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Development Direction of China's Railway Warehousing Industry

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Abstract

With the rapid development of the railway and industrial enterprise in China, the current warehousing industry can no longer meet the demands of the rapid development of high-speed railways and help to complete rail transportation network. Compared with the China's economic development scale, high speed and large social needs, the warehousing industry is obviously lagged behind for the hardware environment of Warehouse is relatively backward and the personal quality of warehouse staffs is mostly incompetent.

This paper through field investigation, using quantitative, qualitative, interviews and other methods to collect data, in-depth details learn about the status of a Chinese railway industry electrical equipment factory production, operation and storage facilities, personnel, security and management, etc aspects. The author also using SWOT analysis method to analyze the warehouse status, the purpose is to find the company's strengths and weaknesses in the railway industry and modern logistics industry. In the opportunities and threats, the author through the analysis and study, think that the company should be improved their personnel quality, storage hardware, software, layout and regulations. In the railway system, the author puts forward effective prevent factors development of railway and warehousing industry is state-owned enterprise system, enterprise burden is heavy, poor cash flow.

Through the research the above issues, the author will put forward own correspondent solutions. The purpose is to make the enterprise warehousing become more comprehensive, professional. The railway warehousing is not only innovation their management concepts, as well as to discuss and study their information technology, personnel quality, and other value-added services. Especially for the integration of existing resources, the railway warehousing needs to operate the advanced management idea to enhance the competitiveness.

The key words: Railway enterprises, warehousing industry, prevent factors

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1. Introduction

1.1 Background

Facing fierce competition in the domestic logistics industry, the railroad industry enterprises should make a lot of improvements which include making warehousing management transformation to develop into the modern logistics enterprises and implementing warehouse management modernization, to enhance its competitiveness and develop into a new economic growth point.

The rapid development of the logistics system demands an equipotent warehousing operations. However, with the development of the railway warehouse industry in China, the warehousing industry currently can't meet the needs of the rapid development of high-speed rail and is not competent to complete rail transportation network. Compared with the scale of China's economic rapid development and large social needs, the development of warehousing industry is obvious lagged behind. The problems are: the warehouse hardware and IT system are relatively backward; the skills of the warehouse personnel are mostly incompetent and a large amount of warehouses with an irregular distribution within the country. Therefore, to achieve the sound development of railway industry, we must pay sufficient attention to the development of the warehousing industry and make it geared to international standards.

With the important role warehousing industries play in the world, warehouse are discussed and described in many literature works. Mason et al¹ had ever written that how to integrate warehousing and transportation functions of the supply chain. Based on the increased global visibility provided by an integrated system, the total cost benefits can be obtained by suppliers and warehouses. Bowen² described that if the places change, it may affect the function of the warehousing. Bowersox et al³ said that the warehouse plays a very important role in the whole transfer process of products from the origin to the end-user.

¹ Mason et al, 2003.

² Bowen et al, 2008.

³ Bowersox et al, 1996.

1.2 Purpose

The purpose of this thesis is to investigate how railway warehousing industry in China can become successful.

Research questions

- What kinds of qualities do companies need to make them become successful in warehousing industry?
- If the management knows what to do, then what is it that prevents the effective development occurs?
- What are the demands that Chinese Railways need to meet to make the necessary changes to become a modern logistics company in warehousing industry?

1.3 Structure of the thesis

The paper is divided into six chapters, they are listed as follows:

- The first chapter, Introduction /Research Background

This part focuses on making an analysis about the development status of the modern railway warehousing industry in China and accordingly put forward the relative research questions.

- The second chapter, Research methods

This part focuses on what kind of methods this article use in its analysis.

- The third chapter, Theoretical framework

This part describes some of the theoretical basis used in this article.

- The fourth chapter, Case study

This part Introduce the general situation of the company, service condition and present situation of the warehouse.

- The fifth chapter, Analysis and Discussion

The author will give the answer to the above research questions through corresponding analysis to solve the company's shortcomings and deficiencies and raise some recommendations and suggestions.

- The sixth chapter, Conclusions

Make a Summary about this thesis.

- The seventh chapter, Further research

The companies can how to do in the further.

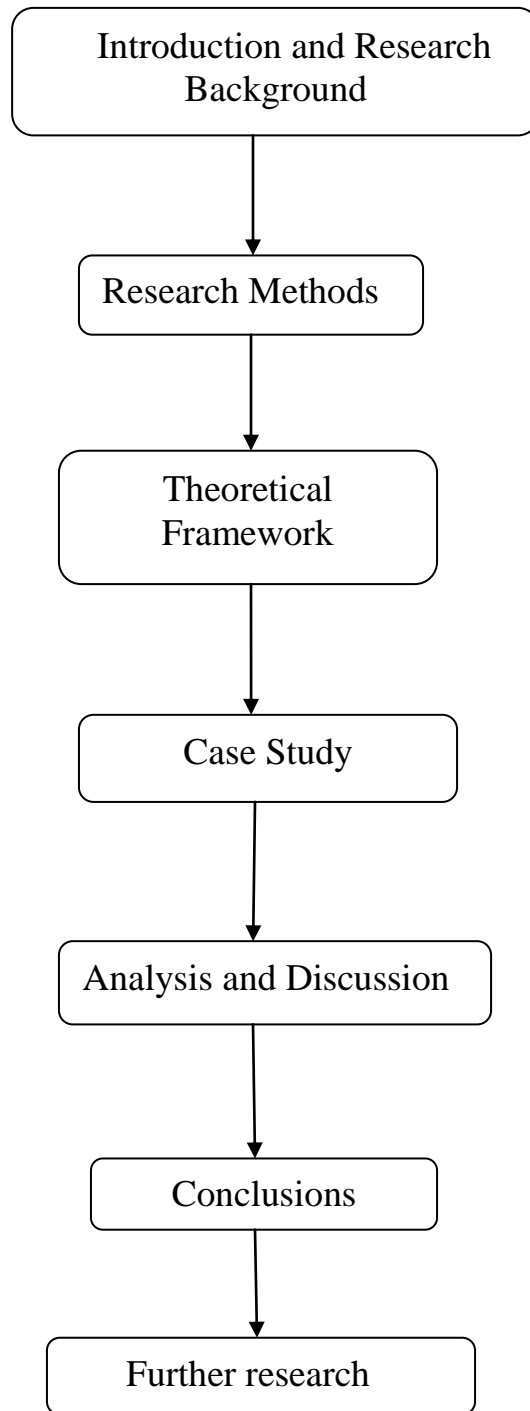


Figure 1: The structure of thesis

2. Research methods

2.1 Introduction

Before introducing the research methods, the author needs to find the objectives of three research questions:

1) What kinds of qualities do companies need to make them become successful in warehousing industry?

For the first research question, the author needs to learn how to define the successful companies and need to describe the character of warehousing.

In order to solve this question, the author needs to study some articles about successful companies within warehousing by searching for their data and relative literatures. The author collects empirical data when working in railway warehousing company, and learns the situation of warehousing industry.

2) If the management knows what to do, then what is it that prevents the effective development of the companies?

To answer this question, we need to learn the causes which prevent the effective development of the company.

To solve this question, the author has made interview and investigation with people who work in the warehousing industry. Based on this information obtained from the interviewers, the author has found out reasons that prevent the effective development of the companies.

3) What are the demands that Chinese Railways need to meet to make the necessary changes to become a modern logistics company in warehousing industry?

To solve this question, we need to know what the definition of modern logistics is. What's more, we also need to learn the characteristics of railway. In addition, the necessary changes of Chinese railway are also the important part that we need to learn. Therefore, the relative literatures play an important role in the study. Through relevant articles or other resources, the author can describe the definition of modern logistics. Besides, the author also gathers the interviews information and analyzes them and makes some suggestions about the necessary changes and requirements a modern logistics company need to make in warehousing industry.

2.2 Research approach

Research approach is a general term for all the methods used in every stage of the study. Research approaches can be divided into three parts: quantitative research, qualitative research and mixed method⁴.

2.2.1 Qualitative research

Qualitative research is a method; it is often used to explore the problem, understanding the event phenomenon, analysis of human behavior and views, as well as answer questions.

JOHN W. CRESWELL defined the approach:

*Qualitative approach is one in which the inquirer often makes knowledge claims based primarily on constructivist perspectives or advocacy/participatory perspectives or both. It also uses strategies of inquiry such as narratives, phenomenology, ethnographies, grounded theory studies, or case studies. The researcher collects open-ended, emerging data with the primary intent of developing themes from the data*⁵.

The purpose of qualitative research is to find out “why”. Its aim is to get the meaning, feeling and describe the situation⁶. Qualitative research approaches collect data through observations, interviews, and document analysis and summarize the findings primarily through narrative or verbal means⁷. Despite the qualitative research process is very convenient, but it still has some limitations⁸:

- Due to small sample size, so the views of the interviewee cannot stand for the public views.
- For the results of qualitative research analysis, its accuracy depends largely on the researchers’ professional abilities and experiences.

2.2.2 Quantitative research

Quantitative research: it determines scientific research provisions of certain amount matters.

Bryman states that ‘*Quantitative methodology is routinely depicted as an approach to the conduct of social research which applies a natural science*’⁹.

⁴ Creswell, 2008.

⁵ Creswell, 2008.

⁶ Rajasekar et al, 2006.

⁷ Lodico et al, 2006.

⁸ Qualitative research limitations, Assess date: 2012-05-30.

⁹ Bryman, 1984.

JOHN W. CRESWELL defined it as followed:

*A quantitative approach is one in which the investigatory primarily uses postpositive claims for developing knowledge, employs strategies of inquiry such as experiments and surveys, and collect data on predetermined instruments that yield statistics data*¹⁰.

Quantitative research is presented by "how many". Contrasted by qualitative research, Quantitative research analysis is based on objective data and needs lots of samples; therefore the information it obtained is very comprehensive.

However, there are differences between quantitative research and qualitative research. Bryman¹¹ lists three characteristics of them:

	Quantitative research	Qualitative research
Orientation	uses a deductive approach to test theories	uses an inductive approach to generate theories
Epistemology	It based on a positive approach& inherent in the natural sciences	It rejects to rely on demonstration got from social reality and individual interpretation
Ontology	Social object is regarded as objective fact.	Constructionist is seen as a constantly-shifting product of a concept in social reality.

Table 1: *Different characteristics between quantitative research and qualitative research*

Above all, although data of quantitative research analysis is very rigorous, however, In the process of quantitative research, it also contains some qualitative research. Thus, it can not only to precisely ensure the accuracy of the sample, but also can improve the efficiency of the survey.

