

Factors Influencing Information Systems Implementation of Manufacturing Enterprises from the Perspective of Employees

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Abstract: With the fast advancement of information technology, information systems have become a vital tool for manufacturers to increase their competitiveness. Many elements, however, will impact the implementation of information systems in manufacturing companies. In the beginning, this paper summarizes the existing literature on the influencing factors of information systems. Then, based on traditional theories, the three participants of Yangzhou Jiasheng Weiye Electrical Equipment Co., Ltd. were interviewed. Combined with the analysis results and ATLAS of interview records. Finally, four influencing factors are summarized from the perspective of employees, namely, senior leadership, information system cost, employee ability, and employee motivation. Finally, it provides some references for the development of manufacturing enterprise information systems.

1. Introduction

1.1. Background of the Study

The information systems in manufacturing enterprises greatly promote communications. So that entrepreneurs can allocate the resources of enterprises, and strengthen information transmission[1]. Moreover, information systems can effectively help manufacturing enterprises to rationally integrate their resources, effectively improve enterprises' performance, and thus enhance the competitiveness of enterprises. Information systems of manufacturing enterprises are an important method to innovate product design and manufacturing mode. What's more, they are an effective tool to build an advantageous industrial chain and enhance the competitiveness of small and medium-sized enterprises clusters, and the inevitable way for manufacturing development. Studying the influencing factors of the Information system implementation in manufacturing enterprises will greatly promote the rapid development of the national economy, improve economic benefits and

enhance international competitiveness. The implementation of the information systems will be influenced by many factors. Although many papers have analyzed the influencing factors, most of these studies are based on foreign theories and mechanically apply Western theoretical research models, which are helpful to the research of influencing factors of information systems implementation in manufacturing enterprises. This kind of research generally adopts the method of interviews, which is more of a verification work for the existing models abroad. Influencing factors from the perspective of employees have not been paid attention to, so the research in this area needs to be further deepened.

1.2. Problem Statement

Employees are playing very important roles in the process of information systems as essential parts of manufacturing enterprises. However, few studies have been conducted to analyze the factors that affect information systems implementation in manufacturing enterprises from the perspective of employees. Once the information systems are introduced into manufacturing enterprises, employees will be exposed to the information systems most frequently, and they will bear more pressure and challenges, and sometimes there will be more contradictions. Therefore, this article analyzes the factors that affect the information systems implementation of the manufacturing enterprise from the perspective of employees, to fill the gaps in previous research.

1.3. Purposes of the Study

From the perspective of employees, this study is useful in analyzing the factors impacting the implementation of information systems in manufacturing enterprises. Then, based on those factors, adopt appropriate actions to encourage the implementation of information systems.

1.4. Research Questions and Research Objects

Based on the foregoing, this research attempts to focus on the following: The following are the research questions:

- 1) What are the factors that influence the information systems implementation of manufacturing enterprises from the perspective of employees?
- 2) What are the relationships between these factors?
- 3) What are the reasons behind these influencing factors?

The research objects:

- 1) To investigate the factors that impact the implementation of information systems at manufacturing enterprises from the perspective of the employees.
- 2) To obtain an in-depth understanding of the relationship among these factors.
- 3) To gain knowledge on reasons that influence the information system implementation of manufacturing enterprises.

From the perspective of workers, this study investigates the factors that impact information system implementation in manufacturing enterprises and provides a theoretical foundation for domestic enterprises to implement information systems more effectively.

1.5. Scopes of Study

This paper mainly studies the factors influencing information systems of manufacturing enterprises from the perspective of employees, taking three employees of Yangzhou Jiasheng Weiye Electrical Equipment Co., Ltd. as the research object, and making research and analysis

through interviews and ATLAS.TI. Participants must fulfill the following two requirements to achieve the interview's goal. Firstly, they have used or are now using information systems. Second, they are employees who work in the manufacturing enterprise. Other criteria, such as the participants' educational backgrounds, age, and employment status, must also be taken into account.

1.6. Significant of the Study

Studying the factors that affect the information system implementation of manufacturing enterprises from the perspective of employees is helpful to pay attention to their ideas of employees. Reduce employees' confusion about the information systems of manufacturing enterprises, so that enable information systems to be better applied among employees.

