A STUDY ON INTELLIGENT BUILDING CONSTRUCTION PROJECT PROCESS MANAGEMENT: A GERMEN PROJECT AS AN EXAMPLE

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ABSTRACT

Title: A Study on Intelligent Building Construction Project Process Management: A German Project as an Example

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Intelligent buildings first appeared in 1984, and intelligent buildings have become more and more popular in the 21st century. Through vigorous development in recent decades, intelligent buildings have gained more and more attention as an important infrastructure for the information society in the process of global informationization and the continuous development of information industry. As a discipline, there are many disciplines and departments involved in the intelligent building under the rapid development of intelligent technology. In the process of implementing intelligent building project, the project management mode of project quality is closely linked. The successful implementation of intelligent building projects is inseparable with project management and mature technology. Intelligent building technology has now been developed quite mature, however, intelligent building construction project management level still needs to be further improved, which is of great significance to the smooth implementation of the project. In view of this, this article takes a project in Germany as an example, based on the status quo of intelligent buildings at home and abroad and related research results, based on the relevant theories of intelligent buildings, a project overview of Germany is introduced, analyzes project implementation process management status from the project construction progress, construction cost and construction quality analysis and analyzes its existing problems and causes of the construction process control results of the external factors that affect the outcome of the proposed. On the basis of this, there are recommendations, for example, to improve the progress of the management of a

摘　要

题目：智能化建筑施工项目过程管理研究——以德国某项目为例

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智能化建筑是从 1984 年首次出现的，智能化建筑在二十一世纪已经越发普及了。通过近几十年的蓬勃发展，智能化建筑在全球信息化进程的不断加快以及信息产业的不断发展中已经作为信息社会的重要基础设施越加受到重视。作为一个学科，智能化建筑在智能技术的迅猛发展下所涉及到的学科和部门也很多，在建筑智能化工程项目的实施过程中，项目质量的项目管理模式的先进性由密切的联系。智能化建筑项目的成功实施与项目管理以及成熟的技术是离不开的。智能化建筑技术如今已经发的相当成熟了，然而智能化建筑施工项目的管理水平依然有待进一步提高，这对项目的顺利实施有着非常重要的意义。鉴于此，本文以某项目为例，基于国内外智能化建筑现状以及相关研究成果，在智能化建筑的相关理论基础上对某项目概况进行了介绍，从项目施工进度、施工成本以及施工质量几个方面分别对其项目实施过程管理现状进行分析，并分析其存在的问题及成因还有项目施工过程控制结果影响的外部因素分析，在此基础上提出相应的崔策建议，如在项目进度管理的完善上明确项目进度管理的基本要求并做好阶段性的项目进度管理，在成本管理上需要全程关注项目成本，加强施工现场的秩序管理，科学核算质量成本以及确保数据的真实性，最后是对质量提出针对性地管控措施。总之，在项目施工过程管理中要对进度、质量以及成本进行全面综合管理，这样才能确保项目的顺利实施。

关键字：智能化建筑；施工项目；过程管理

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Content

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

With the rapid development of modern communication technology and computer technology, people has been increasing their awareness of information technology and their demand for information. This makes their demand for modern architecture not only on space and comfort, but also on efficiency, convenience, safety, as well as communication convenience. Because in this way, it is easier to gain access to information and exchange of information so that information can be shared and thus the market economy and the economic globalization of enterprises can be met. Under this back ground, Building Intelligence System appears and grows rapidly. Fan, (W.Q,2017)Project management are in fact common, of course, there are some of its inherent characteristics, including intelligent buildings as well. As a complex system engineering, the construction of intelligent building engineering not only has the characteristics of building electrical engineering, but also has the characteristics of modern control engineering and information engineering. First, the intelligent building project as a sub-project of the main construction project needs to be coordinated with the progress of the main project schedule. Second, the intelligent system is attached to the building body, and related to other building systems. It not only cooperates with other projects, but also within itself. (Wang.W.X,2012)The requirements of the project are very high and it needs a wide range of coordination and communication. Third, as a product of high-tech fields, intelligent building has a strong comprehensive. Its system functions and structure are more complex, involving a wide range of subject areas, such as system integration theory, acoustics, control theory, computer science and electronics, which can see that it has complex target features and high-tech features.

Since the 21st century, breakthroughs have been made in information and communication technologies. The information physics fusion system is a next-generation intelligent system that integrates computing, communication and control. It is a unified entity that calculates process and physical processes. CPS contains ubiquitous environmental awareness, embedded computing, network

communications and network control and other systems engineering, which makes the physical system with intelligent computing, communications, precise control, remote collaboration and adaptive functions. With the integration of CPS into manufacturing and logistics technology, German Industry 4.0 has created an innovative factory system - the Smart Factory - through its integration with the Internet of Things and the service network. (Xu.W,2012).The fundamental purpose of Germany's strategy of implementing Industry 4.0 is to "ensure the future of German manufacturing industry" and to the strategic goal of "making the manufacturing industry make great strides in history through leaps and bounds" in its 2025 manufacturing. In essence, it is "ensuring the future of China's manufacturing industry". Specific to the enterprise, the implementation of Industry 4.0 strategy is by no means a face-saving project, not to buy the most advanced hardware and software, should be " (Jiang.B,2011)to improve quality and efficiency as the center", the fundamental purpose is to "ensure the future of the enterprise." Therefore, Languang Innovation believes strategy and measures that everything is conducive to "quality and efficiency", all conducive to "ensure the future of the business" are worthy of recognition.

If this intelligent construction project still adopts the traditional project management mode, it will be limited in the pre-demonstration and construction process management of the project. Due to the rapid development of intelligent building technology and the period of technology updating and gradually accelerated, it involves not only many management departments and disciplines, but also with its development to match the project management. There the study of intelligent construction project construction process management is particularly necessary (Lan. Y. H,2017).

1.2 Objective of the Study

As the largest developing country, our country has made good achievements in social development and economic development since its reform and development so far, under the efforts of people of all ethnic groups across the country. However, there is still conflicts among resource shortage, economic growth and environmental destruction. As the main place where people live and work, the energy consumed by buildings is extremely high, so the energy conservation of buildings has become the main target of attention. Nowadays, the contradiction is solved by the green,

intelligent and intelligent building because of its environmental protection, energy saving, comfort and safety features. The intelligent building system has now become one of the key parts of modern commercial buildings(Lu.Y,2016).

Although there are many intelligent building projects that have been completed now, many intelligent systems have not been opened up or the service life of the intelligent system has been shortened, which has brought great losses to investors. There are many reasons that cause this. The main one is the lack of intelligent construction engineering and technical personnel and low management level. (Chen.M.,&.He.F.Y,2013)Therefore, the application of modern project management in intelligent building construction projects has become the main area of our research.

Mainly through the research on the process management of an intelligent building construction project in Germany, this study provides reference for the process management of intelligent building construction projects in China meet the actual needs of the process management of construction projects in intelligent buildings and to improve Intelligent project management of modern construction enterprises and market competitiveness.

1.3 Significance of the Study

This paper studies the current status and problems of process management of an intelligent building project in Germany and the corresponding influencing factors and control measures. It is the practice and implementation of relevant theories and research results of project process management and intelligent building. It provides guiding and promoting to the trend of construction of China's intelligent building construction. It also offers some reference to project process management for China and other countries.

1.4 Conceptual Framework

The main contents of this study include the following parts:

Chapter 1, introduction. This mainly introduces the research background and significance of this article. Based on the information, it summarizes the theoretical framework of this study, and at the same time, it summarized the definition of conceptual operation related to this study.

In this paper, the author summarizes the research results of domestic and

foreign scholars on this subject and preliminarily formulates the basic structure of this article based on the actual situation of a certain project in Germany.

Chapter 2, literature review. According to the access to literature, this chapter will be domestic and foreign scholars in the integration of related research findings, and clarify the purpose of this study.

Chapter 3, research methods. This chapter mainly introduces the research methods, research tools, data collection methods and data analysis methods used in this study.

Chapter 4, results and analysis. The first is the status quo of the process management of intelligent building construction project - a project in Germany. First of all, an overview of a project is introduced, respectively, from the project progress, project costs, project quality and so on a project construction process management status quo analysis; followed by intelligent building construction project process management problems and causes analysis - a project in Germany. It analyzes project construction progress management, project construction quality management and project construction cost management separately and analyzes the external factors that affect the project construction process control results.

Chapter 5, conclusion and suggestion. Based on the above analysis, this chapter summarizes the work done in the full text, points out the limitations of the research in this article, and makes a prospect for the next research work. In addition, the corresponding research proposals are put forward. The first is to perfect the progress management of the project, clarify the basic requirements of project progress management, and do a good job in the progress management of the project. The second is to strengthen the cost management, and pay attention to the project cost, to strengthen the order management of the construction site, to scientifically calculate the cost of quality and to ensure the authenticity of the amount of data. The third is the quality control measures.

