 Most firms encode the materials while warehousing

Regarding the question when the materials are encoded, most participants (47.5%) indicated that their companies would give the materials codes while accepting the materials for warehousing. 24 companies would encode the materials while placing the orders for purchase, 12 companies encode the materials after received orders from customers and 2 companies encode the material while delivering to workshop. Only 4 firms choose to encode the materials during the stage of design.

Table 4.2 The feedbacks on when the materials are encoded

Encode the materials	Frequency	Percentage
Receive the orders from the customers	12	15.00%
Place orders for purchase	24	30.00%
Accept the materials for warehousing	38	47.50%
Deliver to workshop	2	2.50%
During the stage of design	4	5.00%

4.2.2 ABC classification and ERP system

According to the analysis, ABC classification and ERP system are very helpful for materials management. Based on the results of the questionnaire survey, 70% companies do not use ABC classification to manage the materials as shown in figure 4.2. In addition, only 24% companies have implemented EPR system to manage materials.

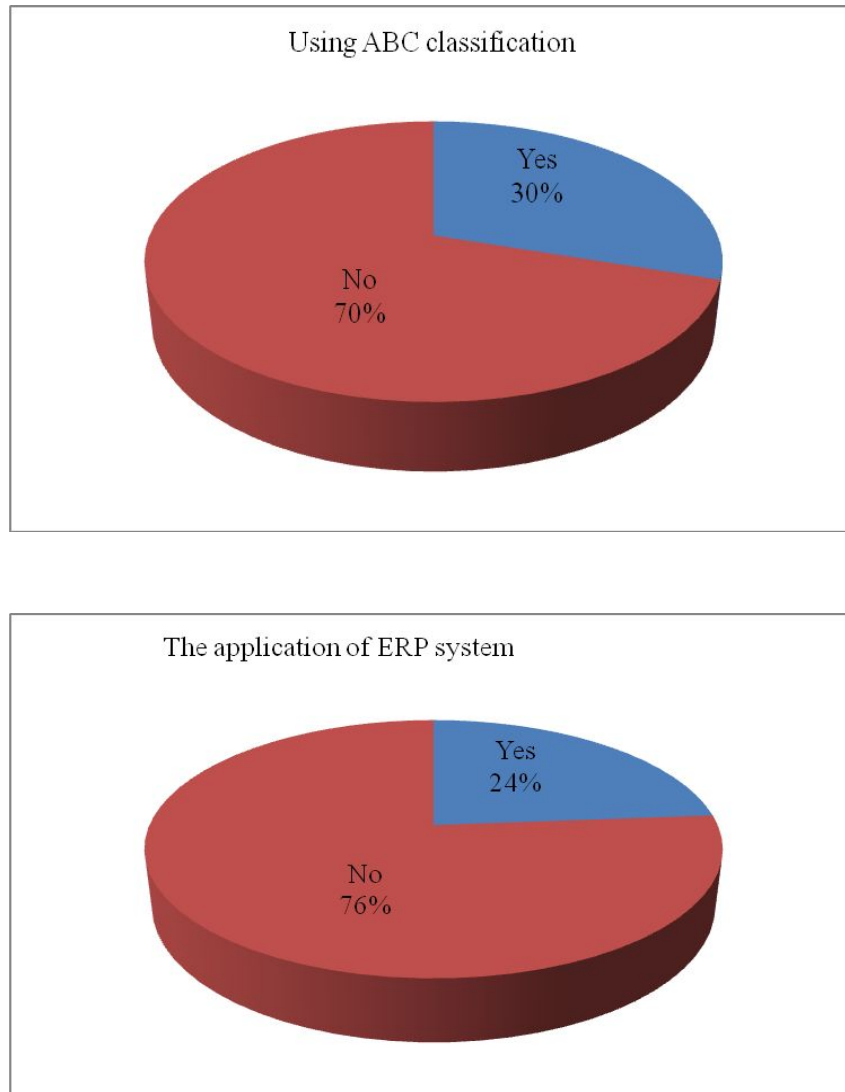


Figure 4.2 The feedbacks on whether ABC classification or ERP system is used to manage material

4.2.3 Manage and control the quality of materials

Regarding the management and control of the quality of materials, 43.75% companies would inspect the quality of materials while warehousing and 15 companies have implemented FAI in suppliers to control material quality as shown in table 4.3. Only 17.5% companies used both FAI and warehousing inspection to manage and control material quality. In addition, 16 companies chose to inspect material quality in workshop.