1.7. Definition of Terms

1.7.1. Comprehension of Information Systems

The term "information systems" refers to the process of social and economic growth in which the focus of economic structure shifts from material and energy to information.

Information systems imply a high degree of sharing of information resources. Personal conduct, organizational decision-making, and social operation tend to be in optimal condition when people's intellectual capacity and social material resources potential are completely used.

1.7.2. Manufacturing Enterprises

Manufacturing enterprises refer to companies that engage in manufacturing production and operation activities or manufacturing labor service activities, operate autonomously, and are accountable for their earnings and losses account independently, and have a legal personality to meet social needs and gain profits.

- 1) Manufacturing enterprises are profit-oriented economic organizations.
- 2) Manufacturing enterprises are businesses that engage in industrial manufacturing and operations or provide industrial services.
- 3) Manufacturing enterprises are independent organizations that assume sole responsibilities for profits or losses, independent accounting commodity producers and operators.
- 4) Manufacturing enterprises are economic entities with legal personalities.

2. Literature Review

2.1. Research Paradigm

The scope of qualitative research and explanatory analysis is commensurate with the goal of this study. The hermeneutic paradigm states that this paper collects raw data by interviewing and observing the selected employees in Jiasheng Weiye Electrical Equipment Co., Ltd. Then, try to find out the participants' emotions, how they understand the informatization systems and the influencing factors they think about during the implementation period.

After the interview, combine the interview results with ATLAS.TI, a qualitative analysis software, summarizes the factors influencing information systems implementation of manufacturing enterprises.

2.2. Relevant Past Studies to Current Studies

Foreign studies have studied the influencing factors of information systems of enterprises. Ravinchand and other scholars put forward that information systems should be evaluated from the demand of various departments for information systems to evaluate the gains and losses of system introduction[2]. G.Latamor and other scholars explained the factors of high-level leaders' influence on information systems[3].

The research on the influencing factors of information systems implementation has also made some achievements. Wang and other scholars outlined the general situation of information systems and pointed out that as far as the success rate of information systems in enterprises is concerned[4]. From the perspective of influencing factors, the influence of enterprise executives on information systems is very profound[5]. After recognizing the benefits of information systems, high-level supports want to implement information systems. However, the implementation of information systems could drive the renewal of enterprise management, which would touch traditional vested interests. This brings negative effects on information systems implementation. Ouyang, on the other hand, standardly divides the influencing factors of information systems into internal and external aspects and points out that these factors have different influences on enterprises[6].

2.3. Research Framework

The research framework of this paper is shown in Figure 1.

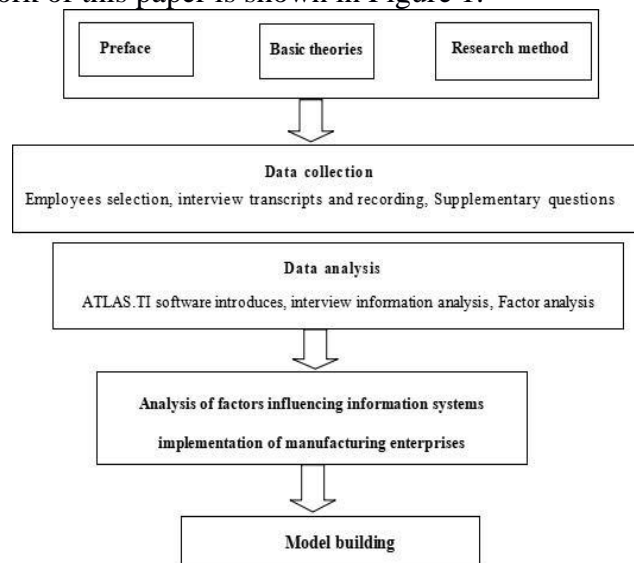


Figure 1: Research framework

3. Research Methodology

3.1. Research Design

The research goal of this paper is to study which factors will have a significant impact on the information systems implementation of the manufacturing enterprise (Yangzhou Jiasheng Weiye Electrical Equipment Co., Ltd.) in China through interviews, so our interviews mainly focus on the influencing factors. To gather in-depth knowledge on this issue, collect raw data through face-to-face interviews with participants. Then, with the help of the knowledge management function of ATLAS.TI, we can convert all kinds of data into academic knowledge that we need to explore,

manage the data systematically and creatively, extract and compare new possibilities and relationships of various data from it, and then reassemble and piece together new ideas.