1.5 Definitions of Terms

1.5.1 The concept of intelligent building

With the development of technology, computer technology, control technology, communication technology and the application in various industries, intelligent buildings develop rapidly. However, since it contains too much and it is too

complicated, it is still under development. So far, there is no universally accepted definition of "intelligent building" and there are different definition sin different countries and regions. (Wang.S. L, 2016)

The American Intelligent Building Institute (AIBI) defines "intelligent building" as the best combination of structure, system, service, operation and interconnection to achieve the best combination of high efficiency, high functionality and high comfort In addition, AIBI states that "there are no fixed characteristics to define intelligent buildings. In fact, the only characteristic that is common to all intelligent buildings is that their structural design can be adapted to the changes of convenient and cost reducing (Kerzner.Harold,2003). AIBI defines the elements and goals of the characteristics of intelligent building. Its means of implementation is only in a broad sense, and it tries to emphasize the applicability of technology.

The European Intelligent Building Group, based in the United Kingdom, defines intelligent buildings as "creating a building that will maximize the efficiency of the occupants while managing their resources more efficiently and with the lowest maintenance cost Building environment. Intelligent buildings should provide a fast, efficient and supportive environment that enables users to achieve their business quickly. ” (Derek.Clements-Croome,2011) According to this definition, it can be seen that the European definition of intelligent buildings emphasizes more on user requirements than on technology.

The Japanese Intelligent Building Institute defines intelligent buildings as "Intelligent buildings are high-performance buildings. The building environment must adapt to the requirements of intelligent buildings, facilitate the efficient use of modern information and communications equipment, and adopt the automation technology of construction equipment and buildings with highly integrated management capabilities (Nan.D,2013) .”Japan's definition focuses on the household's own considerations, especially with regard to the working environment of the tenants and the means provided for the work.

The Singapore Government Public Facilities Agency requires that three conditions must be met for an intelligent building. First, an advanced automated control system should be set up to regulate the various facilities in the building including room temperature, humidity, lighting, security and fire control to create a

comfortable environment. Second, good communication network facilities, so that data can be distributed between floors and floors or within the building. (Davidfisk,2012)The third is to provide adequate external communications facilities.

Singapore emphasizes the automation of equipment and communication network facilities, mainly to define intelligent buildings at the technical level.

In the "Design Guideline for Smart Apartment Building Automation Systems" in Taiwan, the definition of intelligent building was as "refers to building and its base building automation system (Building Automation System, BAS), with the architectural space and the building body components , integrates operation, maintenance and management of equipment systems and space use in buildings such as electrical, telecommunications, water supply and drainage, air-conditioning, disaster prevention, anti-theft and transportation, etc. from the perspective of ergonomics, physical environment, operation type and management type Automation, so that the function and quality of buildings to enhance in order to achieve the building's safety, health, energy saving, convenience and comfort purposes (Zheng.R. X,2013). "

Shanghai Huadong Architectural Design and Research Institute took the lead in launching "intelligent building design standard" in Shanghai to define intelligent building as "taking architecture as platform, combining with construction equipment, office automation and communication network system, integrating structure, system, service, management and the optimal combination between them, to provide people with a safe, efficient, comfortable and convenient environment for the building."

Intelligent buildings in Asia define intelligent buildings as follows: intelligent buildings are designed and constructed according to proper selection of high-quality environment modules and meet the needs of users by setting appropriate construction equipment and obtaining long-term construction value.

As can be seen from the above definition, in different countries, different periods, different industries, the content of intelligent buildings is not the same. most of the definitions are referred to the goal or purpose of intelligent buildings, but a broad description of ways to achieve; Western countries Prominent is to meet the needs of end users, while the Eastern countries are more emphasis on technical maneuverability (Shi.F,2012).

In summary, any definition of intelligent buildings should be clear premise, means and purpose, and should improve the implementability. Based on this premise, the author proposes his own understanding of intelligent buildings: "intelligent buildings are based on building space and building systems and apply control technology, communication technology, and computer technology (3C) of buildings to meet requirements of people in the building on the management and service. It is supported by the network, database technology and communication protocol, and it is characterized by the combination of the usability of the building, facility automation and intelligent function. It is a multi-functional system that integrates traditional building technology, information technology, automatic control technology and system engineering Functional building(D. Tullett，2011) . "

1.5.2 Intelligent building features

Compared with traditional buildings, intelligent buildings have the following characteristics:

1.5.2.1 It has a strong intelligent function.

As a result of the combination of modern control technology and architecture art, the intelligent function of intelligent building is the biggest difference with the general building. Its intelligence is mainly embodied in office automation, communication automation and construction equipment automation. Building management systems and remote communication systems work together to allow users to use their side phones as a terminal for humidity and temperature setpoints for change control; Humidity and temperature values of the test value of the confirmation of energy use and equipment operating conditions to be notified; building management system and office automation system are with the coordination, so that the office automation in the regional network of personal computers, workstations access to building management information. This allows meeting rooms and other space reservation management system and air conditioner operation combined to achieve linkage. It also enables the energy management collected by the building management system to be integrated with the financial management system for office automation (Hu.G,2017).In addition, the rapid development of intelligent building, the connotation of capacity and a variety of high-tech and equipment will continue to introduce multimedia computers, broadband integrated business data networks and

other advanced systems with telecommunications systems and office automation systems, so that the information isolated Buildings become a node of the WAN.

1.5.2.2 The rapid development and large capacity content

The rapid development of intelligent buildings and their large capacity introduce various high-tech and equipment such as multimedia computers and broadband integrated services data networks (B-ISDN) into 3A systems(Sun.X. J,2013).

1.5.2.3 Great flexibility

This is manifested in two aspects. First, there is a high degree of flexibility in adapting to change in an intelligent building environment. For example, a room is designed as a living room (partition), an active floor and a large room, which can be divided into cubicles with different stations. The floor is assembled from a small floor, so that the layout of the building and partition wall can be flexibly changed with the need. Secondly, the pipeline design has the ability to adapt to changes, which can adapt to various situations such as tenant replacement, change of usage mode, equipment location and performance change. For example, the air conditioning system adopts the control of baking value, the optimal start / stop control, automatic control and a variety of energy-saving optimization control measures, which is efficient, energy-saving and convenient(Zhang. Z. T,2012).

1.5.2.4 High energy efficiency and the ability to run in the most economical and reliable state

For example, the air conditioning system uses the baking control, the optimal start-stop control, setting value automatic control and a variety of energy-saving optimization control measures, which makes the building' energy consumption drop significantly, resulting in huge economic benefits.

1.5.2.5 Increasing of the proportion of equipment investment

Intelligent systems in various types of intelligent building accounted for a large proportion of the total investment, which is almost the same as the investment in structural engineering.

1.5.2.6 High architectural requirements

The main contents of the intelligent system implementation contain equipment installation and commissioning, such as the installation and commissioning

of the central control system, the completion and commissioning of the various subsystems, the cabling of the integrated wiring system, the installation of the control system and the installation and debugging of many subsystem equipments. Since there are a lot of content and a longer duration, the corresponding also has higher requirements. Building intelligence typically can take up half the project duration, and the implementation of intelligent systems is spread over half the total project time. Not only this, the intelligent system of equipment and control from the current situation, many of them are directly imported from abroad, which not only has a high demanding of implementation, but also has some strong technical needs of civil works. Besides each subsystem's installation, networking and debugging work should also be coordinated with each other(Hu.G.,2017).

1.5.2.7 Many new features are based on the 3A system's interaction.

1. Building management system and remote communication system work together to let the user take advantage of the side of the phone as a terminal to control the temperature and humidity given value changes to confirm the test value of temperature and humidity, to notice energy usage and equipment operating status, in the abnormal user alarm notification, in air conditioning, lighting input and cut off. It also allows buildings (community) management center to centralize monitoring several buildings through the external network.

2. The building management system cooperates with the office automation system so that the personal computers and workstations connected to the office automation area network can obtain the building management information. This allows meeting rooms and other space reservation management system and air conditioner operation combined to achieve linkage. The energy usage collected by the building management system can also be combined with an office automation financial management system.

3. The cooperation of telecommunication system and office automation system makes the isolated buildings on the information become a node of the WAN.

1.5.3 Phase points Intelligent building construction project management

The main work to be done at this stage is to implement the deepening of the success of the design stage and achieve the requirements of deepening the design so as to ensure the construction technology and construction quality. The quality indexes

of all kinds of equipment used in it should fully meet the design requirements of the technology and the corresponding functional requirements, and make reasonable control over the progress of the funds according to the actual project progress. A key part of this is to solve the problem of construction interface between construction companies and equipment suppliers in the actual construction process and to coordinate with various construction companies and equipment suppliers. The work of this stage is mainly management, so the process management of project construction will be the issues we need to pay attention to(Zou.G. H,2017).

First, construction management. The most productive and time-consuming phase of the entire project construction cycle is the project construction phase. According to a series of previous work, the key to the construction phase is whether the construction of the project can be finally completed and its proper role in the future use. Construction management is an important means of implementing the project plan and controlling the quality objectives in the construction phase. The construction management of the project can be implemented through concrete work and related measures throughout the project implementation.