Comparing two methods, the author chooses the qualitative research in this thesis. Through operating this research method, the author interviews the company's main leaders. It can not only help the company to make a better discover on the problems in the warehousing industry of the railway company and find a reasonable solution, it but also can help the company further develop the warehousing and promote the development of the company 's production and operation.

¹⁰ Creswell, 2008.

¹¹ Bryman, 2004.

2.3 Data collection

Data collection is the process of the collection and measurement of variable information, the way to create a system to answer the research question, test hypotheses, and evaluate the results¹². It is can be done by obtaining their permission to study their position obligation, asking people questions, observing their behaviors¹³ and gathering relative information. According to Walliman¹⁴, collect data divided two parts: collecting secondary and collecting primary data.

2.3.1 Collecting primary data

Collecting primary data refers to collecting first-hand information from the original source, according to the purpose of the research.

- Interview

Interview is one of flexibility types to collect primary data for it can be done anywhere, such as workplace, train, restaurant, what's more, it can be done by telephone, E- mail and video.

The author choose face-to-face interview to collect data. Always, before taking personal interview, the author needs to prepare some questions, and make an interview outline. During the interview, the author can use some of the interview equipments such as voice recorder or camera which can guarantee the integrity of information obtained during the interview.

In this thesis, the author interviews the manager of case company as mainly way to collect information. During the holiday, the author collects empirical data when she working with case company, so the author has the honor to interview the manager and learn the warehousing industry situation.

According to the research questions, the author will interview by several aspects, for example warehouse management departments and responsibilities, key warehouse management systems, warehousing personnel quantity, culture degree, etc. By understanding the basic situation of the case study, to find the advantages and disadvantages of the company in warehousing, thus put forward the suggestions for improvement.

The interview questions will be finding in Appendix.

¹² Data collection, Access data: 2013-03-10.

¹³ Creswell, 2010.

¹⁴ Walliman, 2005.

- Observation

Walliman¹⁵ states that observation is an approach that through non-inquisitorial involving the researchers that recording conditions, events and activities. Walliam¹⁶ also thinks that records of events, situations or things experienced with own senses and perhaps with the help of an instrument, e.g. camera, tape recorder, microscope, etc.

In this thesis, the author used the tape recorder to record the interviewee's answers and sorted out as primary data.

2.3.2 Collecting secondary data

Secondary data-----data that have previously been gathered by someone other than the researcher or for some other purpose than the research project at hand¹⁷. Hearst et al¹⁸ think the '*secondary data in research are data which have not been collected with a specific research purpose*'.

According to SØRENSEN et al¹⁹ article, they think the main advantage of using secondary data sources is that '*they already exist; the time spent on the study is therefore likely to be considerably less than the time spent on studies that use primary data collection*'. Secondary data can contribute to formulate the means of expression of the questions, specifying the way of survey and supplying the relative data which can help to solve the problem.

In this thesis, the secondary data mainly come from:

- Search and read relevant articles and books

The author will find and read some scientific journals articles about successful companies within warehousing, and read some relevant books about warehousing to search some information.

- Through some internal to find some articles to learn more relevant knowledge to solve.

The author will use some databases like Science direct, Google etc scholars and find some scientific journals articles to search some warehousing information.

¹⁵ Walliman, 2005.

¹⁶ Walliman, 2011.

¹⁷ Secondary data, Access date: 2012-07-12.

¹⁸ Hearst et al, 1988.

¹⁹ SØRENSEN et al, 1996.

2.4 The application of data-collection methods in research questions

1) What kinds of qualities do companies need to make them become successful in warehousing industry?

In order to solve this problem, the data is the very necessary component, especially the secondary data. Consequently, the author needs to consult some relevant articles, collect books from library and surf the internet websites.

2) If the management knows what to do, then what is it that prevents the effective development of the companies?

To find out the factors that prevents the effective development of the companies, the author need correspondent public documents. By reading and making summary about other authors' articles, the author has found the reasons which affect the development of the company. Besides interviewing the managers and workers to, the author also chooses the approach of primary data to discuss the question.

3) What are the demands that Chinese Railways need to meet to make the necessary changes to become a modern logistics company in warehousing industry?

For this question, it is necessary to use the secondary data. Through making summary about other authors' views, the author has found out the requirements of Chinese railway. Having read lots of articles and books and combined with the literature reviews, the author can find out the definition of modern logistics and learn the knowledge about necessary changes a modern logistics company should make in warehousing industry.

2.5 Research strategies

Research strategies-----The scientific approach chose to answer a research question²⁰. According to Walliam²¹, the different types of research are commonly divided into five categories: experimental, survey, archival analysis, historical and case study.

²⁰ Research Strategies and Validity, Assess date: 2012-05-30.

²¹ Walliman, 2005.

Case study means the deeply exploration of a program, event, activity, a process, or more single individuals by the researcher. The cases are bounded by time and activity. And the thorough information and kinds of data-collection procedure will be collected and used by the researchers over a sustained period of time²².

More formally, Yin²³ defined case study as:

“A case study is an empirical inquiry that investigates a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon and context are not clearly evident.”

In the Figure 2, it contains a list of eleven characteristics of case studies summarized from other authors.

1. Phenomenon is examined in a natural setting.
2. Data are collected by multiple means.
3. One or few entities (person, group, or organization) are examined.
4. The complexity of the unit is studied intensively.
5. Case studies are more suitable for the exploration, classification and hypothesis development stages of the knowledge building process; the investigator should have a receptive attitude towards exploration.
6. No experimental controls or manipulation are involved.
7. The investigator may not specify the set of independent and dependent variables in advance.
8. The results derived depend heavily on the integrative powers of the investigator.
9. Changes in site selection and data collection methods could take place as the investigator develops new hypotheses.
10. Case research is useful in the study of “why” and “how” questions because these deal with operational links to be traced over time rather than with frequency or incidence.
11. The focus is on contemporary events.

Figure 2: *Key Characteristics of Case Studies*²⁴

Eisenhardt²⁵ concluded that the case study is useful in early stages of research on a topic or when a fresh perspective is needed. Based on these views, in this thesis, the author chooses one company named Zhengzhou Railway Bureau Electric Works Equipment Factory as a case to analysis its warehousing successful place. By interviewing major manager of the manager to learn the warehousing situation and try to get more information of warehousing industry. Through the research, the author

²² Stake, 1995.

²³ Yin, 2002.

²⁴ Benbasat et al, 1987.

²⁵ Eisenhardt, 1989.

hopes to further understand the development of warehousing industry, and thus to solve the research questions.

2.6 Validity, Reliability and Generalizability

Reliability, validity and generalizability are perhaps the most important aspects of a research methodology²⁶.

Validity is fundamental principles of the empirical evidence and theories of an integrated evaluative judgment, supporting the deduction which is based on the test scores or other modes of assessment and adequacy and appropriateness of inferences and actions²⁷. In Moskal et al²⁸ article, the American Educational Research Association²⁹ et al stated the validity as *'the degree to which the evidence supports that these interpretations are correct and that the manner in which the interpretations are used is appropriate'*.

Reliability refers to the uniformity of scores and answers provided by an instrument. Kirk et al³⁰ define reliability as *'the degree to which the finding is independent of accidental circumstances of the research'*.

Hitchcock et al³¹ state that the generalizability is *'the process by which a particular set of observations and findings can be applied to a much larger set of circumstances or population'*. Bassey³² also state that *'A generalisation is a statement which collates evidence of particular events, and extrapolates that evidence to predict the occurrence of similar events'*.

In order to increase the reliability of this thesis, the author through two aspects to show: First, the author uses several methods of data collection, for example, literature review, network, etc to ensure the reliability of the information. Next, the authors also collected data through interviews. For the interview, the respondents are Zhengzhou Railway Bureau Electric Works Equipment Factory employees and manager that are all working in the warehouse department.

In addition, Zhengzhou Railway Bureau Electrical Equipment Factory is under the jurisdiction of Zhengzhou Railway Bureau, and it long-term provision of equipments and productions for the railway sector. Therefore, the company still has certain

²⁶ Reliability, Validity, Generalizability of Research, Access date: 2013-05-30.

²⁷ Messick, 1993.

²⁸ Moskal et al, 2000.

²⁹ American Educational Research Association, 1999.

³⁰ Kirk, 1988.

³¹ Hitchcock et al, 1989.

³² Bassey, 1990.

generalizability. Moreover, the company's information is validity and reliable. Furthermore, the company's own production equipment, so there also have some advantages in warehousing field.

2.7 SWOT analysis

The other method used for analysis warehousing in company is a SWOT analysis approach, which was developed in the 1960s, has been used recently within the context of many private and public organizations³³.

SWOT analysis, *is a strategic planning tool used to evaluate the strengths, weaknesses, opportunities, and threats involved in a project or in a business venture.*³⁴ The purpose of the SWOT analysis is to maximize the strengths and opportunities, minimize external threats, make the threats turned into strengths and seize opportunities with reduced internal weaknesses and external threats.³⁵

SWOT analysis is often presented in a matrix form:



Figure 3: *SWOT analysis*³⁶

³³ Jackson et al, 2003; Dyson, 2004.

³⁴ Arslan et al, 2008.

³⁵ Saaty, 1987.

³⁶ SWOT analysis, Access date: 2013-03-12.

1) Strengths

Strengths refer to core competitiveness of the enterprises which surpass ahead of the competitions; it can help enterprise to achieve their goals. Strengths involve a wide range, and from products to manage all these factors can become business advantages³⁷.

It includes³⁸:

- *Are there any unique or distinct advantages that make your organization stand out in the crowd?*
- *What makes the customers choose your organization over the competitions?*
- *Are there any products or services in which your competition cannot imitate (Now and in the future)?*

2) Weakness

Weakness refers to the missing characteristics or relative disadvantage conditions of the company.

It includes³⁹:

- *Are there any operations or procedures that can be more rational?*
- *What makes your competitors do better than your company? Why?*
- *Is there any attention to which your organization should pay?*
- *As to the competitiveness of your company, is there a certain market segment left for you to conquer?*

3) Opportunities⁴⁰

Another major factor is the external chances to make greater sales or profits in the environment. Weihrich⁴¹ thinks the opportunities are everywhere, including changes in technology, government policy, social patterns, etc.

- *What are the attractive opportunities within the field of your company?*
- *Is there any new emerging trend within the market?*
- *What is the prediction of your organization in the future that helps to seize new opportunities?*

³⁷ Zhang, 2007.