Due to the characteristics of qualitative interviews and research objects, objective sampling is adopted because it's "better suited to qualitative research" and may give extensive, detailed data to answer research questions[7].

3.2. Participants and Setting --3 Participants

Participants used the snowball method to find employees willing to be interviewed. At first, six potential participants all meet the interview requirements. The following three persons were then chosen as research objects using the snowball approach. Details are shown in Table 1.

Table 1: Basic information of participants

Participant	Age	Educational background	Professional title	Competence	Interview time
1	26	Undergraduate degree	Personnel clerk	Training skills	121 minutes
2	33	Associate degree	Worker	Basic assembly line work	83 minutes
3	46	Associate degree	Worker	Basic assembly line work	142 minutes

3.3. Data Collection

Yangzhou Jiasheng Weiye Electrical Equipment Co., Ltd., a representative manufacturing enterprise, was selected. And the interviewees were the above three employees screened by the snowball method. Record the whole interview process by recording equipment. Before each interview, some open and general questions will be designed in advance according to the characteristics of different people. During the interview, based on the initial questions, ask more detailed questions about some information-related issues, and encourage the interviewees to spread their topics and collect more information in the process of discussing problems with them. Each interview lasts for about two to three hours, during which a series of other questions are often raised.

We summarized the paper records and audio records of the interviews and summarized and extracted the contents related to the research. Including meaningful nonverbal communication, participants' feelings, and thoughts. To generate data and complete the research objectives, 21 semi-structured questions were designed for participants.

3.4. Data Analysis

The data were instantly encoded and categorized by the subject to evaluate the records to comprehend the participants' narratives.

3.4.1. Developing the Categories and Properties from Codes

Firstly, the interview records are sorted out to get the interview documents, and then the key points in the interview documents are summarized. According to the investigation, we summarized the following key points as Table 2.

Table 2: Developing the categories, and properties from the codes

Category	Code	Properties
High-level leader decision	Awareness of overall development	External influence
	Management control	
Information systems cost	Maintenance personnel cost	External influence
	Training cost	
	Production management cost	
	Customized cost	
Employee ability	Traditional working behavior	Internal influence
	Poor education background	
	Insufficient professional skills	
	No concept of information system	
Employee motivation	Worries of being replaced	Internal influence
	Pressures of continuous learning	

Four main factors affect the information system implementation of manufacturing enterprises:

1) High-level leader decision:

To a large extent, whether manufacturing companies use information systems and which information systems to use are decided by the company's high-level leaders.

2) Information system cost:

If the cost of the current information system exceeds what the company can afford. It will be necessary to re-purchase other information systems suitable for manufacturing enterprises and evaluate their cost.

3) Employee ability:

If there is not enough pre-training and employees' ability is weak, it is difficult for these employees to use the information system.

4) Employee motivation:

If employees don't understand the information systems and don't want to implement them. There will be resistance to subjective consciousness, which will hinder the information systems implementation.

3.4.2. Validity, Credibility, and Consistency

Following the research findings, the researchers form preliminary conclusions and then listen to the comments of experts, peers, and colleagues. The survey results are also handed over to the participants, and their opinions are listened to. Try to analyze the research results from different angles and check their validity and reliability.

The findings of the study are also compared to commonly held definitions and hypotheses in academic circles. If substantial changes are discovered, researchers will investigate these differences further using the original data to enhance the study's findings.

4. Findings

4.1. Interview Findings

During the interview with three participants, participants often mentioned the words "problems" and "unclear systems" and mentioned the difficulty they felt when using the information systems. From their facial expressions, speech speed, and body movements, we can find that there will be

some difficulties when using the information systems of manufacturing enterprises.

Citation is used to support researchers' opinions and expound opinions or experiences. Creating quotations can give life to the content and support the proposed explanation and explanation. Use short quotations to express abundant data[8]. Researchers asked for explanations to clarify the process and the views of information providers. The interview results are shown in Figure 2 which are divided into two parts: internal factors related to employees and external factors unrelated to employees from the perspective of employees.