Preparation before construction. Before the construction, the project team should be established and determine the project objectives and organizational design. At the same time, management systems and construction organization programs, that is, the project construction schedule and quality planning should be set up. Not only this, but also there should be corresponding procurement plans and inspection plans, as well as organizing the construction team(Liu.X. Q,2012).

Management and control of the construction process. Through the implementation of the construction plan, implementation and adjustment to implement the pipeline, the construction of the line and equipment installation and commissioning, it combines goal management with process control. In order to achieve table management and implement the project inspection system， it establishes a step-by-step plan as well as the concrete objectives of the project; organize inspection and guidance are to ensure civilized construction; further implement the safety system is to prevent accidents; and coordinate the relationship between the parties , carrying out reasonable control over the construction plan of the project is to make corresponding adjustments(Zhao. D,2016).

Second, the construction coordination and cooperation. Intelligent building is a sub-project of the construction project. There are many engineering cooperation interfaces in the process of construction, including the construction interface with the decoration, installation, civil engineering and other units, at the same time, the construction interface of each intelligent system in the system. Whether the intelligent system can smoothly follow the civilized construction requirements, safety requirements, schedule requirements and quality requirements have a great relationship with the clear and positive communication and coordination of all parties involved in the project. Therefore, the construction coordination and coordination in the project construction management is very important.

The "three controls, two management and one coordination" in the theory of project supervision effectively control and effectively coordinate the quality, progress and cost of the entire intelligent system and effectively coordinate the construction organization. It is one of the important responsibilities of project management to delineate and clarify the implementation tasks of each subsystem and the working interface and responsibility between intelligent systems and other types of work. It is necessary to make clear that the construction interfaces are favorable and the project is promoted in an orderly and expeditious manner(Luo.Y. S., & Zhang.J,2014).

The third point is design change management. In the project implementation, due to the particularity of the construction project and the complexity and development of the intelligent system, the system may be changed, including the changes of the project implementation requirements and the changes of the system requirements. If it is a small system needs change, then the system design must be changed.

Design changes during construction often include simple local changes and complex whole changes. One of the simple local changes can increase or decrease a few front-end points in a system. The change can be modified by way of a single contact, and then by the construction side, supervision, design, signed by construction parties and other units before it is able to be constructed. All complicated changes involve more content, such as an increase of a subsystem. The change requires the design unit to re-design or change the construction plan in the light of the actual situation of the existing project. If these changes involve the building itself, then the

minor design changes should be confirmed by the architectural design institute(Liu. F,2016).In the meantime, when the design changes occur during the construction, it often involves the construction interface with the civil engineering, installation, decoration and other units, which also needs to be further coordinated and coordinated in the project management.

CHAPTER 2

LITERATURE REVIEW

2.1 Foreign Literature

From the mid-1940s to the 1960's, project management was widely used in civil, industrial and defense projects in developed countries. Project management focused on the project planning budget and some specific management objectives during this period. In order to pursue investment efficiency and adapt to the ever-expanding needs of engineering construction, by the mid-1960s, people of insight in developed countries were increasingly aware of the importance of project management, and since then have also established three international project management organizations, which are: The Australian Institute of Project Management (AIPM), Project Management Institute (PMI) and International Project Management Association (IPMA). Modern project management phase started from the 1980s, and gradually developed into a management discipline, making great progress both in theory and in practice. By the 1990s, with the continuous development of software engineering, network engineering and information system engineering, coupled with the emergence of project management such as large-scale construction projects and high-tech project development, the project management has both the theory and the method. A lot of innovation, to promote the rapid development of project management, but also more modern, but also broadened the scope of application of project management.

2.2 Domestic Literature Review

China's project management in the real sense of systematic research and industry practice started late. The first project management should be a project utilizing World Bank loans - the Lubuge Hydropower Station. In 1984, China first adopted international bidding and project management to shorten the construction period and reduce the cost, which obtained obvious economic benefits. (Sheng.M,2013)Since then, many large and medium-sized projects in our country have implemented the project management system in succession, including the project capital system, legal person responsibility system, contract system and construction supervision system. In other fields, including high-tech fields, are also constantly

exploring the implementation of project management. In terms of the professional development of project management, China has established and implemented the cost engineers, supervising engineer examinations and the national registration system.(Ji. L,2013)It should be said that the achievements made in our country's project management over the past decade have been remarkable.

With the extensive application of project management and the continuous development of intelligent technologies, the achievements of intelligent buildings in project management in China are also remarkable. Project management companies in some western developed countries have also started extensive use of project management software for project management of intelligent buildings. Some of China's first-level construction enterprises and super-class construction enterprises also began to focus on the use of information technology for intelligent building information management. Some domestic construction enterprises with comparatively strong technical strength have also independently developed practical management software applicated to the enterprise level and the project level, including the construction enterprise information management system of the third company of CSCEC, the construction project of the four companies of CSCEC management information system. There are also some construction projects of information management that have also attracted the attention of some experts and scholars. Some of the technical colleges and universities began the relevant research work. (Chen. J,2015)For example. Shenzhen Qinghua Swell Software Technology Company was established by the Shenzhen Institute of Tsinghua University and Shenzhen Swell Computer Corporation jointly. The company mainly researches and develops the construction industry application software and integrated systems. Harbin Institute of Technology, Shanghai Jiaotong University, also jointly developed with software companies to develop different types of construction project management software.

However, it should be noted that although there has been good results in this research, there should be a clear understanding. Compared with the developed countries, the level of project management in our country is still very low. Especially for the intelligent buildings that have developed recently, there are many deficiencies in the management of construction projects. This is specifically reflected in the following aspects:

1. Some developers do not know much about the connotation and complexity of intelligent buildings. They know little about the development of intelligent building technologies, and they also do not invest enough nor attach importance to intelligent buildings. There is not enough professional and technical personnel; professional knowledge update and improving of the learning did not get any attention.

2. The learning and mastery of norms and standards are not timely, not comprehensive and not profound understanding and effective implementation.

3. There is little understanding of the needs of the market and the positioning of the project is not right.

4. It pays attention to "concept" operation, regards "intelligence" as the selling point of building sales and puts energy and money on the show, but it does not pay attention to do practical work in a down-to-earth manner, which disappoints those who bought the house and had the feeling of being "cheated". This kind of unrealistic speculation and the "fashionable" speculation and can only lead to intelligent building astry and thus curb market demand.

5. The phenomenon of "efforts on construction and ignore management" is relatively common. During the construction period, the involvement of intelligent building management and the introduction and reserve of technical personnel are overlooked. The awareness of management falls backward is not. The high and new technology of intelligent building is not known. Besides knowledgeable management is needed. Most buyers are still not easy to accept intelligent building's high input of knowledge management, requiring only a high standard of management and services, but they do not accept the corresponding standard fees. (Zhou.X. H,2012) Property companies are also reluctant to hire well-paid hiring engineers who are familiar with or proficient in intelligent building technology. Some minor problems in system operation can not be solved in time, the system can not operate normally, and intelligent buildings can not be brought to investors with effective(Zhang.J. H,2016).

6. It is impossible to put forward practical and feasible design requirements for the intelligent system. The design standards and quality of the drawings are not allowed to be judged. For the project contractors, they opportunistically design and construct and errors cannot be found and identified in time.

7. There is no method and procedure for grasping and controlling the engineering technology and quality, especially the lack of distinguishing ability and means of inspection on the quality, performance and authenticity of the equipment and products. It lacks of effective control procedures for the installation and testing and acceptance processes, as well as control methods.

8. People only pursue new things and listen to fake advertisement by suppliers. They do not know that it is impossible to keep advanced all the time. Because construction always falls behind the development of technology, the newest is not always the best and the best is not always the most suitable one. If a project could be comprehensive consideration and optimization design, on the one hand it meets the function of its subsystems and on the other hand it could achieve system integration, we could say this project is rather ideal(Shi.L,2014).

9. In some buildings with smart building signboards, the functions are not open enough, and the subsystems are independent and self-contained. The information can not be interworked and the resources cannot be shared. System integration is not realized at all, and system upgrades and networks Internet brings many difficulties and sequela.

10. Determining a reasonable price should be the basis for the success or failure of the project. However, some developers try to lower investment, resulting in building functions, grade decline and intelligent system fragmented, which leads intelligent building having only fame.

CHAPTER 3

RESEARCH METHOD

3.1 Research Design

This research mainly adopts the following research methods:

3.1.1 literature analysis

By referring to a large amount of documents and materials, the research results of domestic and foreign scholars on this topic are collected, integrated and combed to understand the concept and characteristics of intelligent buildings and the key points of the content of the intelligent construction project so as to provide theory Based on and reference.

3.1.2 Case Study

Taking an intelligent building construction project in Germany as an example, according to the introduction of a project overview, the status quo of construction progress management, status quo of construction cost management and status quo of construction quality management are analyzed, and its problems and causes in this aspect and their impacts are also analyzed construction project process control factors, so as to provide a reference for the project process management strategy formulation.

3.2 Research Tools

The main research tools used in this paper are excel2007, visio2010, etc., of which excel2007 is a tabulation tool, mainly the progress of the project construction planning process and time editing, making the entire project process implementation tasks and time can be clear at a glance. The visio2010 is a drawing tool, mainly used to draw the project construction quality management flow chart, the specific construction quality management process through the form of a graphical display, quality management analysis in accordance with the specific process to determine the quality of the corresponding link, and to provide the basis for the corresponding countermeasures.