³⁸ Weihrich, 1982.

³⁹ Weihrich, 1982.

⁴⁰ Weihrich, 1982.

⁴¹ Weihrich, 1982.

4) Threats⁴²

No one likes to think about threats despite the fact that they are external factors that are out of control and could cause trouble for the business; it still has to face them⁴³. It is vital for the company to prepare for the threats even during turbulent situations.

- *What is your inferior position of competitive force which suppresses the development of your company?*
- *Are there any changes in consumer demand, which call for new requirements of your products and services?*
- *Is the technological changes threatening the position of your organization in the market?*

In this thesis, SWOT Analysis was used as a method to analyze the warehousing situation from case and determine the strategies according to the SWOT factors. By analyzing the enterprise's strengths, weaknesses, opportunities and threats which could help the company make the scientific and reasonable decisions. It may also help enterprises to develop healthily.

⁴² Weihrich, 1982.

⁴³ Weihrich, 1982.

3. Theoretical framework

3.1 Introduction

In this part, the author has searched and read many articles which are relevant to the topic. The author wants to organize the framework according to the research questions. Based on the research questions, we should make clear that the definition of warehousing, modern logistics and other knowledge. We also need to learn the successful companies in warehousing field, and learn the factors that prevent the effective development of the company. The author needs to learn the characteristics of Chinese railway. Therefore, the main purpose of this part is to summarize the views of other authors in their articles.

3.2 Basic concepts

3.2.1 Warehousing

In Kisperaka-Moron's⁴⁴ article, the Bowerson et al⁴⁵ states that '*Warehousing plays a very important role in all transfers of products from the place of origin to ultimate users*'. Warehousing refers to the goods, store and library activities which use storage warehouse and related facilities. Warehousing is an emerging technique for the retrieval and integration of data which is come from the distributed, autonomous and possibly-heterogeneous information sources⁴⁶. Frazelle⁴⁷ is also said the warehouse is an important link in the modern supply chain and it plays a crucial role in the success or in the failure of one enterprise.

According to Lambert et al.⁴⁸, the significance of warehousing is reflected in: achieving transportation economies, supporting the policy of company's customer service, offering the temporary storage of the materials, supplying advises whether the goods be disposed or recycled, fulfilling the constant conditions of the changing and uncertain market, completing the total logistics cost and meeting the expectations of customers about the services, etc.

⁴⁴ Kisperska-Moron, 1999.

⁴⁵ Bowersox et al, 1996

⁴⁶ Yue et al, 1995.

⁴⁷ Frazelle, 2002a.

⁴⁸ Lambert et al, 1998.

There are some definitions about warehouse:

Waters⁴⁹ proposes a definition, “*warehouse is any location where stocks of material are held on their journey through supply chains.*”

In Grundey et al⁵⁰ article, Minalga⁵¹ describes that “*warehousing, in a narrow sense, has a function---- time covered between materials in stock and materials in demand*”.

The other celebrity, Urbonas⁵² proposes that “*warehousing is the interception and storage of goods in an assigned area*”.

Židonis⁵³ defines that “*warehousing is a connecting link between producers and customers and is an integrated part of logistics system*”.

Baker et al⁵⁴ states that “*warehouse is one link in the supply chain and plays a vital role in the success or in the failure of the company.*”

3.2.2 Modern logistics management

Logistic play an important role in the supply chain management.⁵⁵ The Council of Supply Chain Management Professionals⁵⁶ defines logistics management as “*It is part of Supply Chain Management that plans, implements, and controls the efficient, effective frontal and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption to meet customers’ requirements.*”

The distinction between modern logistics and traditional logistics is that modern logistics is conducted with the support of computer network, technology, and it is also equipped with advanced management techniques, it’s no longer the originally isolated logistics. And the warehousing, distribution, transportation and other sectors are closely linked to form a complete logistics chain⁵⁷.

Liu⁵⁸ stated that the integration of production, sales, storage, and after-sales of modern logistics supply chain management can help the enterprise get an overall flexible management which can largely improve the competitiveness of enterprises.

⁴⁹ Waters, 2003.

⁵⁰ Grundey et al.2007.

⁵¹ Minalga, 2001.

⁵² Urbonas, 2004.

⁵³ Židonis, 2002.

⁵⁴ Baker et al, 2007.

⁵⁵ Stank et al, 2005.

⁵⁶ Council of Supply Chain Management Professionals, 2007.

⁵⁷ Gan et al, 2010.

⁵⁸ Liu, 2011.

3.3 Management technology in modern warehousing industry

This part mainly introduces the present in warehousing and distribution field is widely and mature used advanced logistics technology.

3.3.1 Barcode

Barcode, in history, has ever been used as a key data-entry access to detailed product information look-up table in the database⁵⁹. It is the most common system for the automatic object identification. It consists of bar codes and bar-code readers. Bar codes, with different thickness and gaps, are printed as a series of vertical lines and are attached to the identified object⁶⁰.

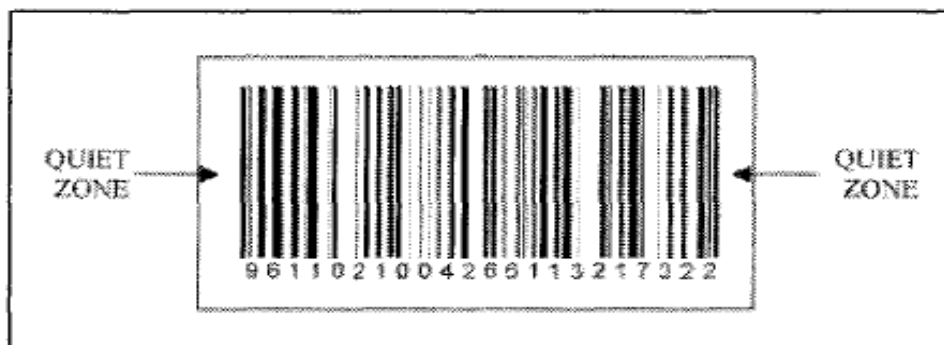


Figure 4: Bar code⁶¹

The barcode refers to an information recording form. The goods with the same specifications and the same production are corresponded with the same product code. Conversely, the same products with the different specifications use a separately different product code.

Manthou et al⁶² mention that: "*barcode is used for improving the accuracy of information and speed of data transmission.*"

Barcode is one of the most economical and practical automated identification technologies. By scanning the barcode, the enterprise will be able to grasp and enter into separate commodities and get to know the origin, manufacturer, product date, prices and other information within seconds⁶³. Barcodes can identify products at transition points such as shipping, receiving, or checkout and it is inexpensive, ubiquitous and, in principle, very accurate⁶⁴.

⁵⁹ Billo et al, 1996.

⁶⁰ Jonsson, 2008.

⁶¹ Porter et al, 2004.

⁶² Manthou et al, 2001.

⁶³ Zhu et al, 2011.

⁶⁴ McFarlane et al, 2003.

Trunk⁶⁵ said that at the present time, the warehousing and distribution services greatly rely on the barcode system to keep track of their inventory and to ensure the efficient flow of the stock-in and stock-out of their products of the warehouse. Therefore, the barcode is checked in promptly with high accuracy and reliability, etc. characteristics of the barcode is widely used in warehousing industry.

3.3.2. RFID

Kim et al⁶⁶ states the RFID: "*Radio Frequency Identification (RFID) is a data collection and storage technology that uses radio waves to automatically identify products within a given range.*"

Angeles⁶⁷ describes that: "*The RFID technology has most notably been identified as a tool that has the capability of increasing the visibility of materials in a context of supply-chain.*"

RFID is short for Radio Frequency Identification and is exactly the same with barcode which is also a form of automatic identification of products, packages, parcels, cargo carriers, etc⁶⁸.

There are three parts of RFID-----Tag, Reader and Antenna. RFID system uses radio waves for automated identification of the objects. The Information is stored in a microchip in an RFID tag or in RFID transponders which are affixed to the reader. The reader could convert the radio waves from the RFID tag into a formal one which can be relayed to a computer for further processing⁶⁹.

⁶⁵ Trunk, 1994.

⁶⁶ Kim et al, 2010.

⁶⁷ Angeles et al, 2005.

⁶⁸ RFID, Access date: 2012-07-25.

⁶⁹ Jonsson, 2008.

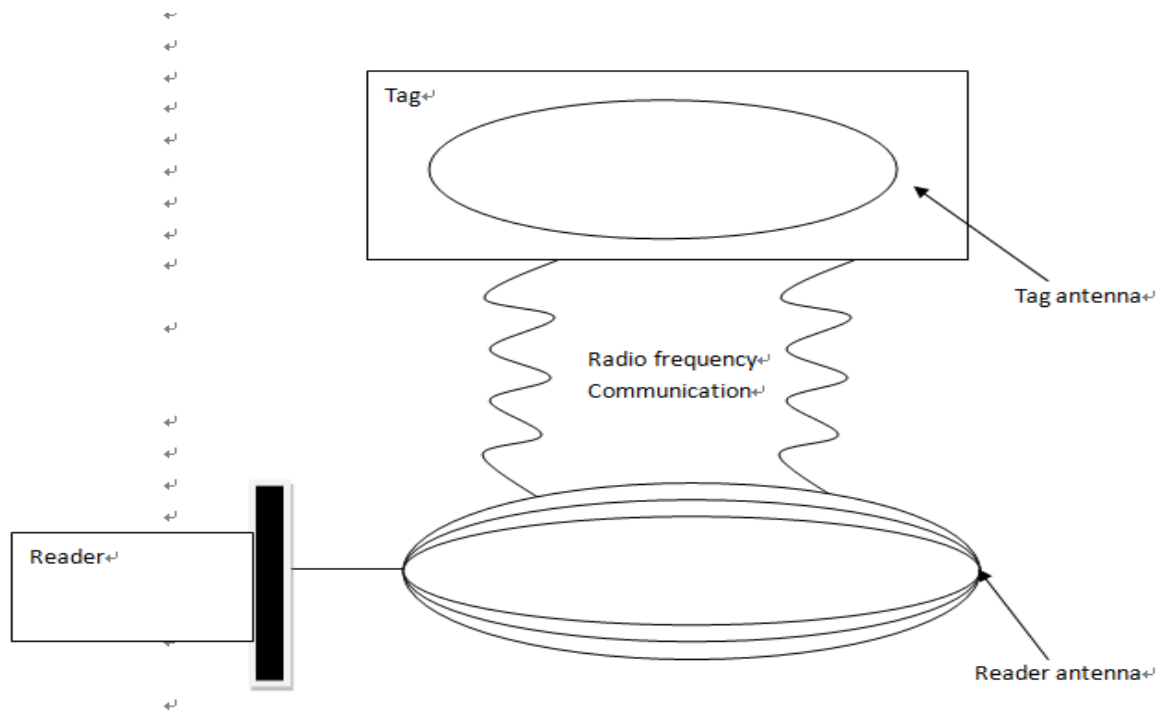


Figure 5: *Principles of communication between an RFID reader and tag*⁷⁰

RFID automatic identification, as a new technology, has a large potential market. However, RFID has a large range of applications, and plays an important role in logistics management, warehousing management distribution management and vehicle management, etc. RFID can identify, trace and track information throughout the supply chain⁷¹.