Show quotations coded with High-level leader				Show quotations coded with Information systems cost			
ID	Reference	Name	Document	ID	Reference	Name	Document
1:1	1:14	Management control	Participant 2	1:6	1:27	Production management cost	Participant 2
1:3	1:20	Awareness of overall development	Participant 2	1:7	1:33	Maintenance personnel cost	Participant 2
1:4	1:23	Awareness of overall development	Participant 2	1:8	1:27	Maintenance personnel cost	Participant 2
2:1	1:17	Management control	Participant 1	1:9	1:36	Maintenance personnel cost	Participant 2
2:2	1:20	Awareness of overall development	Participant 1	2:4	1:36	Customized cost	Participant 1
2:3	1:14	Management control	Participant 1	3:2	1:27	Training cost	Participant 3
3:1	1:14	Management control	Participant 3	3:3	1:33	Customized cost	Participant 3

Show quotations coded with Employee ability				Show quotations coded with Employee motivation			
ID	Reference	Name	Document	ID	Reference	Name	Document
1...	1:44	Traditional working behavior	Participant 2	1...	1:58	Pressures of continuous learning	Participant 2
1...	1:47	Insufficient professional skills	Participant 2	2:5	1:59	Pressures of continuous learning	Participant 1
2:7	1:43	Traditional working behavior	Participant 1	2:6	1:53	Worries of being replaced	Participant 1
2:8	1:40	No concept of information system	Participant 1	3:4	1:53	Worries of being replaced	Participant 3
2:9	1:46	Insufficient professional skills	Participant 1	3:5	1:59	Pressures of continuous learning	Participant 3
3:7	1:49	Insufficient professional skills	Participant 3	3:6	1:56	Pressures of continuous learning	Participant 3
3:8	1:40	Poor education background	Participant 3				
3:9	1:42-43	Traditional working behavior	Participant 3				
3...	1:46	Insufficient professional skills	Participant 3				

Figure 2: Creation quotation

4.2. Section A: External Influence

1) High-level leaders' decision

P1: Participant 1 mentioned that the implementers of the information systems are often high-level leaders with higher academic qualifications, deeper qualifications, and wider experience. Their grasp and control of information systems often play a key role in information system implementation.

P2: Participant 2 said: "Although employees are more dependent on traditional office work, leaders have the awareness of information systems." The high-level leaders realized that if comprehensive reform is not implemented. Enterprises will be in danger of bankruptcy. Moreover, information systems are a future development trend, so enterprises decided to implement information systems.

2) Information systems cost

P1: Participant 1 mentioned the obstacles to the information systems implementation and said, "There are many kinds of products produced by enterprises, complicated production processes, and long production cycles. Many modules need to be customized, which is expensive and not easy to access information systems. The cost of information system comes from the high design cost.

P2: Participant 2 said, "At the beginning, the company adopted foreign information system for production management. However, the problem soon appeared. The daily maintenance cost is very high, and if you want to change the operation mode of a certain module, you need to pay an extra-large sum of money. Once the problem occurs, if the Information systems maintenance worker solves it, then the time from the time they leave their company until they return to the company will be their maintenance time, and the maintenance cost is calculated according to the maintenance time. "

P3: When participant 3 mentioned that after introducing information systems, employees still need training, which is another expensive fee, and the effect is not particularly obvious.

4.3. Section B: Internal Influence

1) Employee ability

P1: Participant 1 mentioned that most of the employees come from technical schools and have not received information training, so many employees still used the traditional way of working for production, and the consent of information systems was unknown when enterprises implement information systems.

P2: When talking about information systems, Participant 2 said that most employees do not support it. Because the nature of employees' work is mostly stylized operation, they don't need any professional skills, so they are used to it. However, after the information system implementation, employees did not show enough enthusiasm, even because productivity was reduced by using information systems that they are not familiar with.

2) Employee motivation

P2: Participant 2 has some feelings about this: "At the beginning, information systems implementation is slow, employees generally don't accept information systems, and the productivity of enterprises is not improved obviously that reduce the employee motivations."