3.3 Data Collection Methods

The data collection method of this article is mainly through the data provided by the company where the project is located and the relevant data is

collected through the Internet.

3.4 Data Analysis Methods

Data analysis methods mainly through the software such as Excel 2007 for statistical analysis. This data analysis method is relatively easy to operate. The calculation involved is relatively simple and does not increase the corresponding workload.

3.5 Research Process

This research process is shown below:

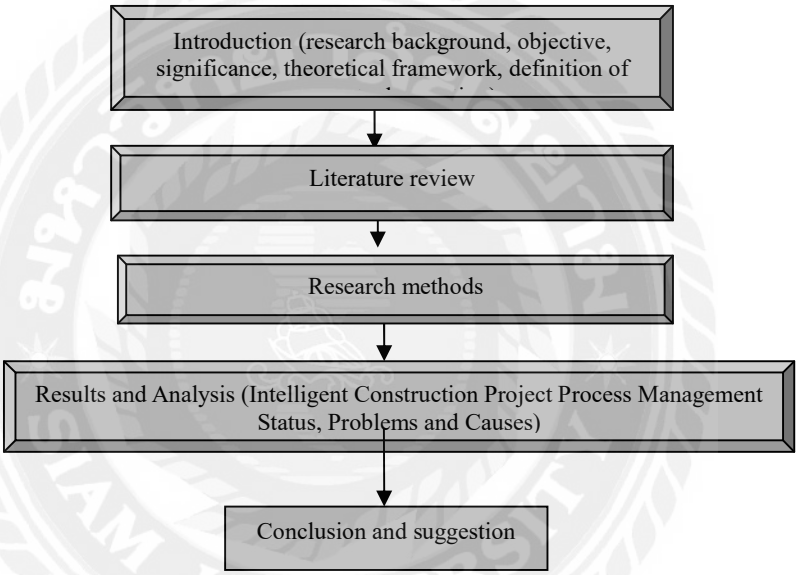

Figure 1 Research process of this study

CHAPTER 4

RESULTS AND ANALYSIS

4.1 Intelligent construction project management status quo - a project in Germany as an example.

4.1.1Overview of project

The project is a German new engine factory construction project. The factory building is a complex of buildings, including integrated office buildings, joint factories, foundries, power stations, canteens and other single buildings. The two single buildings are interrelated, and each is of specific functions. The project includes subsystems such as communications, computer networks, broadcasting, television, surveillance, access control and communications pipelines.

In order to ensure the organized implementation of the project, a project team was set up for the project. The main site managers and technicians involved in this project include project manager, technical manager, technician, security officer, budget, contract management and plan coordinator, buyer, quality inspector and foreman, etc. The project team is mainly responsible for the management of the project implementation phase.

4.1.2 The status of construction progress management of the project

4.1.2.1 Basis preparation for the intelligent building project schedule

1. Documentation and minutes of the meeting of the project construction unit (owner) ;

2. Contract duration: August 12, 2015 to November 16, 2015;

3. Project construction quota;

4. Construction site conditions: equipped construction conditions, but too many on-site construction teams and too much interference;

5. material supply conditions: customized products, the longest delivery cycle was weeks;

6. Meteorological data: During the construction period, it was basically not affected by the winter rainy season.

4.1.2.2 Construction process and lapsing of the intelligent building project

According to the characteristics of the project, the construction process is divided according to the subsystem, divided into five subsystems:

1. Communication Pipeline Subsystem (See Table 1)

Table 1 Communication Pipeline Subsystem Process Table

Serial number	Process	Duration and lapsing
1	Construction preparation	Start from August 12, three days
2	Mapping line	Start from August 14, three days
3	Excavation of external pipe network earth	Start from August 15, 7 days
4	Clean the trench	Start from August 16, 6 days
5	Pipe cushion	Start from August 17, 5 days
6	Pipeline laying	Start from August 19, 9 days
7	Clean the pipeline	Start from August 22, 8 days
8	Pipeline encapsulation	Start from August 24, 8 days
9	Pipe welding to every home	Start from August 17, 7 days
10	Tube well masonry	Start from August 19, 14 days
11	Plastering mortar	Start from August 25, 7 days
12	Backfill earthwork	Start from August 26, 6 days
13	The production of manhole cover	Start from August 20, 13 days
14	Install the well pieces	Start from August 29, 5 days
15	Sub-item acceptance	Start from August 24, 20 days

Italic items in the table are the swap items

2.Plant Communication Subsystem (See Table 2)

Table 2 Plant communication subsystem process table

Serial number	Process	Duration and lapsing
1	Construction preparation	Start from September 3, 3 days
2	Material access	Start from September 5, 6 days
3	Telephone cable laying	Start from September 11, 12 days
4	Network optical fiber laying	Start from September 11, 14 days
5	Telephone cable into the end	Start from September 19, 9 days
6	Sub-item acceptance	Start from September 17, 14 days

3. Monitoring subsystem (see Table 3)

Table 3 Monitoring subsystem process table

Serial number	Process	Duration and lapsing
1	Construction preparation	Start from August 29, 8 days
2	Monitoring network earthwork excavation	Start from September 7, 8 days
3	Clean the trench	Start from September 9, 6 days
4	Piping and optical fiber laying	Start from September 13, 17 days
5	Monitoring rod embedded parts production	Start from September 12, 8 days
6	Monitoring cable laying	Start from August 20, 46 days
7	Monitoring production and installation	Start from September 22, 14 days
8	Monitoring camera installation	Start from September 27, 16 days
9	Monitoring Center equipment installation	Start from October 5, 10 days
10	Monitoring system debugging	Start from October 8, 10 days
11	Sub-item acceptance	Start from September 23, 28 days

4. Infrared alarm subsystem (see Table 4)

Table 4 Infrared alarm subsystem process table

Serial number	Process	Duration and lapsing
1	Construction preparation	Start from September 4, 8 days
2	Infrared earthwork excavation	Start from September 10, 8 days
3	Clean the trench	Start from September 14, 8 days
4	Pipeline laying	Start from September 17, 20 days
5	Production of shotgun embedded parts	Start from September 21, 28 days
6	Radio cable Laying	Start from October 4, 15 days
7	Installation of the radio probe and module	Start from October 10, 16 days
8	Alarm Center equipment installation	Start from October 16, 10 days
9	Alarm system debugging	Start from October 21, 9 days
10	Sub-item acceptance	Start from October 7, 28 days

5. One-card system (see Table 5)

Table 5 One-card subsystem table

Serial number	Process	Duration and lapsing
1	Construction preparation	Start from September 16, 8 days
2	Cable pipeline laying	Start from September 22, 14 days
3	Attendance machines and other equipment installation	Start from September 30, 8 days
4	Communicator installation	Start from October 4, 21 days
5	Software debugging	Start from October 21, 26 days
6	System debugging	Start from October 24, 16 days
7	Sub-item acceptance	Start from October 18, 27 days

4.1.2.3 Safety precautions of the progress of the intelligent building

According to the characteristics of the project, combined with the site conditions and construction programs, in order to ensure the completion of the contract duration, the project team has formulated the following progress safeguard measures.

1. Develop a practical construction program, adhere to a reasonable construction procedures and construction sequence, follow the construction technology and its technical rules, and organize the sub-project construction.

2. In combination with technical measures, various new materials, new technologies and new methods to speed up the construction are prioritized.

3. The technology and quality of single project should be fine and practical. Strict procedures for the transfer system, conceal projects in a timely organization and acceptance and ensure that there is no rework.

4. The preparation of sub-projects do not occupy the construction cycle and reasonable use of time will be interspersed into the construction of their projects.

5. According to the construction requirements of each sub-item and section, connect them rationally and organize the construction of parallel three-dimensional crossings. Equipped with two sets of team work on the construction organization, unify command, organize the construction at the same time and speed up the progress of the overall project.

6. It is equipped with a set of excellent project teams capable of fighting tough battles. from the project manager to the members of the small team, the physical quality is good, the business should be refined, they should have the ability to connect with operations, and there should be an organization that can guarantee command 24 hours a day mechanism.

7. The number of personnel of the main types of work is flexible and could grab the progress in the key areas.

8. To coordinate the relationship with the general contracting and other specialized types of work, to arrange the working procedures so as to avoid the collision and interference with each other and to ensure the smooth progress of the construction period.

9. According to the actual situation on site, inspect and analyze frequently

the production problems occurred in the construction, find timely adjustment, scientifically arrange the production plan and ensure the realization of the contract duration.

10. Make all preparations before construction, and enter the site in advance according to the specific conditions at the construction site and organize the mechanical equipment, materials and personnel in advance and in a reasonable and orderly manner, and ensure implementation according to the construction organization plan.

11. Organize regular and irregular production coordination meetings to promptly solve all kinds of problems arising in production.

12. Establishing a system of award and punishment for the duration of the project, signing the responsibility period for ensuring the project duration, and ensuring the prompt rewards and punishments.