Table 4.3 The feedbacks on materials management and quality control

Give the materials codes	Frequency	Percentage
FAI (First Article Inspection) in suppliers	15	18.75%
Warehousing inspection	35	43.75%
Both FAI and warehousing inspection	14	17.50%
Check in workshop	16	20.00%

4.2.4 How often does your company implement stocktaking?

Regarding the cycle of stocktaking, 24 companies would implement stocktaking once a year and 23 enterprises would like to implement stocktaking after project finished as shown in figure 4.3. 7 enterprises do it once a month and 19 enterprises do it once a quarter. In addition, 5 enterprises never implement stocktaking.

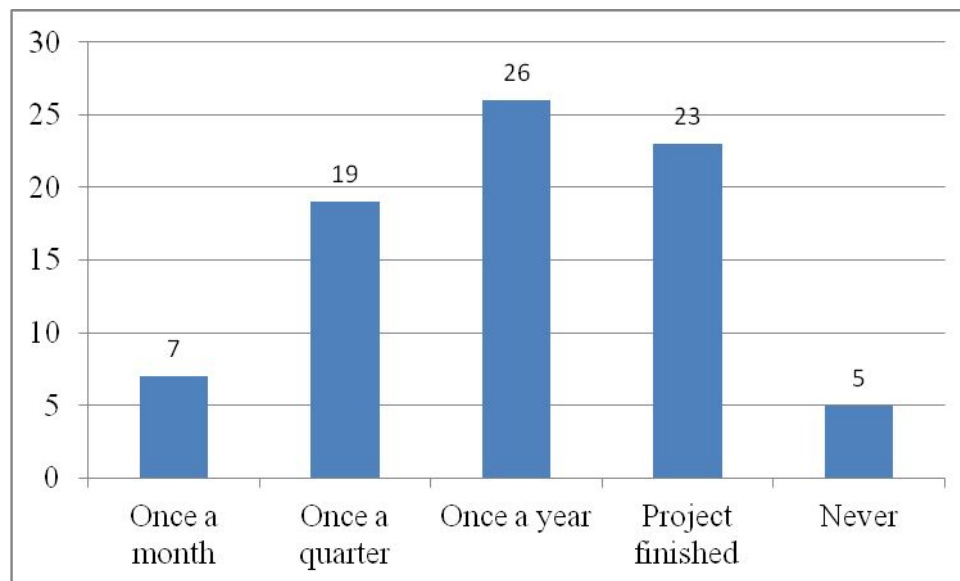


Figure 4.3 The feedbacks on the cycle of stocktaking

4.2.5 The problems regarding materials management in

Chinese SMEs

According to the feedbacks of the questionnaire survey, 62 participants held that the companies have the problem of high costs in materials management as shown in table 4.4. More than half of the participants point out that the main problems regarding materials management in Chinese SMEs are quality and incorrect bills of material. In

addition, 40% participants claim that the main problem of materials management is shipping errors and 17.5% participants chose receiving an error as the main concern.

Table 4.4 Problems of materials management In Chinese SMEs

Problems of materials management	Frequency	Percentage
High costs of materials management	62	77.50%
Incorrect bills of materials	43	53.75%
Shipping errors	32	40.00%
Receiving errors	14	17.50%
Quality problem	41	51.25%

4.2.6 The reasons for the problems regarding materials management in Chinese SMEs

Table 4.5 Reasons for the problems on materials management in Chinese SMEs

Reasons	Frequency	Percentage
High inventory	65	81.25%
Wrong encoding	39	48.75%
Be lack of management and control	15	18.75%
Ineffective quality control	34	42.50%
A wide range of materials	33	41.25%

Based on the responses of the participants, most participants (81.25%) held that the main reason for the problems of materials management in Chinese SMEs is high inventory. High inventory could cause a lot of problems, such as high store cost and high management costs. 48.75% participants pointed out that wrong encoding might be another reason for the problems regarding materials management because wrong encoding would cause the problems of ordering error, shipping error and receiving error. A wide range of materials (41.25%) and ineffective quality control (42.5%) might be another two reasons caused the problems of materials management. In

addition, 15 participants claimed that material management is lack of management and control in Chinese SMEs.

4.3 Case study

In order to achieve a deep understanding on the problems and reasons of materials management in Chinese SMEs, face-to-face interview is used to investigate the situation of materials management in a small Chinese enterprise. The case company is Yancheng Shangda machinery co., LTD, and it locates in Jiangsu Province. The interviewees are general manager, an administrative manager, a procurement manager and two storekeepers in case company and the company focuses on producing railway parts in processing industry.