P3: Participant 3 raises the same question. Employees generally don't understand

Information systems, and even have feelings of resistance. Information systems implementation in manufacturing enterprises is unbelievable.

From the interview content, it can be seen that from the perspective of employees, the most important reason for external factors is the decision of high-level leaders, followed by the cost of information systems. From the employees' point of view, the internal factors can be seen as the ability of employees and the motivation of employees.

By importing the above contents into ATLAS software, we can get the following Figure 3, Figure 4, and Figure 5.

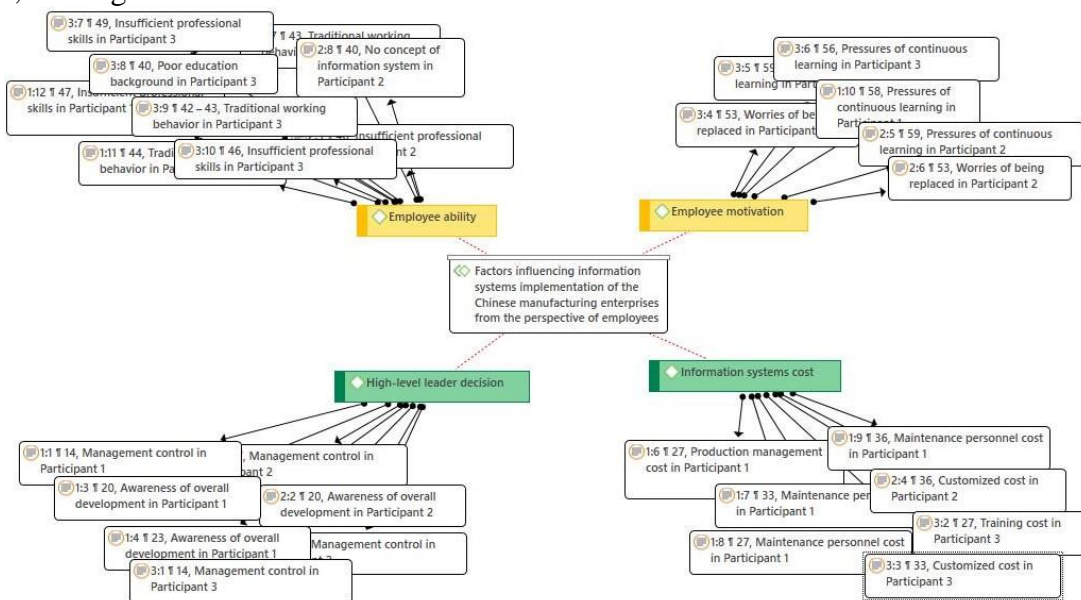


Figure 3: Network of a group with its quotations

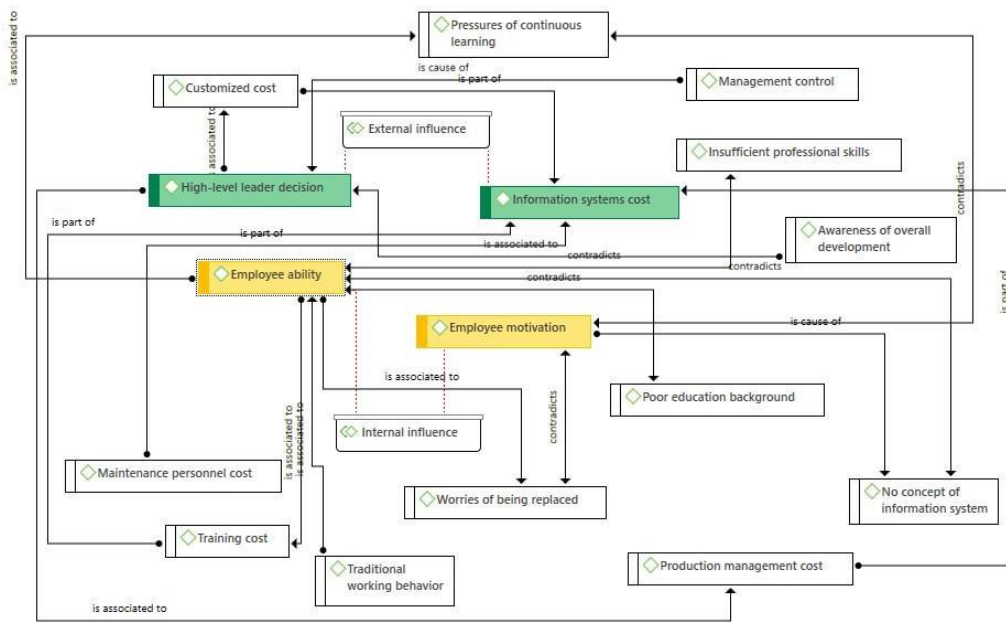


Figure 4: A network of codes around the code groups

	1: Participant 1 ⑩ 10	2: Participant 2 ⑨ 9	3: Participant 3 ⑩ 10	Totals
Employee ability ⑨ 9	2	3	4	9
Employee motivation ⑥ 6	1	2	3	6
High-level leader deci... ⑦ 7	3	3	1	7
Information systems c... ⑦ 7	4	1	2	7
Totals	10	9	10	29

Figure 5: Cross-tabulation of research objectives groups

5. Conclusions and Recommendations

5.1. Conclusions

Introducing Information systems is an efficient way to optimize the structure and accelerate development. Employees are an important group in enterprises. Based on this background, this paper analyzes the factors that affect information systems implementation in manufacturing enterprises from the perspective of employees. Three participants of Yangzhou Jiasheng Weiye Electrical Equipment Co., Ltd. were selected by the snowball method. Then, adopt the interview method, with the help of ATLAS.TI qualitative software analysis. An analysis model of the factors influencing information systems implementation of manufacturing enterprises is established, and four influencing factors, namely, high-level leadership, information system cost, employee ability, and employee motivation, are put forward.

5.2. Implications and Recommendations

First of all, two external factors, high-level leaders and information system costs are also real existence factors. Firstly, we need high-level leaders to insist on taking information systems as the "top project". Second, to get information systems at an appropriate price, we must consider both the

cost composition and the cost-benefit analysis when screening business information systems.