13. The materials should be placed in piles strictly according to the layout plan of the site to avoid secondary handling and make rational use of space to create conditions for smooth construction.

14. All kinds of construction equipment shall be managed by the specific persons and repaired and maintained by special personnel. The operation status should be checked frequently. The operation records should be filled in carefully and the delivery system should be strictly implemented to ensure the safety factor and continuous operation coefficient to ensure the good condition and the utilization rate.

4.1.3 Construction cost management status of the project

In the project implementation process, the project department also strictly manage cost in accordance with the company's cost management measures.

4.1.3.1 Cost control management program project manager manage cost control according to the following procedures:

1. The company carries out the project cost forecast and formulates the project cost control target;

2. According to the company's goals, the project manager formulates cost plans, the implementation of cost control and cost accounting;

3. Project manager analyzes cost and prepares the project cost analysis report;

4. Collect and save cost information.

4.1.3.2 The calculation of the target cost

1. According to the company's operating objectives, estimates:

Target cost reduction rate = target cost reduction / budget cost

Target cost reduction = budget cost - target cost

Budget cost = engineering settlement income - taxes

Target costs = labor costs, materials costs, machinery costs, other direct costs of the planned costs + management fee plan - material supply profit plan

2. Target cost calculation basis.

Company target profit and cost reduction rate.

The project's budget costs.

Project construction organization design and cost reduction measures.

The cost of similar projects in similar industry.

Construction quotas within the enterprise.

4.1.3.3 Construction cost control

4.1.3.3.1 Construction project cost control takes contract, subsystem cost as control objects.

4.1.3.3.2 Construction project cost control: labor costs, materials costs, machinery use fees, other direct costs and indirect costs.

4.1.3.3.3 Construction project cost control methods

1. Labor costs control .

Improve the efficiency of labor productivity: improve the level of mechanized construction, as far as possible to use mechanical construction, such as the construction of trench excavation as far as possible the use of mechanical construction; improve the labor organization, the implementation of specialized operations; labor costs strict implementation of fixed quotas to avoid "grinding ocean" phenomenon, strictly control the labor team labor costs expenses; the use of convenient and rapid means of communication, the introduction of the remote office, compressed non-productive employment.

2. Material costs control.

Strengthen material budget compilation and review work to reduce purchase cost; insist on on-site material acceptance system, strengthen pre-product pricing and

on-site supporting supply.

Implement quota system to improve the "three rates" of turnover materials (turnover rate, good rate and recovery rate)

3. Mechanical fee control

Rational allocation of construction equipment, adhere to the people, set machine, set jobs, improve the construction machinery "three rates" (good rate, utilization, operating efficiency).

4. Other direct cost control

Reasonable allocation of construction equipment, adhere to the people, set machine, set jobs, improve the construction machinery "three rates" (intact rate, utilization, operating efficiency), on the part of general-purpose machinery that is required to rent that way, to control the occurrence of mechanical fees.

5. Indirect cost control

The key to the control of indirect costs is to lean management, encourage managers to work part-time, and implement cost-controllable expenses to save expenses and reduce waste.

4.1.3.3.4 Emphasis of cost control

Study and research the terms of the construction contract, formulate and implement the construction budget budget control, project final accounts, make engineering claims and measures to reduce the project cost.

Demonstrate and optimize the construction design or construction program, technological innovation, technological progress, development and implementation of more conducive to reducing the cost of the project construction schedule and technical measures.

The cost analysis of construction projects must adhere to the principle of "seeking truth from facts, talking on the data, focusing on the limitation of time and serving the construction". One must conscientiously implement the responsibility system for cost management and establish a cost analysis system.

The project manager department must fill in the "Task Force Cost Summary Table" on a monthly basis and carry out text analysis to make analysis records. The project manager should document the result of cost analysis to provide basis for correcting and preventing cost deviation, improving cost control methods, formulating

cost reduction measures and improving cost control system.

During the cost analysis, it is necessary to find out the reasons for promptly correcting and handling the problems found in the indiscriminate and indiscriminate cost and violation of regulations, to ensure the truthfulness, accuracy and completeness of the costs, and to gradually strengthen and improve the management of costs.

When conducting cost analysis, real and reliable data should be used as the basis for analysis, that is, to have data analysis and comparison, and to have textual analysis materials to ensure the dependability of cost analysis results.

The main analysis methods are as follows:

1. Comparative analysis

Comparative analysis is to identify differences and analyze the reasons by the comparison of comparable indicators. Mainly includes the following analysis:

The actual amount of construction and budget compared to the amount of engineering analysis; actual consumption and planned consumption comparative analysis; actual purchase price and the planned price comparison analysis; various expenses actual amount and planned amount of comparative analysis; comparative analysis of actual costs and plans.

2. Trend analysis

Trend analysis is the analysis of a cost indicator of the current period and the number of previous years, the number of years and changes in recent years, in order to understand the cost of the development of the speed and trend of the method.

3. Factor analysis

In order to analyze and find out the impact of many factors on the cost index, one can only compare them with each other after the factor analysis is used to decompose the index into various factors.

4.1.4 Construction quality management status of the project

4.1.4.1 The general method of quality management

4.1.4.1.1 The user's demand for the quality of intelligent building project

1. Operability. The degree of product safety.

2. Availability. When used under given conditions, there is possibility that the products perform satisfactorily.

3. Reliability. Under given conditions of use and use of time, the product may be trouble-free operation.

4. Maintainability. After the provisions of the maintenance, the product is in normal operation capacity.

4.1.4.1.2 The main factors affecting the quality of intelligent building projects.

Intelligent buildings involve micro-electronics, computer, automatic control and network multidisciplinary multi-disciplinary, which is an interdisciplinary system engineering; technology changes involved and not yet mature. The particularity of the technical system naturally brings new difficulties to quality management. The main factors affecting the quality of intelligent building projects include the following several aspects (see Table 6).

Table 6 Main factors affecting the quality of intelligent building projects

Personnel	Project management staff qualifications: academic qualifications, job titles, job certificates	Contractor qualification
	Site operator qualification: technical level and employment permit	
	Subcontractor qualification	
	Business, Technology, Operational Training, Level 3 Safety Education	
Equipment, materials	Project approach equipment quality	
	Raw materials, semi-finished products quality, finished product protection	
Construction equipment	Construction machinery, equipment, tools	
	Testing equipment	
	Fire and other equipment	
Process Technology	Construction design	
	Construction program, work instructions	
	Laws, regulations, rules	
	Engineering standards, working methods, process standards, operating procedures related systems	
surroundings	Site construction environment: site, space, transportation, lighting, water, electricity, gas	
	Natural environmental conditions: meteorology, geology,	
	Engineering and technical conditions: design drawings, start the examination and approval, design submitted, the drawings examined	
	Design change negotiations	
	Project management conditions	Quality Management System
		Quality assurance activities

4.1.4.1.3 Intelligent building quality control points

According to the characteristics of intelligent building construction project, its quality control should be composed of the following seven parts:

Construction preparation phase; materials, equipment procurement phase; materials testing and construction technology test phase; construction operation phase; Use function, performance test phase; completion phase of the project transfer; return visit and warranty phase (shown in Figure 2).

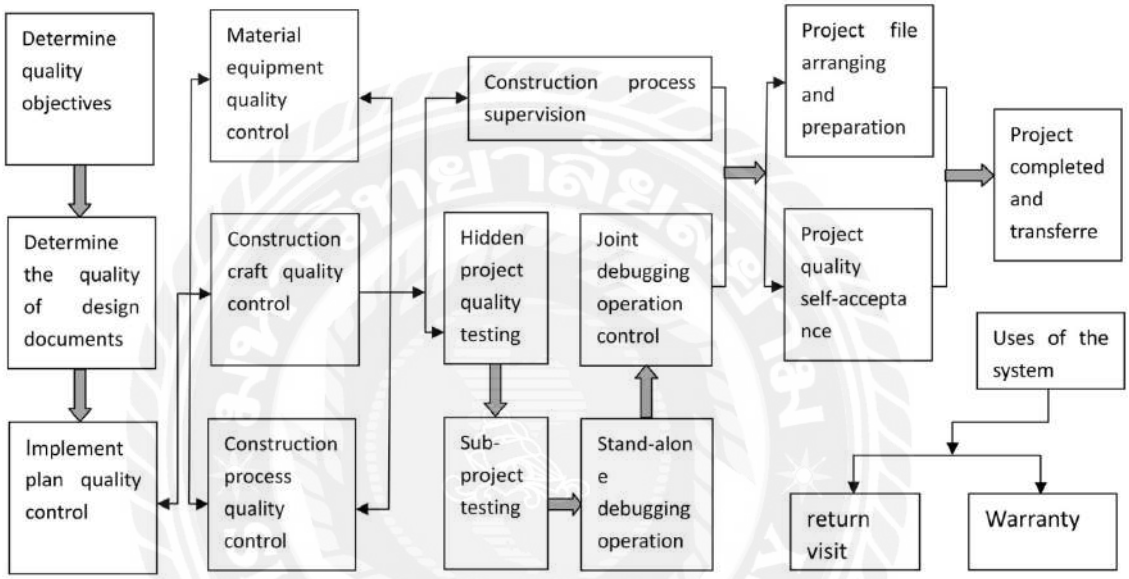

Figure 2 Intelligent building quality control chart

Thus, how to coordinate various stages of quality control work is a complicated process. In this process, it should focus on a good grasp of the following points:

First, the principle of "prevention first" should be implemented in the quality management of intelligent construction projects. Most of the concealed projects of intelligent projects do not have the rework conditions in most cases, or there are other huge losses caused by reworking. Therefore, we should try our best to ensure the final delivery quality by controlling the quality of every link in the construction process.