It is considered that RFID can bring many benefits to supply chain management, including reduction of contraction, the efficiency of material-handling, the increase of product availability and the improvement of asset management⁷².

3.3.3 WMS

WMS refers to Warehouse Management System.

Shiau et al⁷³ state that: "A warehouse management system (WMS) is a database which drives computer application and is used by logistics personnel to improve the efficiency of the warehouse by directing cutaways and to maintain accurate inventory by recording warehouse transactions."

⁷⁰ Jonsson, 2008.

⁷¹ Zhu et al, 2012.

⁷² Angeles, 2005; Li et al, 2006; Taghaboni-Dutta et al, 2006.

⁷³ Shiau et al, 2010.

Warehouse management system is a key part in the supply chain, and primarily the function of WMS is to control the movement and storage of materials within a warehouse, including goods-receiving, storage, stocktaking and goods-picking⁷⁴.

In the modern society, warehouse management has become diversified. By using the WMS system, it not only can help companies control all aspects of the warehousing industry management, but also can improve the implementation of standardized requirements, including the receiving, shipping, replenishment of the goods, etc.

The operation of WMS system can be used without RFID, barcode, computer application and other technology support. All these techniques have formed a complete warehouse management system, which can better improve the work efficiency of the company and help to make the best use of information.

3.4 Research question 1

To get the answer that how to achieve “success” in warehousing industry, it should get to know the current situation of railway warehouse firstly.

There are showing that current situation and existing problems in railway warehouse industries:

- Under the influence of long-term fiscal system, the railway warehouse industry has formed a management system which mainly based on department management. Among all the transportation enterprises in China, the railway industry is the unique one that no clear line existed between the functions of the government and enterprise and in the mean time it has both the management function and the operational function. Under such circumstances, a lot of material supply centers which at the same time possess the management function are born, they are both the administrative units of the material supply and operation units of materials, thus a lot of drawbacks are difficult to solve.
- The construction level and management level of railway warehouse industry, including its pre-planning and the layout settings, is still very low. Because of geographical restrictions, a lot of storage building of the railway enterprises are built around the railway with the transportation is very inconvenient. What’s worse, the quality of warehouse housings is relatively inferior, which go against the storage and transport of materials and equipments.

⁷⁴ Liu, 2010.

Learning about the current situations, then it needs to know the factors which prevent the successful development of the companies. In order to meet the requirements of success, it needs to answer the following three questions⁷⁵:

1. *What is the science of warehousing?*
2. *What are the rules of the warehousing game?*
3. *What are the warehouses paradigms in which we believe?*

The requirements of success are listed as follow⁷⁶:

Customers

Customer-oriented --- successful companies divide up the market, and determine the main objective of service⁷⁷. Successful companies usually establish a competitive advantage by their products or services for customers.

The productions of the company satisfy the demands of customers which will make the company successful.

Professionalism

One of the warehousing requirements of success is that the companies need to have professionalism. Tompkins⁷⁸ states that '*warehousing will be viewed as a critical logistics step and a competitive strength and not as a necessary evil*'.

For a profession as important as warehousing, it needs more scientific approach, staffs, hardware and software managements to warehousing must be taken.

Staffs

In Song's⁷⁹ article, she thinks how to create an efficient, lean, harmonious staff team; it is that each leader must think about. Since warehousing industry professional strong, much link processes, which requires warehousing staffs have the appropriate knowledge and necessary skills.

Based on Wang's⁸⁰ article, he summarized some points of qualities of staffs.

- 1) The staffs should have certain culture knowledge.

As an administrator, they often have to write, calculate, mark, symbol recognition in the work. However, some computer management is not easy to operate, from a

⁷⁵ Tompkins, 1998.

⁷⁶ Tompkins, 1998.

⁷⁷ Hooley et al, 1986; Hansen et al, 1990.

⁷⁸ Tompkins, 1998.

⁷⁹ Song, 2011.

⁸⁰ Wang, 2008.

development point of view; the warehouse administrator should have a high school education.

2) The staffs should have certain professional knowledge.

Administrators need to be familiar variety of materials performance, use, storage and maintenance methods, in order to do a good job for the storage of goods inspection.

3) The staffs need to have good occupation moral.

If warehouse personnel want to establish a good occupation morality, the most basic is that management personnel must love their jobs, and secondly, they need to be kind to the users.

Measurement

Other warehousing requirement of success is measurement. Tompkins⁸¹ states that *‘warehousing standards will be established, performance will be measured against these standards and timely actions will be taken to overcome and deviations’*.

A good company must establish some warehousing standards to ensure that the relevant departments warehousing and personnel can work effectively⁸².

Leadership

Kirkpatrick and Locke⁸³ state that:

“Leaders do not have to be great men or women by being intellectual geniuses or omniscient prophets to success, but they do need to have the ‘right stuff’ and this stuff is not equally present in all people. Leadership is a demanding unrelenting job with enormous pressures and grave responsibilities. It would be a profound disservice to leaders to suggest that they are ordinary people who happened to be in the right place at the right time.”

A good leader can bring help to the staffs and bring hope to the company. Therefore, a good leader plays an important role in almost any company.

These requirements of success may then be used as a foundation upon which to assess the status of one's warehouse operations⁸⁴.

⁸¹ Tompkins, 1998.

⁸² Zhu et al, 2011.

⁸³ Kirkpatrick et al, 1991.

⁸⁴ Tompkins et al, 1998.

3.5 Research question 2

In support of national policy, the warehousing industry has achieved certain results. However, there is still having several barriers affect the development of the warehousing industry.

According to Carter et al⁸⁵ article, they states that three barriers of warehousing.

- **Hard to find appropriate warehouse locations**

In Wu et al⁸⁶ article, they pointed that strict land management policies to make warehousing enterprises access to land more difficult, if they want to develop warehouse, they need to pay a high cost to obtain land. Most of the warehouses in the city are being pulled down, and the company couldn't acquisition of land alone, so they have to move to the 'logistics park'. However, most of the logistics park land price is too high to make a lot of enterprises cannot afford, which cause the land idle. It makes the enterprise is very difficult to buy suitable place to build warehouses⁸⁷.

- **Lack of warehousing facilities**

According to Wilding et al⁸⁸ article, they stated that companies are often faced with lack of appropriate facilities and special requirements. This situation is very common in china. Due to the limited capacity of the warehousing industry investment, for the dramatic growth of the warehousing requirements, the company will face the situation that shortage of new warehouses, the delivery vehicles and infrastructure, etc⁸⁹.

However, due to the lack of automation of high-end storage facilities, most of the warehouses are manual operation.

- **Lack of warehousing services except storage**

Based on Goh et al⁹⁰ article, they thought most warehouses can be used only for general storage purposes. As warehousing market is not standardized, competitive inequality, leading most enterprise warehouses have lower economic benefits and long-term losses. In this way warehousing development has gradually lagged behind, it only be used storage products⁹¹.

⁸⁵ Carter et al, 1997.

⁸⁶ Wu et al, 2011.

⁸⁷ Warehousing situation, Access date: 2013-3-20.

⁸⁸ Wilding et al, 2004.

⁸⁹ Wu et al, 2011.

⁹⁰ Goh et al, 2003.

⁹¹ Zhu et al,2011.

There also some other reasons which affect the development of the management:

- **Lack of the management system and regulations:**

For a long time, the management systems of China's industry sector is seriously split, which restricts the development of Chinese warehousing industry. Due to the lack of a clear standard management system now, there is no one clear definition for warehousing. Moreover, Wu et al⁹² thought that sense of legal concept of warehousing managerial staff is not strong, and couldn't use the legal means to protect the interests of enterprises.

- **Unreasonable layout**

Tompkins⁹³ states that '*facility layout is integral to successful performance in all operational areas*'. However, most of the warehousing industries choose some relatively developed areas as their sites of buildings which lead to the unreasonable layout of these industries and in turn result in the insufficiency of function of some warehouses in other areas.

- **Lack of technology:**

*A variety of technical considerations can affect the choice of architecture---the ability to integrate metadata; scalability in terms of the number of users, volume of data, and query performance; the ability to maintain historical data; and the ability to adapt to technical changes, such as in source systems*⁹⁴. However, nowadays, the technical level of the storage industry in China is still relatively low and the means of transportation is still very traditional. These elements, to a large extent, have affected the development of the warehousing industries.

- **Low level of education and shortage of talents:**

Developments of the warehousing industry, the companies are not only needed to master certain professional and technical personnel, they also need operational personnel and warehouse management personnel⁹⁵. However, there are aspects of talent is very scarce in China. If the companies in warehousing industry want to develop in a much higher level, the education level of the staffs must be improved. In addition, Warehousing industry not only requires operational staffs but also need administrative staffs⁹⁶. In the aspect of education the staffs should not only possess a theoretical

⁹² Wu et al, 2011.

⁹³ Tompkins, 1998.

⁹⁴ Watson et al, 2005.

⁹⁵ Wu et al, 2011.

⁹⁶ Hunag, 2010.

foundation but also have certain experiences. Only this, the development of the warehousing industry much step into a higher level.

3.6 Research Question 3

In this part, it needs to learn the characteristics of the China railway:

- 1) Appeared on the surface, China's railway transport prices are very cheap. However, since the railway system is lack of point- to - point functionality, making rail transport has produced two short-distance transportation costs.