Secondly, two internal factors, the quality of employees and the motivation of employees, are important factors for the promotion of information systems in manufacturing enterprises. Therefore, firstly, introduce highly educated and skilled employees who have the information systems basis. secondly, pay attention to information systems training for all employees. Only when the front-line users fully understand the benefits of information systems, can the implementation of information systems be carried out smoothly.

Because of the particularity of the interview research method, the sources of information are rather messy. Random interview records of interviewers often make researchers unable to start or miss key information. This paper puts forward four important influencing factors but does not rank them according to their importance. So based on this paper, further work can be related to the ranking of influencing factors.

References

- [1] Hsiao Y., Yang C., Lin W., & Lee W. (2007). A study on key failure factors for introducing enterprise resource planning. *Human Systems Management*, 26 (2), 139-152.
- [2] Ravichandran T., Lertwongsatien C., & Lertwongsatien C. (2005). Effect of Information Systems Resources and Capabilities on Firm Performance: A Resource-Based Perspective. *Journal of Management Information Systems*, 21 (4), 237-276.
- [3] Cendon B., & Jarvenpaa S. (2001). The development and exercise of power by leaders of support units in implementing information technology-based services. *The Journal of Strategic Information Systems*, 10 (2), 121-158.
- [4] Wang J., Li R., Xu Y., Xu Y., Jia W., & Deng F. (2010). Study on Rapid Extraction Technique of Data Sharing Oriented Urbanization Information: A Case in Yancheng City, Jiangsu Province, China. *Geo-Information Science*, 12 (3), 399-405.
- [5] Sumner M. (2009). How alignment strategies influence ERP project success. *Enterprise Information Systems*, 3 (4), 425-448.
- [6] Hu Q., Hart P., & Cooke D. (2007). The role of external and internal influences on information systems security—a neo-institutional perspective. *The Journal of Strategic Information Systems*, 16 (2), 153-172
- [7] Merriam S. B., & Tisdell E. J. (2015). *Qualitative research: A guide to design and implementation*. John Wiley & Sons.
- [8] Eldh A. C., Restedt L., & Berter C. (2020). Quotations in qualitative studies: reflections on constituents, custom, and purpose. *The International Journal of Qualitative Methods*, 19.