Second, the intelligent construction project quality management should pay attention to the analysis of quality accidents. The construction environment of intelligent building project is complex, and the quality of intelligent building system is greatly influenced by environmental factors. The emergence of many quality problems are closely related to the environment and construction conditions, the need

for specific analysis of specific issues, take the appropriate measures to address the actual situation on the scene. Therefore, special attention should be paid to the timely and in-depth analysis and follow-up of quality accidents so as to avoid the assumption of dogmatism.

Third, the intelligent construction project quality management should play the role of internal and external supervision and testing. The intelligent building system is not only a system of continuous development of technology, but also a building system that should be closely integrated with the system requirements to adapt to the building system. Its construction standards, requirements are constantly changing. There may be some aspects of lag and not adapt to the phenomenon, It needs to be regulated and adjusted by means of supervision and inspection.

Fourth, the quality management of intelligent building project should pay attention to the role of quantitative analysis. Intelligent building systems have rather mature detection methods and measurement methods. The system's quality indicators can be detected on the spot to identify problems in time and to locate the cause of the problem, providing data for the study to solve the problem, which is an important feature and advantages of intelligent construction project quality management. We must fully utilize this, to protect the quality of the project.

4.1.4.2 The construction quality management of the project

4.1.4.2.1 The quality control process of preparation of the intelligent construction project during the construction phase

Quality control in the project construction phase is closely related to the cost and schedule control of the project. In order to achieve the quality target, the relationship between quality control and cost and schedule control must be coordinated. This is the main consideration at the time when we are preparing a project quality control process. For example, we set aside sufficient time for part of the inspection and acceptance at the time of preparation of the preliminary schedule and take a conservative approach to cost control in order to keep the progress of work under pressure. To provide protection of time and cost for quality control (see Figure 3).

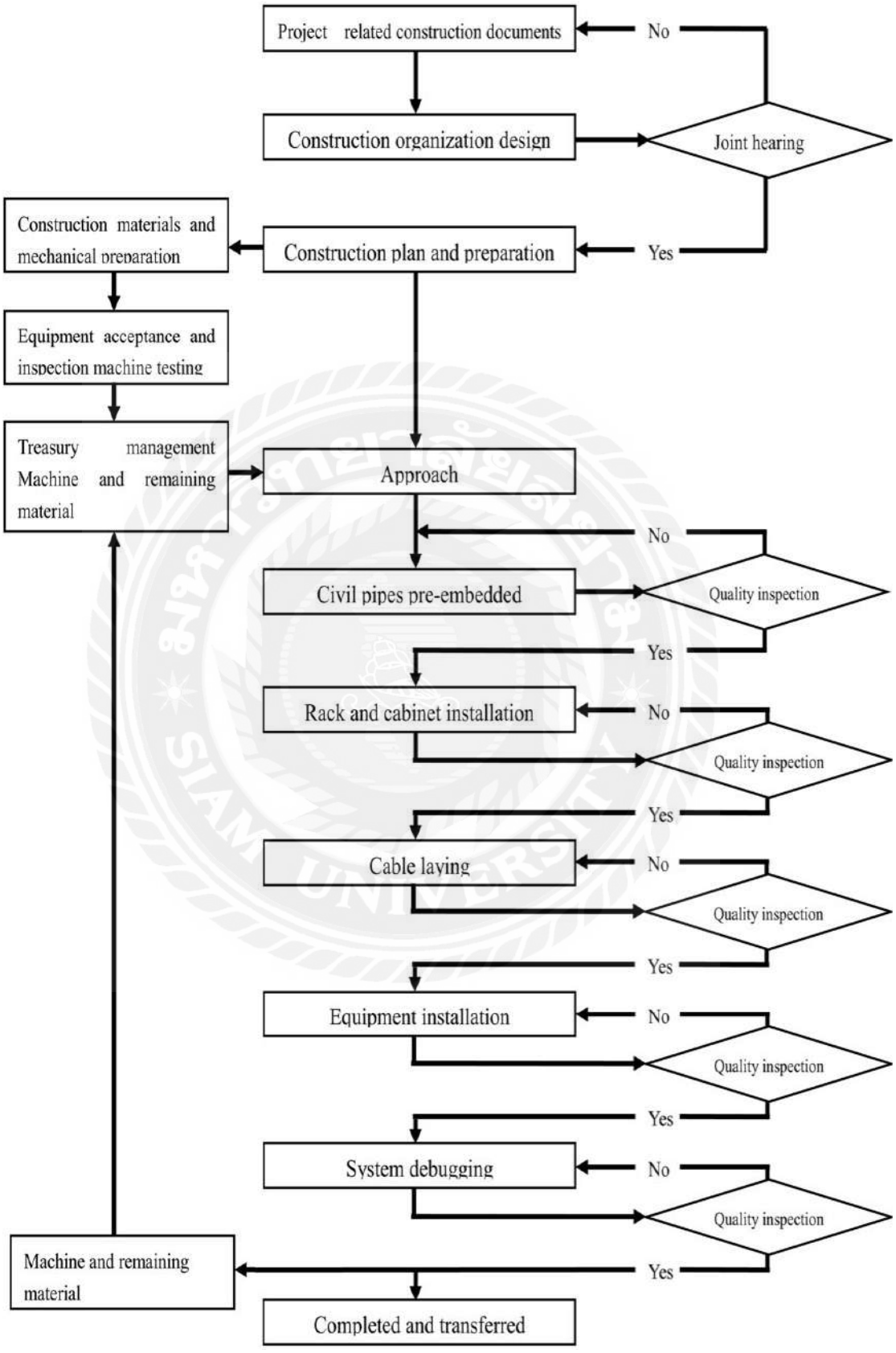

Figure 3 The intelligent building project quality management flow chart

4.1.4.2.2 Strict implementation of quality management rules

In order to effectively restrain human behavior, and earnestly implement the quality management rules is an effective way, factors affecting the construction quality of the human factor is the primary. Specifically, to implement the following aspects:

1. Strict implementation of self-test, mutual inspection, special inspection system. Self-inspection by the construction staff, mutual inspection by the team leader is responsible for the organization, after passing the quality management personnel for special inspection. Hidden projects need to be signed by the supervision before they can continue construction.

2. Strict implementation of pre-inspection system. Pre-screening objects are inter-process lap joints and within the key parts processes. According to the importance of pre-inspection object, the pre-inspection was respectively by the project manager, technical director, technician, quality inspector, team leader responsible for the organization and implementation. Construction could not be continued before pre-inspection qualified.

3. Strict implementation of materials storage system. Materials storage system is an effective means to protect the quality of materials an important means of storage of materials in construction. It should strictly quality control, check the production license, factory certificate, inspection certificate production quality must meet the design and acceptance criteria to eliminate unqualified material storage, after storage should be properly protected, to avoid damp materials, by external damage, extrusion deformation, the number of outbound materials should be consistent with the actual number needed to prevent extra-material circulation, plugging material regulatory loopholes, to avoid not qualified materials flow into the scene.

4. Strictly abide by the construction techniques and methods to eliminate the phenomenon of construction. Do not follow the technical measures. Strengthen on-site personnel training. Personnel who are still unable to grasp the construction methods after training should be promptly retired, and the barbaric construction behaviors should be promptly detected and stopped.

5. Conscientiously carry out quality activities The project team members should participate in the quality team activities of the company on time, carefully

study the operation rules, design specifications, quality standards and other business knowledge, exchange work experience, draw on successful practices and promptly communicate and apply them within the project team.

4.2 Intelligent construction project process management problems and causes analysis

4.2.1 Project management progress management problems and causes

1. Project construction progress management problems

There must be a time limit for the full deployment of a project. This will inevitably lead to a progress problem. For the handling of this issue, management units often chant slogans and excel in empty vernacular words, but they do not act in the real sense and do not have the punishment system to be established Fulfillment, at the same time, failed to do random response. In other words, the speed of progress management in the project in Germany is the result of a combination of factors. Gu, J. H. (2016).

2. Causes of the project construction progress management problem

Affect the construction progress of the project are many factors, generally speaking, the owner factor, survey and design factors, natural environment factors, social environmental factors, organizational management factors, materials and equipment factors and funding factors. Depending on the specific circumstances in which a particular project is located, these factors may not necessarily affect the progress of the project at the same time. However, when the progress of the project is affected, the reasons are often those factors. Hu, Y. P. (2016).