General Manager introduced the process of managing materials. Firstly, R&D department is in charge for designing the products according to the requirements of the customers, writing processing instruction and making bills of materials with codes. Purchase department would place the orders based on bills of materials and codes and organize FAI. After FAI approved, the suppliers could produce in batch and deliver to warehouse. Quality department and store department would inspect the materials and warehousing if qualified. Store department would deliver the materials to the workshop for production according to production schedule.

An administrative manager is asked about the application of ABC classification and ERP system. The manager said that the company has ever considered applying ABC classification and ERP system for materials management. However, the proposal was given up finally. He explained that the management of the company understood the benefits of ABC classification and ERP system. However, the employees refused to use because they could not understand these methods or systems and they prefer traditional manual methods to manage materials. This manager also said that the management is also figuring out how to persuade the employees to use ABC classification and ERP system, such as providing training.

A procurement manager and two storekeepers are asked about the problems related to materials management and how to deal with these problems. They said that the main problem of materials management is control inventory and reduce the costs because the demands of customers are uncertainty. Thus, they made great efforts to forecast the demands of customers and the supply of materials in order to reduce inventory. On the other hand, R&D department has attempted to use common components for multi products because using common components is one of the most effective approaches to reduce inventory through decreasing the types of materials in processing industry. Procurement manager also shared a report of costs comparison of before and after components commonality as shown in table 5.1. Procurement

manager estimated that the inventory has decreased around 20% due to using common components. In addition, two storekeepers said that the issue of wrong encoding has been solved after R&D department is in charge of encoding materials during the stage of design.

Table 4.6 Costs comparison of before and after component commonality

	Before component commonality			After component commonality		
Item	Inventory	Price (Thousand Yuan)	Total cost	Inventory (Thousand Yuan)	Price (Thousand Yuan)	Total cost (Thousand Yuan)
Wheel A	12	50	600	16	60	960
Wheel B	12	50	600			
Brake A	10	30	300	24	35	840
Brake B	10	30	300			
Brake C	10	30	300			
Springs A	15	20	300	30	25	750
Springs B	15	20	300			
Springs C	15	20	300			
Axle A	30	15	450	60	16	960
Axle B	30	15	450			
Axle C	30	15	450			
Transportation costs			18			14
Storage costs			18			14
Inventory moving costs			6			5
Overhead costs			5			4
Total costs			4,397			3,547

5. Analysis and discussion

5.1 Encode the materials is too late

Based on the feedbacks of the questionnaire survey, few companies would like to encode the materials during the stage of design. They usually encode the materials while accepting the materials for warehousing (47.5%), placing orders for purchase (30%). Thus, it is too late to encode the materials for Chinese SMEs in processing industry. Chatfield, Harrison and Hayya (2009) pointed out that almost all activities of materials management are associated with the codes of materials. The purchase department would place the orders by using material codes according to demands of production. The suppliers would deliver their parts or materials with the codes to the warehouse, and the warehouse would classify the materials and send them to workshop based the codes. The workshop usually processes the products according to the codes in design files. Thus, it is important to ensure that the codes of materials are consistent with purchase orders, technical files and warehouse files. Some researchers hold that the codes of materials could be given during mass production (Hu et al., 2013). However, Musa, Gunasekaran and Yusuf (2014) pointed out that the companies should encode the materials during the stage of design and the reasons are explained as follows. Firstly, encoding the materials during the stage of design would be helpful to ensure the traceability of materials, which is helpful to manage all materials during next stages, such as purchase, production, inventory, selling, customer service and spare parts. What's more, encoding the materials during the stage of design could ensure the unique code for every material, which would be helpful for mass production and inventory management.

5.2 The applications of ERP and ABC classification are not extensive in Chinese SMEs

Based on the results of the questionnaire survey, 70% companies do not use ABC classification to manage the materials and only 24% companies have implemented EPR system to manage materials. Thus, the applications of ERP and ABC classification are not popular in Chinese SMEs. Yu (2011) pointed out the companies should apply new technologies or tools for assisting business operation because they have great positive impacts on organizational performance. However, most SMEs in China would like to hire more employees instead of applying new technologies, due to the limitation of money, such as ERP system or SAP. The main concern is to save money. Kelle and Akbulut (2005) found that ERP plays an important role in sharing information, cooperation and cost optimization for supply chain, which would be helpful for the companies to gain more long-term profits. Thus, it is not wise for the companies to save money instead of applying new technologies. What's more, they did not realize the potential of ERP system in improve working efficiency and

accuracy of materials management. In addition, some employees worked in material management hold that ABC classification is extra works for them, and they are not willing to use it.