The reasons are listed below:

- a) Due to the inflexibility of rail transport, in order to avoid the touchdown of the goods and avoid secondary handling cargo transshipment, the freight cars have to wait for a long time.
 - b) Despite the time of transport distance and transport of transit vehicles are extremely short, but the vehicle owners still charge the goods owners in accordance with the once-transport price, and what's more, they add twice additional handling fees. This situation makes the railway freight business has lost its price advantages in short-haul markets. Moreover, compared with highways, railways don't have the flexible advantages. Shippers have to consume more energy and manpower costs to transact business. Along with the damage caused by twice handing of goods, all these factors have hampered the development of rail freight business.
- 2) In recent years, with the development of China's highway, it not only improves vehicle transport efficiency, but also the fuel consumption of road transport has been reduced by the vehicle large-scale development. In the mean time, the human cost of road transport (driver costs) has been reduced. With the development of the logistics industry, improvement of social informatization level and reduction of the probability of the vehicle to return empty, the resource utilization efficiency of the road transport has improved a lot.

A series of efforts from both external environment and the industry itself has laid a solid foundation for the decrease of operating costs of road transport. Despite the goods price and oil prices continue rise, the road transports could consume the cost itself within its field by its peculiar development, and it can still be able to maintain its lower transportation price still, profiting the whole industry in the same time.

The low price of Road transport has generated a huge impact on China's railway transportation business.

- 3) In terms of China's railway warehousing industry, the main problem is the low utilization rate, unnoticeable effect, scale uncertainty and unobvious advantage during the usage of the warehouse. Besides, the warehouse space resources are left unused, especially for some enterprises with small batch and single productions, the contradiction between the unused warehouse space facilities& equipment resources and configuration repetition. Due to the companies have not implemented thorough investigation and analysis in the warehouse building and planning work, a lot of major decision-making problems existed in warehouse design and planning before construction. Furthermore, the company has not implemented the research and analysis to the necessity of the warehouse before construction, upon the completion of the construction, the company has discovered that the warehouse automation level is very minimal and utilization rate is very low during the actual operation.
- 4) On the other side, affected by railway geographical conditions and a shortage of funds restrictions, some small and medium-sized enterprises warehousing face the problems of unreasonable previous period design, small-scale investment and the low level of modernization. Moreover, these enterprises are short of knowledge to improve the warehouse operations' mechanization, automation, intensification and informatization. For these incomplete equipments, a lot of staff 's ideas still remain on the manual operation and are lack of confidence in the new automated warehouse, and they haven't put automated warehousing in an important position and thus ideologically they have given up the study and use of automated warehousing. The external factors and the current situation have changed--- the transceiver tasks, the amount of work, type of goods all have changed. However, warehousing equipments and management systems didn't follow these changes and upgrades, gradually, it began to lose the original market, leaving warehouse in a backward state.

If the companies want to change, they should focus on the combination of traditional logistics. The traditional logistics is including transportation, packaging, handling and local function. To stimulate the development the company, changes are necessary.

4. Case study

In the summer of 2011, the author went to a railway industrial enterprise which is located in Zhengzhou ---- Zhengzhou Railway Bureau Electrical Equipment Factory. The author has studied and visited there for two weeks, and has got a lot of knowledge of the enterprise production management, warehouse management, transportation of materials and product marketing strategies, etc.

4.1 *Company Overview*

Zhengzhou Railway Bureau Electrical Equipment Factory was founded in 1958. The existing staffs of the company are 105 people, 9 administrative staffs, 15 technical workers. The area of the office reach 600 square meters, and there are also 2,588 square meters of production sectors, and 960 square meters of storage place.

The company implements standard working system, eight-hour-work per day. And the main business of the company is center on railway signal communication equipments and materials. In the mean time, the company also operates electric equipments installation, disposal of waste materials, computer technology services, and housing rental as their sideline.

In March of 2005, the Chinese railway operated a new round of reform programs: repealed the railway branch and reduced management layers. Their management system has changed from the original four-level management system “Ministry of Railways - Railway Bureau - Railway Branch - Station Section” to the three-level management system “Ministry of Railways - Railway Bureau - Station paragraph”. And in some degree, it improves the organization and management performance, optimize the transport organization and improve the transport efficiency. After the adjustment of the productivity distribution, Zhengzhou Railway Bureau Electrical Equipment Factory Established is merged by four companies, including Zhengzhou Nortel Service Equipment Factory, Zhengzhou Railway Engineering Machinery Factory, Zhengzhou Huadian Technology Company, etc. It is the unique universal company which is mainly focus on the production electrical equipments under the jurisdiction of Zhengzhou Railway Bureau.



Figure 6: Zhengzhou Railway Bureau Electrical Equipment Factory

4.2. The main products of company

The company mainly chooses steel, nylon and other insulating materials as their raw materials and processes the railway-only equipments; they also conduct additional public works, traffic works, maintenance equipments and accessories as their sidelines with an annual output of 50,000 tons and the annual output value reaches 35-45 million.

There are some mainly products:

- ZPW-2000 self-closing equipment: Various steel ladle copper corrosion lead wire, resistance wire, all kinds of reflective signs, all kinds of CBG capacitor and protective cover.
- Signal equipment: signal cabinet, crossing cabinets, switch indication disc, angle steel type, tray type turnout installation device, late-model high-strength composite materials rail insulation, tapped signal varistor, cable ducts, all types of jumper, connecting wire, rod pressure shunting residual pressure tester.
- Hump products: hump automatic speed control machine, steel spring contact group, TJK2A cylinder repair and TD type fast discharge valve repair.
- Traffic security equipment: anti-running fastener, retarder, various models of turnout coupler lock devices and station wireless voice alarm.
- Software: the train safety monitoring system.
- Agent products: aluminum alloy signal mechanism, all kinds of boxes, cable connecting box, all kinds of transformers, Hill Bridge turnout and other products.

4.3 Company Organization Structure

In this company, there are two mainly departments to help company operation.

4.3.1 Management department

- ✧ Production department: factory production organization , site construction , production safety , product quality management;
- ✧ Technology Development Department : staff education , technology management , research & development and application of new products;
- ✧ Marketing department: product marketing, product sales settlement , market development, publicity ;
- ✧ Materials Department: production, purchase of engineering materials, management of products& semi-finished products& materials, warehouse management of consumables; management of mechanical-power equipment;
- ✧ Finance Department: financial management and settlement, payroll management;
- ✧ Office: logistics management, guard, attendance, vehicle management, secretary, conference organization, receipt and management of the superior files.

4.3.2 Production department

- ✧ Mechanical workshop: is located in the factory headquarters and mainly process combinations cabinet and the residual pressure tester, etc.
- ✧ Electrical workshop: is located in the factory headquarters and mainly process combinations, rheostat, capacitance, etc.
- ✧ Fitter workshop: is located in the north plant area (plant area of former Zhengzhou North railway electricity Equipment Factory) and mainly process hook lock, various types of wire ropes, Hump equipment, etc.
- ✧ Comprehensive workshop: located in the east plant area(former Zhengzhou Huadian Technology Company), mainly process all types of mounting device, rail insulation and a variety of protective covers, etc.

4.4 Research question 1

To solve this question, based on interviews the leader of the company, the author has learned that what the company should do to get success in warehousing industry.

1) Customers

Customers are very important to the development of the company. So for the company, it is an important issue to meet the demands of the customers. During the

interview, the leaders said they would do their best to meet the requirements of customers to help customers to reduce their cost.

2) Regulations

In order to solve this problem, the author interviewed the leadership of the company to understand that: the company to the stock-out materials, stock-in materials, finished and unfinished products, etc aspects has formulated regulations. He believes that formulate some of the measures regulations for warehouse staff management is very important.

➤ Administrative regulations of the materials-requisition

All production materials in the workshop principle must be applied in condition of being needed in the process of production. And the warehouse manager distributes the materials by receiving the printed production plan --"material delivery voucher", according to the production regulations. For the conditions of all kinds of materials-supplement occurred in production process, the warehouse manager can issue the bill of materials and require materials in advance. However, the applied materials should be sent back to the warehouse manager at the end of a work day.

➤ Administrative regulations of the storage of the finished and semi-finished products which are produced in the workshop.

The relevant staff who in charge of finished and semi-finished products should command the printed warehouse voucher, and then hand it to the relevant staff to transact the business of products-storage.

Warehouse manager need to transact the business of products-storage according to the "semi-finished products warehouse voucher" supplied by the workshop before the semi-finished products of the workshop entering the warehouse. For the semi-finished products which are counted the weight in the same time, warehouse administrator should mark the weight.

➤ Administrative regulations of the stock-out materials

During the stock-out of all the goods and materials, "materials delivery voucher" of each departments are needed. In principle, the goods and materials are drew in the condition of the delivery vouchers are issued (manual voucher is either potent).

➤ **Administrative regulations of the stock-in of the finished goods**

Before transacting the stock-in of the finished goods business, the staff must fill out the "arrival goods list", and then the goods should be sent and be inspected by quality inspection departments ("arrival goods list" need inspectors' signature), then check the goods according to the "arrival goods list". Until the goods all are stocked in, the warehouse manager should refill the "procurement storage lists" upon getting the "arrival goods list", and then sign and make confirmation after verification.

➤ **Administrative regulations of the stock-out of the finished goods**

No matter sales stock-out or allocation stock-out, the warehouse manager can deliver goods only on the condition of getting the relevant documents filled by the sales department. In principles, the staff must observe "deliver the goods at the sight of the bill". Delivery of the goods is strictly prohibited without getting the relevant bills and documents.

3) Warehouse productions

Warehousing business is the work with a high-technical requirement and strict organization, the requirements of the work is: timely, accurate, strict and economic. The leader said they have done well in the area of production.

There are some main production processes of railway products of Zhengzhou Railway Bureau Electrical Equipment Factory.

- **Preparation Process of the production technology**

The process includes: analysis of market research, product development and technical appraisal before production of products.

- **Production process**

The process includes: manufacturing of rough part, spare parts processing, components assembly and product assembly, commissioning, painting, spraying and packaging, etc.

- **Auxiliary production process**

It means the necessary production process which ensures the smooth operation of the production, including process equipment, design and manufacture of mold- processing, energy-supplying and equipment maintenance, etc.

- **Production services process**

It includes procurement of raw materials, transportation, storage, supply, stock-in & stock-out of the products, sales and delivery of the goods.

According to the needs of the thesis topic, we put emphasis on the study of warehousing management.

4) Professionalism of the staffs

The leader said they have a group of good staffs. The staffs treat warehouse management professional and all hold very positive attitude towards work. All these play a significant role in the development of the company.