The main factors that affect the progress of the project are the owners' factors, survey and design factors, material design factors and social environmental factors. Usually the main factors include the followings: changes in the requirements of the owners led to design changes; the construction site conditions cannot be provided or provided venues cannot meet the normal needs of the project; no timely payment to the construction contractor or material suppliers.

In the implementation of this project in Germany, we found that the owners did not provide the required information in an all-round way. The middle and early stages of construction were basically under the condition of side design and construction so that the original schedule could not be implemented normally. The

main reason for the change in the owner's demand is that the factory intelligent project is for production and the production equipment does not fully understand the needs of the intelligent project owner. The factory intelligent project needs to be matched with the production management program. Before the project is put into production Production management procedures are also in the process of continuous optimization, these uncertainties make on-site construction is often at a standstill, affecting the construction period. Investigation and design factors include the following aspects: inaccurate survey data, in particular, errors or omissions in geological data; inadequate design content, inappropriate application of norms, design flaws or mistakes; design possibilities for construction are not considered or considered Week; construction drawings are not available in time, not complete, or a major error occurred. Han, Z. X. (2016).

In the implementation of the project in Germany, there has been a design program and the actual situation on the scene does not meet the situation. As a factory project, the project is implemented in a group of buildings. These buildings have different functions, different structures and different design schemes and construction methods. However, these differences are neglected in the design, which makes the construction of the local area difficult Large, affecting the construction progress.

Materials, equipment factors mainly include the following aspects: the errors in the supply chain of materials, components and parts, machinery and equipment, variety, specifications, quality, quantity and time cannot meet the needs of the project; irrational use of special materials and new materials; construction Equipment is not complete, improper selection, installation errors, faults, etc. LI, T. (2016).

Material specifications inconsistencies and storage problems occured in the project. This caused some of the materials not meeting the requirements to enter the site. Although the quality inspectors later discovered the problem, the resulting return and partial rework also caused a delay in the construction period.

Social environmental factors Such as the construction of external units near the interference; holiday traffic, city planning restrictions; temporary water, power cut, open circuit; and common law and institutional changes in foreign countries, economic sanctions, war, riots, strikes, business failures and so on.

The progress of the intelligent building project in Germany is influenced by

the social environment factors. First of all, the intelligent building project belongs to the weak project, and must be coordinated with the construction progress of the built-in and civil works. The parallel construction cannot be advanced or delayed. Therefore, it should coordinate these relationships and obtain the corresponding resources throughout the construction process. Second, the project owner unit is a large-scale company that regulates strict rules and regulations. It has stringent requirements in terms of safety, hygiene and environment. Any violation of laws and regulations will be penalized for suspension of work and rectification, which will have a negative impact on the progress. Zhang, J. J. (2015).

4.2.2 Problems and causes of project construction cost management

4.2.2.1 Project construction cost management problems

First, there is a lack of corresponding systems and enforcement efforts in controlling costs. From the overall point of view of the construction project, the progress management budget of the intelligent building project lacks scientificity, making the expenditure in the early stage of the project uncontrollable and out of control, thus causing large deviation in the project payment in the latter part of the project implementation. The project excessive manager's expenditure is lack of specialized personnel and system to restrain.

Second, there is a lack of unified management of the cost management of subcontractors for contractors. The contracting of a project often only focuses on the first contractor while neglecting the remaining subcontractors, which greatly increases the probability of problems in the quality of subcontracting projects. Therefore, subcontractors will reduce costs, reduce costs and reduce losses. This approach, eventually passed on to a project management has brought the project management issues.

4.2.2.2 Causes of the project construction cost management problem

Based on the analysis of the main factors of the project cost changes, the project will relieve the project cost pressure by constantly striving for additional projects, expanding the project scale, optimizing the staffing of on-site construction teams and improving the technical level. Based on the analysis of the main factors of the project cost changes, the project will relieve the project cost pressure by constantly striving for additional projects, expanding the project scale, optimizing the

staffing of on-site construction teams and improving the technical level. The main factors that affect the change of construction project cost are:

1. The project scale and technical equipment level

Under certain conditions of construction and production and operation, when the size of the project (such as the construction area and the number of spots) is increased, the fixed expenses shared by the units and units will be getting smaller and smaller, and the average cost per unit project will decrease. At the same time, due to the small project size of the unit, the cost of raw materials, man-made and mechanical equipment that must be consumed by the unit project will also be reduced correspondingly through the cost-cutting measures such as adopting new equipment, new technology and new technology, the cost of change has also declined.

The scale of the project is in an increasing state after the start of the project. The increase comes from two aspects. One is the increase of subsystems. As the owner's understanding of the intelligent building system deepens in learning and communication, the project gradually recognizes the corresponding system The benefits brought by the project are the additional investment and the new demand, which make the scale of a project increase continuously. The second is the increase of the number of points. During the construction of the project, the owner of the project organizes and organizes the project after the project is put into operation With the new arrangements, the increase in personnel has caused a big change in the layout of buildings. The construction area and staff density have increased a lot, and the demand for the number of spots has naturally increased. In order to reduce the pressure on cost management, the fixed cost of the project is reduced.

2. Skilled workers and project management level

The skilled workers who use the construction team and first-line production workers and the management level and professional quality of project managers will have less labor cost for the project. Under the premise of continuously optimizing the management of the project department and continuously improving labor productivity, the project cost will also be reduced. Due to the expansion of the scale of the project, the amount of labor increased and the quality of the staff declined. Although the cost of using the bag-dry system was affected, some of the teams affected the construction period and caused the construction efficiency of other teams to decrease. As a result,

the construction cost increased to a certain extent. In order to solve this problem, while using on-site management and guidance, the use of telematics in the wide area information network has saved some of the administrative costs that should have been incurred and offset the pressure of rising costs.

3. Changes in market conditions and government policy changes

With the establishment and perfection of the socialist market economy and China's accession to the WTO, the pace of change in the construction market is accelerating. However, the pricing of construction products and the control of project costs are still subject to many policy and market factors.

During the implementation of this project, the price fluctuation of international precious metals led to the rise of engineering materials prices. However, the implementation of the project budget audit unit lags behind the market price, so that the added value of material costs can not be properly digested. For the sole responsibility of owners and their own reputation, A project team to digest the cost added value, which brings a certain degree of negative impact on the project cost control objectives.

4. The other factors

In addition to the above factors, the geographical location of the project, the surrounding environment, the customs of the locality, etc. directly or indirectly affect the cost of the project.

The project is located at the junction of urban and rural areas. The labor force of simple labor is relatively abundant, and the labor cost is less than 15% of the budget value. The convenient transportation, low material transportation and storage cost are not high. The cost of living is reasonable and the administrative expenses are not increased. Saying the project's external environment is very conducive to cost control.

4.2.3 Problems and causes of project construction quality management

4.2.3.1 Project construction quality management problems

Quality is not only the life of an enterprise, but also the guarantee for the successful opening of an intelligent system. Although there is a relatively complete quality control measure in an intelligent building construction project, the system can be successfully opened. However, there are still many areas for improvement in

quality management.

1. It did not establish a perfect quality management system.

In the intelligent construction project quality management, there is only the quality objectives and quality control section. It has not yet established a complete quality management system, such as quality objectives decomposition, quality problems analysis.

2. It did not establish the full quality awareness. The project department did not do quality publicity work, nor did it regularly publicize the quality standards of the state, enterprises and project departments.

3. There is no quality responsibility system.

Without quality accountability, employees will not value quality because they have no connection with their interests. Therefore, we must establish a quality responsibility system, is to implement the quality of everyone, the quality and everyone's interests are linked.

4.2.3.2 Cause of project construction quality management problems

There is a traditional thinking in the field of construction safety, "a hundred years plan, quality-oriented", some people say that "slowly work fine", "excellence, regardless of cost." To make people feel that there is quality assurance, we must pay the cost of progress and costs. However, not all this is true. Intelligent building project products are one-time production. Each project has its own product characteristics and there are many factors affect quality management work. The quality of the project is affected by many factors, such as the project decision-making, survey and design, materials, machinery, equipment, construction methods and techniques, technical measures, personnel quality, construction period, cost and the political, economic, social environment and climate where the project is located , Geography, geology, resources, etc., these factors directly or indirectly affect the quality of construction projects. In the process of project process management, materials, machinery, equipment, construction methods and techniques, technical measures, personnel quality, construction period and cost have the main influence.

1. The impact of construction period on quality management

First of all, due to the reduction of the construction period, the method of compressing the construction process is usually adopted to ensure the fulfillment of

the contract duration requirements. The simplest method is to compress the construction process interval. For example, under normal conditions, pipe threading in the building plastering, painting and ground engineering after the end of the wire protection tube before the water and debris clean. However, due to schedule compression, this process is omitted. This may cause the worn cable jacket damage, flooding, and after use for some time there may be emergence of mixed lines and broken lines.

Second, due to the duration of compression, the type of work, the time interval between processes is shortened, when the duration of compression to a certain extent, the various types of work processes will have mutual interference. The result is that the construction is finished, but the quality did not meet the requirements.