5.3 Material quality could not be guaranteed

According to the responses of the questionnaire survey, more than half of the companies inspect the quality of materials while warehousing or in the workshop. Thus, the quality of materials could not be guaranteed in Chinese SMEs. With the development of the economy, the customers become pay more attention on product quality (Chatfield, Harrison and Hayya, 2009). Great quality of materials is the basis of good product quality. Kaynak and Hartley (2008) pointed out that the companies in process industry should not only pay close attention on their own quality of products and services, the quality of their suppliers and subcontractors should also be controlled. Kaynak and Hartley (2008) also pointed out that the companies should review the procedure of quality control in material management. What's more, the main suppliers should be involved in the procedure in order to improve material quality. Overall, Chinese SMEs should figure how to ensure the quality of materials from the perspective of quality control and material management.

5.4 Chinese SMEs pay less attention on stocktaking

According to the feedbacks of the survey, most small and medium-size enterprises in China implement stocktaking once a year or after project finished. Thus, these SMEs could not know how many the materials in the stock accurately. Chow, Duh and Xiao (2006) pointed out that the companies should check the inventory periodically in order to know how many components in the stock and which materials should be returned to the suppliers after project finished. What's more, retaining large amounts of unsold stock or nonconforming materials would take up a lot of unnecessary storage space, which will increase store costs (Yu, 2011).

5.5 High costs of materials management in Chinese SMEs

According to the feedbacks of the questionnaire survey, 77.50% participants pointed out that the main problem regarding materials management in Chinese SMEs is high costs for materials management. Chinese SMEs used to store enough materials in the warehouse in order to meet the demand of production and consumers. All materials stored in the warehouse are associated with the costs, including store costs, moving costs and opportunity costs. Zhang (2012) claimed that the costs of materials management could be divided into two main categories: holding costs and motion costs. From the perspective of holding, more inventories of raw material, parts and finished goods would increase the costs of materials management (Germain et al., 2008). On the contrary, the costs of materials management would increase if the

inventory is not enough to meet the demand of customers' needs and manufacturing demands. Thus, Chinese SMEs should investigate the situation of materials management and take effective actions to reduce the costs of materials management in order to improve its competition ability.

5.6 Main weaknesses of Chinese SMEs in materials management

High inventory (81.25%), wrong encoding (48.75%), ineffective quality control (42.5%) and a wide range of materials (41.25%) are four weaknesses of Chinese SMEs in materials management. Firstly, high inventory would cause a series of problems related to materials management, such as increasing store space and cost, transportation costs (Zhang, 2012). Many Japanese companies implemented Just-in-time strategy to lower its inventory, which has helped them achieve competitive advantage in the global market. Secondly, wrong encoding might cause the problems of ordering error, shipping error and receiving error. These errors would have high negative impact on organizational productivity (Germain et al., 2008). A wide range of materials is another weakness of Chinese SMEs, which is also associated with inventory. It is inevitable to increase inventory while increasing the types of materials. Thus, Chinese SMEs should figure out how to reduce the types of materials in order to further reduce inventory. In addition, ineffective quality control is one more weakness of Chinese SMEs.

6. Conclusions and recommendations

6.1 Conclusions

This thesis investigated the main problems regarding materials management of Chinese SMEs in processing industry and analyzed the reasons that cause these problems through the questionnaire survey and interview.

Based on the feedbacks of the questionnaire survey and case study, this thesis identified some problems regarding materials management. Firstly, Chinese SMEs in processing industry encode the materials while warehousing. Furthermore, the applications of ERP and ABC classification are not popular in Chinese SMEs. What's more, material quality could not be guaranteed. In addition, Chinese SMEs pay less attention on stocktaking and most SMEs in China implement stocktaking once a year or after project finished. In addition, materials management costs are too high in Chinese SMEs because of high inventory, wrong encoding, ineffective quality control and a wide range of materials. Regarding the purpose of this thesis, the SWOT analysis is not appropriate. Thus, the author did not use this method in this thesis. This study also explored the reasons that cause the problem of materials management of Chinese SMEs in processing industry, including high inventory, wrong encoding materials, a wide range of materials, ineffective quality control and lack of management and control. Thus, it is necessary for Chinese SMEs to take effective measures to solve these problems in order to improve materials management.