Zhengzhou Railway Bureau Electrical Equipment Factory is company which is mainly operating the business of the production and agent distribution of railway equipments. The warehouse management work is a very important work which firstly requires the warehousing staff has a heart of love for the work. They should have a spirit of dedication, efficiency and can execute warehouse management principles, policies and laws earnestly, and has a high sense of responsibility. Besides, they should be devoted to their duty, keep honesty and self-discipline and concern for the operation of the company. What's more, they should strictly comply with the rules& regulations and work responsibility of warehouse management; they must be familiar with the characteristics of the storage materials, and strengthen themselves in daily study and learning. The warehouse personnel of the company all have the spirit of dedication for only this can do their work better with the spirit of dedication.

5) Leadership

As the Electrical Equipment Factory under the jurisdiction of Zhengzhou Railway Bureau and is the only company in the production of electrical equipments as a main national enterprise. However, due to the company operates independently; it alone is not able to support employees' bonuses and salaries according to the task of Railway Bureau. Thus, the leaders of the company need to find more ways to raise more money for their staff.

4.5 Research question 2

In order to answer this question, the author divided in two parts to study. And the author has conducted several interviews with the leaders of company to learn more.

4.5.1 External factors:

Although the company is constantly in the process of developing, there are still some factors which restrict the fast and sound development of the company.

- 1) The main reason of the low development of the company is that the company is lack of capital.

Zhengzhou Railway Bureau Electric Works Equipment Factory is the unique state-owned enterprise which is mainly produces electrical equipments under the jurisdiction of Zhengzhou Railway Bureau. However, the operation of the company is too independent. If the company wants to develop healthily and sound, it not only needs to obtain the support by Zhengzhou Railway Bureau but also need to find the sources of sponsorship for it is vital for the company.

- 2) The other reason is the company is short of some advanced management system.

On the contrary, the company is still operated by some traditional warehousing management systems.

- The company is lack of appropriate transport tools. Overall, the level of company handling mechanization is low. The transport equipment in the company is merely a car which carries and hauls goods from each separate factory, what's worse, the auxiliary equipment-- fork lift truck, only used in the processing and carrying heavy loads. The handling elevators were forbidden to use for its incomplete qualification. The company now mainly relies on the manpower and small-sized car to conduct the stock-in & stock-out business and goods-transfer business. Almost all the work is count on manual operation. And sometimes when the company is lack of manpower, they need to recruit temporary porters. With the number of staff is huge, causing the management of the staff is difficult which leads to the lower working efficiency and higher logistics costs.
- The problems also occur in unified and nonstandard signs, inaccurate materials code and materials names. Neither computer management nor professional materials management software are used in their management, making it is hard to trace products by specifications and types of the products and materials, increasing

the difficulty of work and making work efficiency inefficient⁹⁷.

4.5.2 Internal factors:

In this part, the author lists some factors which affect company developments. The first reason is lack of some advanced technologies and equipments. The Table is showing some laggard equipments of the company.

Equipment name	Types	Amounts
Shearing machine	CA11-6.3*2000A	3
Press machine	J23-16B	3
Hydraulic plate bending machine	WC67Y-63/2500	2
Ordinary lathe	L-3	15
Universal lifting platform milling machine	X62W	4
Radial drilling machine	Z30 32*8/1	3
Bow saw		2
Bench drill		15
The shaper	B6050	3
Tapping machine		2
Universal cylindrical grinder		2

Table 2: *The main equipments*

Obviously, from the table above, it can easily know that the types of these equipments are not modern. Sometimes it has to rely on manual handling.

The other reason is the staffs. Some of these staffs have incompetent knowledge of warehousing management, causing a lot of questions.

By talking with the company warehouse personnel, the author learns that the there are 5 handling the company's warehouse management work among which one professional management staffs and 4 management staffs are concurrent post. The unique professional staff among the five is a female and graduated from technology school; she had worked in the workshop for 12 years and is very experienced in the product performance, material basic knowledge and the safety operation. What's more, she has a

⁹⁷ Song et al, 2011.

very strong sense of responsibility. However, due to the cultural level, she has few financial settlement capabilities, no mention to operating the information technology management by computer.

The third reason is the layout of the company for it is also a very important factor.

- The storage layout and area division of materials, products and semi-finished products are unreasonable and the storage of the goods is very messy. There are two principal products produced in this company, however, when the needs of goods is large, there is no fixed location for the goods to store. Thus, these goods are deposited in the storage area of other products. Sometimes, the company has to use public venues to stack goods without pre-planning, resulting in the raise of difficult o f the product selection and reduction of efficiency.
- The company hasn't set the appropriate functional area. Walking through the materials warehouse of main factory, the author found the materials, products, tools, and abrasives are all mingled in a warehouse which means there is no warehouse partition. What's worse, no specialized area used for the works such as the assembly, inspection and packaging etc of Stock-in and stock-out work, affecting the handover of stock-in and stock-out information and having seriously affected the work efficiency.
- There is no efficient office space. The work of product stock-in and stock-out management not only involves product inventory and confirmation, but also involves the sign of notes and transfer work. Due to warehouse staffs have no office space in warehouse; they have to constantly walk around in the process of goods stock-in and stock-out, causing the waste of manpower and material resources and the work efficient is very low.

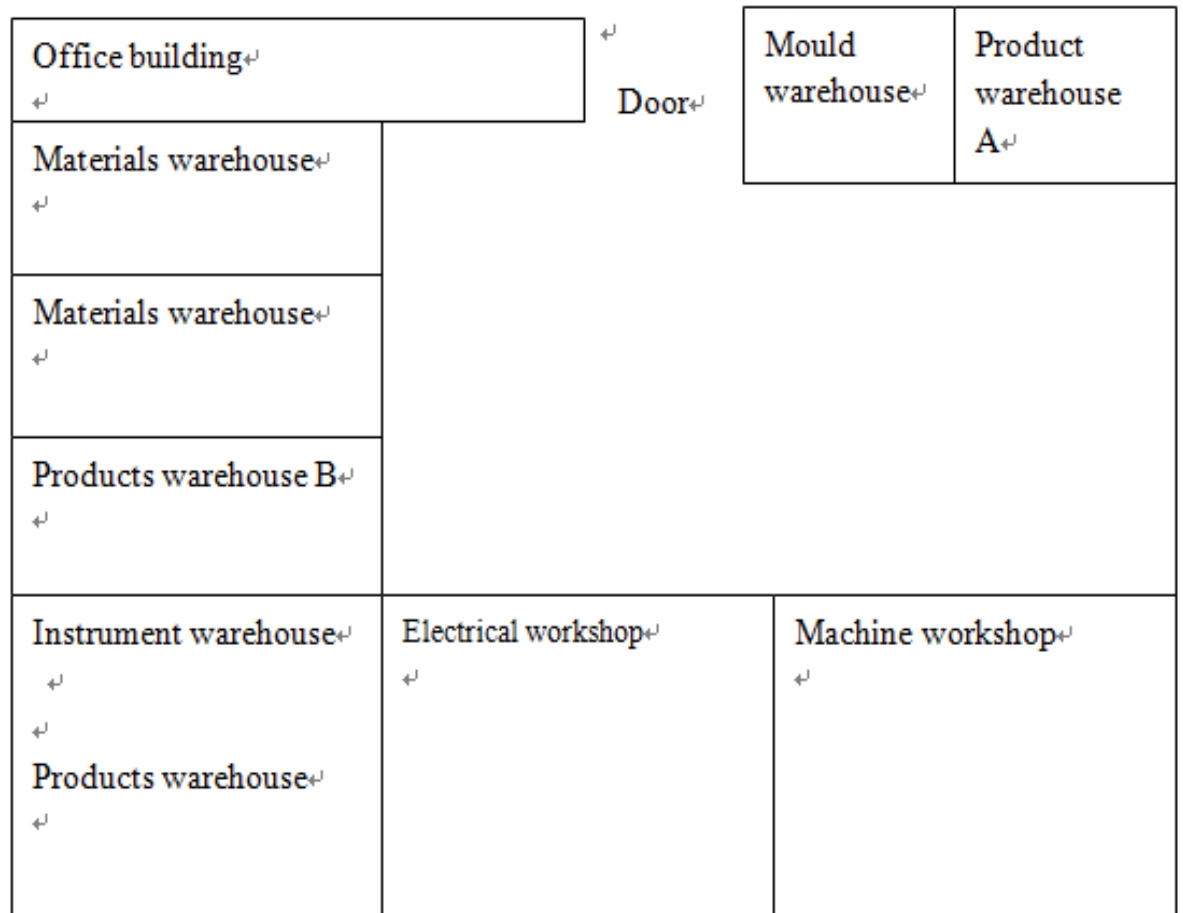


Figure 7: *The Original layout*

4.6 Research Question 3

Since the Ministry of Railways is both an enterprise and a government agency, forming a situation of nationalization of the railway enterprises. For a long time, the number of staffs work in state-owned enterprises is huge, no matter work hard or lazy; the staffs get almost the same returns, causing the reduction of the vitality of enterprises. Such kind of operating mechanism has not been changed fundamentally and the economic benefits situation has not been fundamentally improved. Thus, the situation seriously hindered the development of enterprises.

5. Analysis and research

This part is to answer the research questions of this thesis based on the literature review and interview of company leader.

5.1 Research Question 1

The result of this question based on the literature review.

(1) The quality of the warehousing industry personnel requirements.

The warehousing industry is adapting to the society productivity level. The aim of the production run is getting the maximum profit, which is the basic assumptions of economics and in the mean time is a reflection of social reality cause of rail transport products which demand the high-qualified warehouse personnel.

To answer this question, based on theoretical framework part 3.4, Wang⁹⁸ states some quality of warehousing industry personnel requirements and with the case study part 4.4; the author summarized some railway warehousing industry personnel requirements:

- The staffs should get to know the basic knowledge of the performance of railway products, including the product name, size, type, use area, warranty, service life, warehousing environment and temperature requirements.
- The staffs should also have learning about the steel, wire, electrical materials, equipment, tools, molds, basic knowledge and have a detailed understanding for the steel wire specifications, models, quality standards, inspection methods, weight range of methods, equipment, tools, molds which are under their jurisdictions.
- The staff should be equipped with the skills for safe operation and enough responsibility, mastering the knowledge of fire safety, transport and storage knowledge of hazardous chemicals and maintenance knowledge of the storage equipments.
- The staff should master some skills for financial, material balance. What's more, they should master the knowledge of warehouse inventory and can carry amount of inventory. They should be able to view and calculate the book inventory balances on the number and amount of inventory; they can take periodic physical inventory and live view and check the inventory of the number of products, calculating inventory amount by the product price.

⁹⁸ Wang, 2008.

(2) The hardware and software aspects of warehouse management

With the development of the market economy, enterprise should gradually speed up the pace of modernization of the warehouse.