Again, due to the construction period compression, construction operation personnel invest much, resulting in a decline in the quality of personnel. Another simple way to speed up the construction process is to increase the input of construction workers so that the construction workers in each type of work are increased, that is, each sub-project in each phase can be completed in the shortest time. (Wang.X.J,2009)The intelligent building project is a project with relatively high technology content. The technical requirements are complex. Those who do not have the appropriate training and experience can hardly reach the corresponding technical requirements quickly. The quality of the construction projects will not be guaranteed.

2. The impact of cost on quality management

First, the direct way to reduce costs is to reduce material costs and cause material degradation. The impact of material quality degradation on project quality is direct and can not be offset by other means.

Second, the second way to reduce costs is to reduce labor costs, reduce the use of skilled workers, and reduce the quality of construction. After the completion of the project, it is impossible to judge the quality of the products by the final inspection as the general industrial products. It is also impossible to disassemble or disassemble the products to check the internal quality or replace the unqualified parts. Therefore, this requires that the quality control of construction projects should be based on pre-control, prior and incident control, and preventive measures. The reduction of skilled workers will make the quality control process more complicated, and the

quality requirements will be difficult to achieve, thus inevitably affecting the quality Control the result.

3. The impact of construction methods and processes on the quality

Construction methods and processes directly affect the quality of the project. Intelligent building systems extensive use weak signals. The ability of anti-interference and anti-attenuation is very low, demanding on the external environmental conditions. Intelligent construction projects on the construction methods and processes have specific provisions.

4.2.4 External factors affecting the control result of project construction process

In this project, the project design determines the scope of the project, and the implementation plan is also developed around the project design. Therefore, the quality of the design determines the result of the process control.

The quality of the design of the project needs to be further improved, affecting not only the quality of the owners of the factors, but also the design quality of the design unit attitude. (Luo.Y,2009)

Design is to define the function of engineering, technology and other parts and details of the problem from the technical aspects.

An important way to ensure the quality of design is to control the design effectively. We can think that improving the quality of design, finding problems and mistakes in the design stage, and correcting it is the most convenient, the least expensive and the least expensive. In the project process management, the quality of the design is like an invisible hand, affecting the outcome of process control.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

Project management has always been highly regarded in construction projects. Based on the theory of project management, project management practices are usually used to guide the practice of project construction. However, the level of project management is critical to the cost, quality and progress of construction projects Have a direct impact. Intelligent project management system is one of the important means of construction project management. It is also a very important branch. At the same time, it is also a necessary product of modern construction project management and computer network technology in the wave of information society. The object of intelligent project management system is infrastructure and project management theory as a prerequisite to automation and control technology and information technology as the support of the technology, including software, control, communications and electronic technology, which can r automatically detect and control all the electrical and mechanical building equipments. (Zhao.X. Q, 2015)One can also use the the system software inside the network area for the optimization of multiple information resources management, in order to achieve office automation systems and building automation control, while providing efficient and efficient and safe and comfortable integrated service environment, to meet the comprehensive and comprehensive supervision of buildings, information resources sharing and management control needs. In order to achieve the modernization of the project management, intelligent project management system is based on the traditional project management and integrated into intelligent technology and functions, which involves a broader connotation and denotation. Therefore, different management objects and different stages have different meanings. (Yan. S. G,2015)In view of this, this study is based on the concept and theory of intelligent buildings as a basis, taking a project in Germany as an example, from the perspective of project management, to study the actual construction process management of an intelligent building project in Germany. Specifically, firstly, the research of this paper is based on the background,

purpose, significance of the research and results at home and abroad, to determine the research methods of this article; secondly, according to the actual situation of the project in Germany, respectively from the project construction progress management, project construction cost management and project construction quality management, the status quo of construction management in a project is analyzed. (Wang, L. C.,& Liang, Z.Y,2015)The problems and causes of construction project management in a project are analyzed again. The external factors affecting the project construction process control results are analyzed. According to the above analysis and the characteristics of a project put forward its construction process management measures and suggestions, including improving project schedule management, there are strengthening cost management and quality control measures.

5.2 Research limitations

Due to the limited time and personal ability, the research of this article is not yet considered comprehensively and hopefully, it can be further improved in the following research work.

5.3 Research recommendations

5.3.1 Improve project schedule management

1. The basic requirements of project progress management.

There are often many unexpected things in a project follow-up process, thus bringing trouble to the project leader. Even though the general direction of the project can be grasped in the concrete construction, for various reasons, various problems occur during the actual construction of the project. The causes of the problems include the existence of various uncertainties and obstructions as well as restrictions on building resources. In this case, the project leader is required to carry out an intelligent construction project not only to grasp the real-time situation, but also to develop appropriate response measures to deal with all kinds of unexpected situations, so take precautions. If the system is in a quiescent state for a long time, it shows that the project construction process management is not standard and unscientific. Therefore, to achieve a scientific and rational project management process efficiently and orderly, the management team must have a special follow-up, and overall grasp and implement.(Li. K,2014)

Progress management involved in the process of the implementation of an

intelligent building project management system throughout the project, but the effective and accurate management of the progress of the project is the focus of attention. A professional and pragmatic and efficient management team could ensure the overall project work, thereby enhancing the efficiency of the project process and ultimately higher completion of the task. The management team among the staff must have a high sense of responsibility and sacrifice. This awareness and spirit can make managers more responsible and could further promote enterprise construction. (Li.X,2014)Not only that, but also the company should pay attention to the training of managers.

1. Make periodic progress of the project management

When planning the progress of the project, it is necessary to hold the principle of overall control and order. Because the progress plan is an overview of the entire project and is closely linked with each part of the project, the progress management team should attach great importance.

In the preparatory phase of the construction and implementation of an intelligent building project management system, the company needs to plan corresponding subsidiary objectives so as to minimize the damage caused by unknown risks and unexpected situations.

5.3.2 Strengthen the cost management efforts

1. Full attention to project costs in project construction

The company controls costs from the beginning of the design phase. During the implementation of the project, it is necessary to avoid unnecessary waste, but also to prevent over-saving resulting in poor quality of raw materials, quality, but off. Therefore, in the project cost management system, managers must consider the overall situation, it is necessary to achieve scientific and reasonable control costs, but also to be careful in the decision-making and implementation. (Lu.X.Y,2010)Of course, in the interest of insurance, professional and experienced construction actuaries can be hired to make objective, concrete and comprehensive analyzes of project costs and to make reasonable arrangements for their specific decisions.

2. Strengthen order management at the construction site

In the actual implementation of the project, the manager of the entire intelligent building project management system cost of building materials and input

costs scientifically carefully to ensure the standardization of the project. Managers should take serious measures to deal with some of the bad behavior, to minimize the design changes.

3. Scientific quality cost accounting

In a word, if we want to systematize and make the quality costing more cost-effective, we will surely pay more attention to quality costing.

4. Ensure the authenticity of the data

Only to fully pay attention to the cost, to strengthen the implementation and on-site, to scientifically account costs and to ensure the authenticity of the data could one protects the smooth implementation of an intelligent building project.

5.3.3 Quality control measures

Project quality is a concentrated expression of the value of the project deliverables. In order to ensure the quality of the project, the implementation of total quality management of the project, that is, the entire process, full, all-round quality management. (Ke.Z. Y,2014)

1. Mission and goals

The main tasks of the quality and safety control process are to supervise, inspect and measure the implementation of the project and compare the project implementation results with the pre-set quality standards to determine whether they meet the quality standards, find out the existing deviation, and analyze the deviation Reason, and take appropriate corrective measures.

2. Departments involved

Quality and safety control process mainly depends on engineering department, Technical department and contract department assist it in order to ensure its smooth operation. The main functions related to the relevant departments as shown in Table 7.

Table 7 Module and role of quality and safety control processes of each business

Business module / Character	Establish quality assurance system	Site quality control	Quality inspection and evaluation	Safety management	Completion of quality inspection
Contract Department		√	√	√	√
Engineering Department	√	√	√	√	√
Technology Department	√		√	√	

Note: "√" represents the business module involved in the department

The detailed description of each business module in the integrated process of quality and safety control is shown in Table 8.

Table 8 Detailed description quality and safety control process of each business module

Business module	Detailed description
Establish safety and quality assurance	Develop project safety and quality assurance system
Site safety and quality control	Dynamic monitoring of project quality, test specifications, test data processing
Completion acceptance assessment	Assessment of quality levels, archiving the completion of all types of documents
Safety management	Edit safety construction specifications and plans, safety incident handling

3. Quality management support system

For the owners of self-inspection, social supervision of the main problems, intelligent building project should use "4 +1" quality management support system, that is, construction self-inspection, social supervision, owner monitoring and government supervision plus "technical advisory panel of experts," the project Quality management system can enable owners to grasp the status of project quality as soon

as possible, and establish a more effective supervision mechanism for self-inspection and supervision.(Lu.J.H,2010)

On the basis of the four-level quality assurance system, a group of old experts (including electrical, communications, process and cost engineers) with excellent technology and rich experience should be invited to form a group of technical quality consultants in the building intelligent construction and project quality supervision, so the project quality is actually in the "four quality assurance + technical quality consultant" quality assurance system for management and monitoring.

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