In summary, the conclusion could be reached that Chinese SMEs in processing industry should pay close attention on improving materials management in order to achieve competitive advantage in domestic and global market. Despite the fact that by using the questionnaires and interview to investigate the main problems regarding materials management of Chinese SMEs in processing industry, it might be hard to assume that the findings of this study would be effective for all Chinese SMEs in processing industry because of the changes of business environment and organizational characteristics. In addition, it is difficult for this study to reach larger sample size. Thus, future efforts could be made to investigate the main problems regarding materials management of Chinese SMEs by involving larger sample size and interviewing more participants, which might conclude more precise and valuable results.

6.2 Recommendations

6.2.1 Encode the materials during the stage of design

According to the results of the questionnaire, encoding the materials should be finished before placing orders for purchase. Thus, encoding the materials should be

conducted before placed orders. It is very important for Chinese small and medium-size enterprises in processing industry to encode the materials during the stage of design because other departments could promote products, place order for purchase and warehousing according to the codes in design drawings and files.

6.2.2 Apply ERP system and ABC classification for materials management

According to the study in section 3, ERP system is very helpful for materials management in terms of improving working efficiency and reducing errors. Based on ERP system, all departments in a company could work on the same platform, such as design, purchase, stocktaking and shipping. Thus, small and medium sized enterprises in China should implement EPR system for materials management. In addition, SMEs in China should also apply ABC analysis for materials management.

6.2.3 Implement FAI and warehousing inspection to manage material quality

Nowadays, more and more companies are paying close attention on quality control in order to achieve competitive advantage in the market. An effective action is to start to manage and control the quality of materials from the suppliers. According to the survey, only 18.75% companies have implemented FAI in suppliers to control material quality. Thus, it is necessary for Chinese SMEs in processing industry to implement both FAI in suppliers and warehousing inspections to control and manage the quality of materials in order to improve products quality.

6.2.4 Taking effective actions to overcome the weaknesses in materials management

Based on the survey and face-to-face interview, using common components is an effective approach for Chinese SMEs to overcome their weakness of inventory. Thus, these SMEs should consider designing common components during the stage of design. With the common components, the types of materials could be decreased efficiently and the costs of supply chain could also be reduced. In addition, encoding the materials should be taken by R&D department in order to solve the problems of wrong encoding, shipping errors and receiving errors.

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Appendix: Questionnaire and feedback

Dear Sir/Madam

You were selected to participate in the survey regarding the situation of materials management in Chinese small and medium-sized processing enterprises. The aim of this survey is to investigate the problems regarding materials management in Chinese small and medium-sized processing enterprises in order to take appropriate actions to solve them. I appreciate if you could take some time to fill in this questionnaire.

Thank you for your kind assistance.

Regards,

Name

PART A: DEMOGRAPHIC INFORMATION

1. **Your age:** _____
2. **Your gender:** ☐ Male / ☐ Female
3. **Your educational level** (please circle):
High School / Bachelor's Degree / Master's Degree and above
4. **Years of working experience related to materials management:** _____
(Years)

PART B: The questionnaire and feedback

1. When would your company give the materials codes?

- (1) Receive the orders from the customers (12)
- (2) Place orders for purchase (24)
- (3) Accept the materials for warehousing (38)
- (4) Deliver to workshop (2)
- (5) Others: Encode the materials during the stage of design (4)

2. Does your company use ABC classification to manage material?

- (1) Yes (24)
- (2) No (56)

3. Does your company use ERP system to manage material?

- (1) Yes (19)
- (2) No (61)

How does your company manage and control the quality of materials?

- (1) FAI (First Article Inspection) in suppliers (15)
- (2) Warehousing inspection (35)

- (3) Both FAI and warehousing inspection (14)
- (4) Others: Check in workshop (16)

4. How often does your company implement stocktaking?

- (1) Once a month (7)
- (2) Once a quarter (19)
- (3) Once a year (26)
- (4) Project finished (23)
- (5) Never (5)

**5. What kinds of problems regarding materials management in your company?
(More options)**

- (1) High costs of materials management (62)
- (2) Incorrect bills of materials (43)
- (3) Shipping errors (32)
- (4) Receiving errors (14)
- (5) Quality problem (41)
- (6) Others

6. What are the main reasons for these problems? (More options)

- (1) Wrong encoding (39)
- (2) High inventory (65)
- (3) Be lack of management and control (15)
- (4) Ineffective quality control (34)
- (5) A wide range of materials (33)
- (6) Others

7. Interview questions for case study

- (1) How does your company manage materials?
- (2) Does your company use ABC classification to manage material? Why?
- (3) Does your company use ERP system to manage material? Why?
- (4) Are there any problems related to materials management?
- (5) How does your company deal with these problems?