A. Increase warehouse hardware investment

This company has a large amount of storerooms, but there's an obviously defective. Due to historical reasons, though it has a total of 23 storerooms which is distributed in three factories and the maximum range is 20 kilometers, which is not conducive to the turnover of goods, materials. Due to the lack of upfront design, most of the warehouse was converted from offices or factories and its ventilation, loading; inventories conditions can not comply with the technical requirements of the warehouse.

According to the case study 4.5.2, the table 2 showed that the equipments are not very advanced. Therefore, the company if want to success, it need to increase some hardware investments.

Hardware investment also includes the construction and renovation of the storerooms, the purchase of new shelves, tray, the digital automatic identification system and new logistics equipments such as sorting, processing, packaging, and other logistics equipment. All these equipments will greatly enhance the level of existing warehouse automation and logistics operation efficiency and increase the logistics services function.

B. In terms of warehouse software investment, they should strengthen the construction of logistics information.

The investment to software by the plant is not enough. Only the main plant's materials storerooms and finished-products storerooms are installed with video surveillance with a really small range. The full-time warehouse staffs are provided with a computer, mainly for printing documents, while as to the billing business, information-inquiry, customer-management functions are all conducted with manpower. Based on the theoretical framework part 3.3, the author is recommended that the company uses bar code technology. They should install encoded barcode printers in warehousing operations room and conduct coding to the materials, products, and inputting the information into the computer system which is useful for find the goods easily and can avoid making mistakes. Barcode technology is a powerful weapon to

automate management, is conducive to the purchase of materials, sales and warehouse management integration⁹⁹.

C. Purchasing the appropriate handling tools according to cargo specifications, remediating handling lifts to achieve complete qualification. It can also save manpower, reduce cargo damage & personnel costs and improve work efficiency.

D. The company in the railway industrial enterprises warehousing management aspect is still remaining in the state of the traditional operation. Although the staffs are equipped with computers, they have not yet formed the system, no mention to the network. Based on the theoretical framework part 3.3, if the company wants to achieve success, they need to introduce some modern management technologies. Therefore, if the company wants to make warehouse management modernization, it must be equipped with devices to achieve the following functions: sales, billing settlement, distribution, transportation, information inquiry, customer management, cargo tracking and tracing, the company can provide customers with more convenient, reliable, and efficient logistics services.

(3). Regulatory aspects of warehouse management, need to establish and improve, in order to ensure complete warehouse management.

Based on the theoretical framework part 3.4, Tompkins¹⁰⁰ states that '*warehousing standards will be established, performance will be measured against these standards and timely actions will be taken to overcome and deviations*'. If the companies want to success, the leader needs to establish some regulations of warehousing management.

Firstly in the terms of staffing moderation, they should do the configuration according to the material and product flow.

The annual output value of this company reaches 35 million RMB which should be configured with 3 or more full-time administrators.

Secondly, they should have specialized requirements for job responsibilities and need skills requirements for the personnel.

In addition, in terms of the stock-in and stock-out management of the materials and products, they should not only have regulations of material, product storage approach,

⁹⁹ Liu, 2009.

¹⁰⁰ Tompkins, 1998.

but also have requirements for materials-refunding, out-and-in regulations, processing requirements of the material-return or substandard products.

5.2 Research question 2

The result of this question is based on the interviews of company leader, and also contact with literature reviews about the warehousing barriers.

1) The heavy burden of enterprises.

In Goh's et al¹⁰¹ article, as warehousing market is not standardized, competitive inequality, leading most enterprise warehouses have lower economic benefits and long-term losses. However, due to historical reasons, the company not only should take the ages of the employees, co-ordination into account, but also takes notice about the wage burden of the second-tier staffs, which has created a vicious cycle. The company doesn't have the energy to improve the storage design and is not capable to improve the quality of staff, leading the company into a worse situation.

2) Cash flow is impeded.

As enterprises are operating independently, they should share the profit and bear the loss all by themselves. However, the wages of the staff must obey to the prevailing wage standards of the Ministry of Railways. The company must go to tender competition with a considerable number of individual enterprises, which is resulting the fewer and fewer operating income and more and more wage expenditures.

This is reflected in:

Firstly, they may suffer huge losses. Secondly, it may cause losses of assets. Thirdly, they have higher debt ratio. The company can't carry enough money to buy handling tools and computer equipments.

3) The function of Factory Warehousing and layout research

The features of railway factory Warehousing include warehouse management functions, storage functions, classification and transport functions, and other value-added services functions.

In terms of Factory warehouse management, the author hold the ground that great warehouse operations and management are useful to the operation of the production process for the entire company, which can guarantee the continuity of the production

¹⁰¹ Goh et al, 2003.

and operation, and vice versa a negative effect will be produced. In terms of storage functions, it includes storage, assembly and classification of the underlying operating. Through basic operations, the cargo has been processed effectively which is in line with the market and customer needs. They can deliver the goods in batches or one-time delivery, and can be requested by the user¹⁰². The function of Warehousing is particularly evident in the classification and transport.

Because of the plant warehouse is located in three locations, and products-classification is conducted in the production workshop, the handling and transport the finished products are conducted in the main plant for storage. The cost of the transporter is high which weakens its economic function. Other value-added services is including labeling, re-packing, weighing, assembling, assembly, simple processing. Because of a small amount of staff in the factory, only one full-time employee, however, the main factory includes finished products storerooms with total six rooms, so the function can't be implemented in the warehousing. The company can only transfer the workshop production-staff to help complete this function or the work is transferred and directly finished in the production workshop.

4) Optimization of the layout of the main factory warehouses

Tompkins¹⁰³ states that *'facility layout is integral to successful performance in all operational areas'*. Therefore, to establish a reasonable layout is very important.

In order to make one optimization layout, the company can base on the amount of the materials, products, semi-finished products, quantity and access degree, they can rational plan the location and size of the storage area to set the appropriate functional areas.

According to the characteristics of a variety of materials and products, they can set materials library, 1st product library, 2nd product libraries, tools library and abrasive library.

The company could set storage operating room on door's left part, and set dedicated area of the library assembly, inspection, and packaging area on the door's right part. All these can ensure that the products of the library are accurate, qualified, and greatly improve the work efficiency.

¹⁰² Li, 2012.

¹⁰³ Tompkins, 1998.

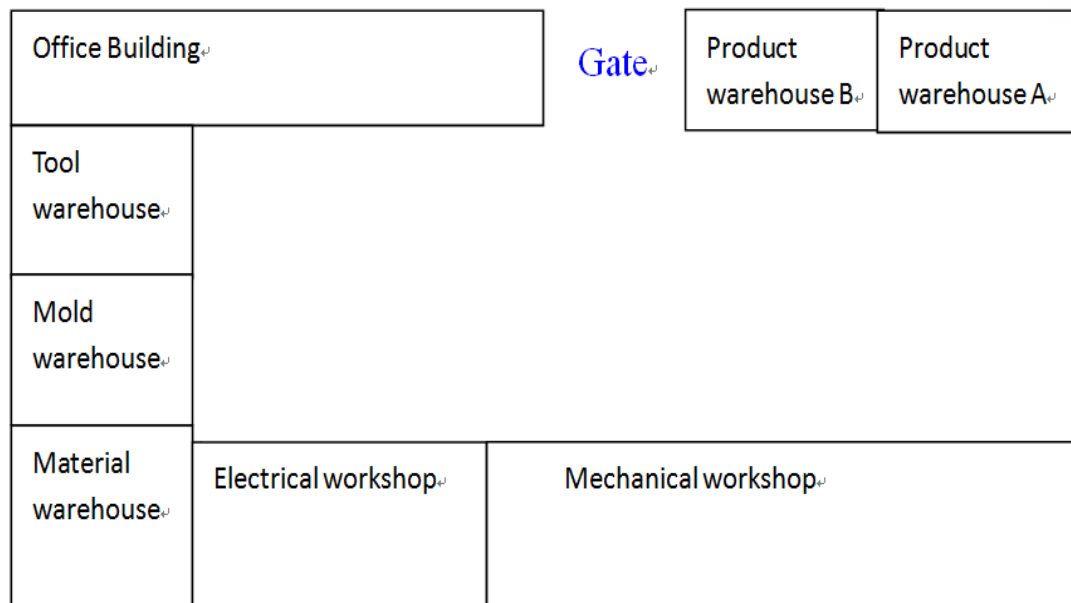


Figure 8: *New warehouse layouts*

5). Set convenient, efficient office space.

The company can set warehouse management office next to the warehousing operations room. And in the product stock-in & stock-out Management, they can facilitate product inventory and confirm to facilitate the signing of the notes and transfer the work to facilitate the rest of the warehouse staff. All these are convenient to the product inventory and confirm work and convenient to the notes signature and the warehouse staff can also take rest.

5.3 Research question 3

Railway reform involves a number of personnel. In view of the complexity of the pattern of interests, the railway itself has commercial, public welfare and the natural monopoly nature of the tangle of industry characteristics.

As to reform a daunting task, the reform repetition is inevitable. Since the reform is too complicated and both include operational restructuring and the investment and financing system, so the separation of enterprise must take its real reform as its first step.

Over these years, the proposed program of the railway reform is market-oriented, and the specific operation program is in a disagreement scene. Different programs can both pilot and be competitive, and also co-exist in the case of different places. The key is to weigh the pros and cons and to strive for the good point. However, the reform and

opening up principles should be consistent, and the government should not act directly as business entities and investment and financing, and they must make a determined effort to separate government from enterprises and promote the liberalization of market access and regulatory monopoly enterprises as its core, establishing a set of market fair competition rules.

After the restructuring, the duty of the government is focused on oversee monopolies, maintaining market order, and ensuring universal service and railway safety operations.

The impact of railway reform :

1) A reasonable price mechanism, the respect to the laws of the market and the regulation of the government. And the consumers will benefit at last.

For example: Cause of the much higher price for the Wuhan-Guangzhou High-speed rail, Zhengzhou-Xi'an high-speed rail, and the attendance of the train is low; at the same time, the low-speed railway is overcrowded even have to save standing tickets.

This is a manifestation of negative effects of the current laggard system to the people's livelihood. In the one hand the train is running slow and has no seats; in another hand the other trains is suitable, fast but with empty seats.

At this point, it is particularly important to respect the laws of the market.

2) Railway broaden the business scope

After operating independently, the railway can very easily expand the entire industry chain of transport services. Relying on the freight station engage in multimodal transport and the railway is responsible for long-distance transport. Road transport is responsible for short-distance transport, which is a logistics concept. In addition, improving service quality, increasing the proportion of high value-added goods for transport are also important links. Both focus on sales and market simultaneously can harvest in the end.

3) The changes within the railway system.

Regulatory authorities at all levels have become the state officials, and their identity has changed. The employees need to learn new ideas, and even the culture of the company needs to change.

4) In macro level, China's manufacturing industry is in the trend of going inland¹⁰⁴.

The inefficiencies of the railway production in the past causing the manufacturing companies in the southeast coast are reluctant to use rail transport materials except some low-value-added products. Inside the company, the reduction of labor costs, price level will increase accompanied by a sharp increase in the road transport costs. So the rail transport should play the role of its low cost. In the same time, after separation of the railway between government and enterprises, whether they can unveil transportation services which can satisfy the manufacturing industry and mainland local government, whether supporting facility in the mainland local economic development zone can comply with the enterprises-go-inland has become an important factor.

5.4 Analyze of company warehousing

SWOT analysis is used in this chapter to analyze the present status of the warehouse.

- **Strengths**

1) Are there any unique or distinct advantages that make your organization stand out in the crowd?

Warehousing is an industry, each industry has its own characteristics, and warehouse operations also have its own characteristics and can be viewed mainly in the following aspects:

a) Work process is not continuous

Despite the company advocates zero inventory, and the less turnover in the workshop production, the better. But from a management point of view, each batch of products or goods required stock-in, regardless of the length of time, it must be stored in a warehouse in a period of time, so every batch of products or goods from stock-in to the stock-out isn't a continuous operation, but was conducted uninterrupted.

b) Uneven amount of work

Owing to the current railway operate a market economy, and its production tasks need strong marketing support. However, there are a lot of uncertainties in the talent, markets, capital, technology, etc. Different product orders, resulting the uneven production, what's worse, warehouse stock-in operations and stock-out operations is uneven in time, then it often causes emergency goods receipt, goods delivery which making overtime time added in the warehouse management.

¹⁰⁴Railway forum, Access date: 2012-08-10.

c) The work object is complex

The company isn't a professional warehouse , and the warehouse object is also a wide variety, there are thousands of varieties of products: it not only has finished and semi-finished products , but also has materials , tools , grinding tools ; Besides, it not only has sophisticated electronic equipment, but also has clumsy iron and steel products ; it not only has their own products , but also processing outsourcing products ; it not only has new products , but also has waste materials and equipments. The inventory objects require different operating means, methods and techniques. Thus, it is more complex for the warehouse operations, especially like the kind of work object mentioned above; sometimes it needs special care, so during the work, specially care is desperately needed.

d) Workplaces

The production and operation of the company includes the nature of the production, management, and engineering, etc. However, as the scattered distribution of the warehouses, operation links are operated within the scope of warehouse. But some parts of the work, such as engineering materials, are operated outside the warehouse.

The above points illustrates a railway warehousing industry is not only a demanding workload, and work uneven. The object of the operation is also very complex. The work is not only conducted in a wide geographical scope, but also the work objects are especially extensive.

Therefore, due to the particularity of the warehousing industry, warehousing staff must have a hard-working spirit. The author thinks a hard-working spirit is an important advantage in company.

2) What makes the customers choose your organization over the competitions?

✧ Warehousing resources

After the adjustment of the distribution of productive forces, there are some companies merging together, as well as production workshop and management personnel have also been reduced. Then these idle factories and offices all can be transformed into the warehouses, forming relatively rich resources.

3) Are there any products or services in which your competition cannot imitate (Now and in the future)?

✧ Relying on the railway, they have a more practicable management system.

Although the company's warehouse management system isn't completely sound, but thanks to the characteristics of the high-density railway and semi - militarization, inside the railway, activities and security checks are frequently conducted. And the basic security system and facilities are advanced and self-contained, such as fire prevention facilities --- fire extinguishers and other equipments. What's more, advanced operators even install automatic fire protection devices and coffer burglar facilities - security doors, electronic monitoring are all installed.

● **Weakness**

1) Is there any avoidance that your organization should be aware of?

✧ Present warehouse layout is unreasonable

Frazelle¹⁰⁵ refers the warehouse is an important link in the modern supply chain and it plays a crucial role in the success or in the failure of one enterprise. Warehouse layout has a strong influence of the goods turnover efficiency and transport costs.

The company is a new company which is merged by four companies, the total warehouse amount is at least 23, but was distributed in three factories, making the original warehouse distribution is more dispersed which leads to the layout of the warehouse is unreasonable. Moreover, the original companies aren't distributed in the same place, and the furthest distance reaches 20 kilometers. During the time of transporting materials, semi-finished products, products, it not only consumes time, but also increases the product cost. These are not good for the turnover of materials and goods from the view of production, operation, marketing and after-sale service.

● **Opportunities**

1) What does your organization predict in the future that may depict new opportunities?

The company is now in the growth stage, and its production and operating momentum develop well. With the development of China's high-speed railway, high -

¹⁰⁵ Frazelle, 2002a.

speed rail development infrastructure investment merely in 2011 reached 500 billion Yuan. In the other hand, the company grasps the characteristics of high-speed railway, and develops products like turnouts hook lock, the residual voltage test, etc for dedicated high-speed rail. Thus, it is not only a solution to the railway safety of needs, but also increases the operating income.

- **Threats**

- 1) What is your competition doing that is suppressing your organizational development?**

- a) Market competition

With the development of the railway market and continues expand of the market, more and more companies are beginning to research and produce the railway electricity products, and facing a fiercely competition in the market. For company which is in the state of growth, they are also facing a huge challenge by the other companies in this field.

- b) Lack of capitals

Although the company belongs to the management sector of the railway, due to the company operates independently, so all the staff salaries and administrative expenses, the cost of materials must be solved by themselves, leading to a lack of capitals. On the road to the development of information technology, the company suffers a huge challenge.

6. Conclusion

The traditional warehousing industry in China is in the process of development, they lack the government and industry associations' actively guide to the coordination and introduce the skilled, knowledge management. And the operation of the warehouse personnel is conducted by these external drivers. But the warehouse enterprises are actively making exploration and practice by their own initiatives.

- **Research question 1: What qualities have companies that are successful in stock / warehousing and what trends are in this area?**

By combining with the relevant literatures and interview to the company manager, it can be found that:

- i. If the companies want to be successful, leaders had better have a professional knowledge and ability so that they can lead staff work together.
- ii. The company should establish new warehouse management standards to accommodate less-volume, variety, and the rapid turnaround in commodity circulation characteristics.
- iii. Do a good job in the warehouse handling automation and the receiving, shipping and inventory management intelligently these two basic works.
- iv. Logistics enterprise with advanced production and marketing enterprises should take the initiative to form an alliance, introducing advanced management concepts, expanding its own outlets and distribution system.

- **Research question 2: When the management knows what to do then what is it that prevents the effective development occurs?**

In this part, there are several factors that prevent the effective development occur.

- a) Hard to find appropriate warehouse locations
- b) Lack of warehousing facilities
- c) Lack of warehousing services except storage
- d) Lack of the management system and regulations
- e) Unreasonable layout
- f) Lack of technology
- g) Low level of education and shortage of talents

- **Research question 3: What is required of the Chinese Railways to make the necessary changes to become a modern logistics company in warehousing?**

Railway warehouse industry is in the direction of intensive development, the building features more complete and more efficient operations. Many logistics companies are centered on the limited land. Thus, the establishment of public warehousing platform, the docking of the warehousing industry information systems and customer information systems, information technology, state-of-the-art, suitable, reasonably priced all will cause more concern over warehousing enterprises.

Based on the existing storage environment, applying to the construction of information networks and information technology, the warehouse level of value-added services will further improve the various operational aspects. And reasonable docking and its integrated logistics business has become the main direction of the development of the warehousing industry, extending the function upstream and downstream of the storage industry which can get more value-added revenue.

7. Further research

In recent years, with the increasing development of science and technology, railway enterprises begin to establish a logistics company which has advanced management concepts. The enterprises began to focus on the construction of the storage equipment, training of personnel and the improvement of the law. And the overall supply chain management actively develop a long-term cooperation relationship with customers by providing a variety of value-added services to participate in the customer's supply chain management and reduce customer costs, and thus improve their own competitiveness.

- 1) Enhance the infrastructure construction and gradually achieve the zero stock.

The warehousing industry should invest more and make great efforts to improve the level of the existing infrastructure construction; what's more, they should constantly reform the old-aging warehouses and be updated with the modern warehousing equipments. They should not only learn the advanced experience and technology from home and abroad, but also form a scientific and reasonable warehousing facilities network according to the practical situation of every field in the railway industry. Taking their own advantages, the railway enterprises should transfer their inventories to the central material supply station upwardly and transfer their inventories to the customers' inwards, realizing the zero stock, reasonable accommodation of the inventory structure and inventory centralization.

- 2) Strengthen the integration of warehousing resources and perfect the system of warehousing standardization

Storage and transportation facilities of warehousing enterprises in different industry of China's railway, such as train industry, machinery industry, engineering industry and electric industry cannot be used at the same time, which is badly influencing the reasonable resource-planning ability of railway industry. To meet the demands of the modern logistics, these companies should strengthen the integration of the resources and establish comprehensive logistics enterprises and warehousing network. Warehousing standardization not only aim to achieve the close cooperation of warehousing links and other links, but also is the effective method to improve the work efficiency inside the warehousing industry. Thus, the warehousing of railway industry should constantly perfect its standardization system, achieve computerization management and build an

effective network to achieve the sharing of warehousing information .In addition, they should also positively promote the warehousing informatization of enterprises' warehousing management and increase the utilization rate of the warehouse to achieve the effective warehouse control. Moreover, the warehousing industries should build a public information platform by utilizing the modern information technology to achieve the effective integration of the public information platform and warehousing network and elevate the warehousing informatization level of the enterprises.

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Appendix

Interview questions:

1. Lists the scope of production and management of your company.
2. Based on 2010, lists your company's annual production and annual output value.
3. What are the main products of the company production?
4. What about the company employees and technicians status?
5. How many warehouse personnel in your company? How about their degree of culture?
6. What are the warehouse management systems in your company?
7. List the number of warehouse and warehouse area.
8. List the main production equipment specifications and quantity.
9. List the warehousing management departments and their responsibilities.
10. What are the warehouses is equipped with transport or auxiliary equipment?
11. Facing the new situation, the railway should how to reform?
12. Please look forward to the future direction of development of the warehousing industry.