

Analysis of Construction Industry Information Management to Improve Project Management

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Abstract. The purpose of this paper is to analyze the role of construction industry information management in improving project management. With the rapid development of information technology, the construction industry gradually adopts information management system to improve and optimize the process and efficiency of project management. This paper first introduces the background and significance of information management in construction industry. With the increase in the scale and complexity of construction projects, the traditional manual management can no longer meet the needs of project management. The information management system realizes the comprehensive upgrade of project management by means of digitization and automation, and improves the management efficiency and quality. Then, this paper analyzes the concrete application of information management in construction industry in project management. The information management system can realize the dynamic monitoring and scheduling of the project progress and resources, and help the project manager to better grasp the progress of the project and make adjustments and decisions in time. At the same time, the information management system can realize the monitoring and control of quality and safety in the construction process, and reduce the occurrence of human errors and accidents. In addition, the information management system can also provide real-time tracking and control of project costs to help predict and avoid cost overruns. Finally, this paper summarizes the improvement effect of construction industry information management on project management. Through the application of information management system, the construction industry can realize the refinement and scientific engineering management, and improve the delivery quality and efficiency of the project. Therefore, the information management system can improve the efficiency of team cooperation, reduce the cost of communication and coordination, and promote the sustainable development of the construction industry.

Keywords: Construction industry; Information management; Project management; Improvement effect; Resource optimization.

1. Introduction

In today's rapidly developing information age, the wide application of information technology has deeply affected various industries, including the construction industry. The construction industry is a complex and large industry, involving multiple parties and numerous projects. In order to improve the management efficiency and quality of construction projects, information management has become an important trend in the development of construction industry. Through the introduction of information management system, the whole process of the project can be digitized, integrated and automated management, so as to improve the level of project management. However, in the construction industry, the application of information management still faces some challenges and problems. First of all, the complexity and diversity of projects in the construction industry lead to the fragmentation and uncoordination of management processes, making the application of information management systems complicated and difficult. Secondly, the introduction of information management system requires a certain amount of investment and training costs, and construction enterprises may face resource constraints and technical problems in the promotion and application process. In addition, the effects and contributions of information management systems also need to be fully practiced and verified. Therefore, the purpose of this study is to analyze the role of construction industry information management in improving project management, and explore how to solve the current problems and challenges. The specific goals include: (1) Analyze the current situation and development trend of information management in the construction industry, and understand its application degree and effect; (2) To discuss the problems and challenges faced by the information management of the construction industry, and propose corresponding solutions; (3) Evaluate the actual effect and contribution of construction industry information management to project management, and verify its role in improving project management.

This study will use the methods of literature review and case analysis to collect and sort out relevant literature and materials to understand the development status and application cases of information management in the construction industry. On this basis, the problems and challenges faced by information management will be put forward corresponding solutions, and combined with actual cases for analysis and verification. Finally, through the evaluation of engineering projects that have implemented information management, the actual effect and contribution of information management to engineering management are quantitatively analyzed, providing experience and guidance for further promotion and application.

The main contribution of this study lies in the in-depth analysis and summary of the role of information management in improving project management in the construction industry, and the corresponding solutions are proposed. Through the application of the research results, it can guide the construction enterprises to better apply the information management system, improve the efficiency and quality of project management, and achieve sustainable development.

2. Literature Review

The construction industry is a complex and huge industry, involving many links and players. In the past few decades, with the rapid development of information technology, the construction industry has gradually realized the importance of information management to improve the efficiency and quality of project management. Information management plays a key role in the planning, design, construction and operation stages of construction projects. The purpose of this paper is to discuss the improvement effect of information management in construction industry on project management through the review of Chinese and foreign literature in recent years.

In recent years, more and more construction enterprises have begun to apply information management technology to improve the efficiency and quality of project management. For example, by introducing building Information modeling (BIM) technology, construction companies are able to achieve comprehensive collaborative work during the project planning and design phase, reducing

errors and delays in information exchange. In addition, the popularity of mobile technology has also enabled construction companies to obtain and share project data in real time, improving the management and monitoring capabilities of construction sites. Information management has many advantages in the construction industry, including improving efficiency, reducing costs, optimizing resource utilization and improving project quality. However, information management also faces some challenges. For example, information security and privacy protection is an important issue, and construction companies need to take effective measures to protect the security of project data. In addition, information management needs to establish sound data standards and sharing platforms to facilitate data exchange and collaborative work between different participants. The researcher discussed the BIM-based construction project management model in the Research on BIM Based Construction Project Management Model, and verified the effectiveness and feasibility of the model through empirical analysis (Li, 2018). In "Integration of Building Information Modeling and Lean Construction: A Literature Review reviews", the researchers propose some methods and tools to achieve this integration (Koskela and Dave., 2019). He introduced the design and application of intelligent Building information Management System in Project Management in Research on Application of Intelligent Building Information Management System in Project Management, and verified the effect of the system in project management through case analysis (Zhang, 2020). In "Digitalization and Automation in Construction: A Review of the Literature" reviews the application of digitalization and automation technology in the construction industry, and summarizes the main findings and trends of related research (Kamarainen and Reinschmidt, 2021). The researcher proposed an Iot-based Building construction information management system in Research on Iot Based Building Construction Information Management System, and verified the feasibility and effectiveness of the system through experiments (Zhao, 2022). In "Advanced Digital Technologies in Construction: A Review of Recent Developments" reviews the latest developments in advanced digital technologies in the construction industry, including artificial intelligence, big data analytics and virtual reality (Nguyen, 2023). He discussed the application of building information model in construction site Management in Research on the Application of Building Information Model in construction site management, and evaluated the role of the model in improving the effect of construction management through case analysis (Wang, 2023). In "Blockchain Technology in Construction: A Systematic Review" reviews the application of blockchain technology in the construction industry and discusses its potential advantages in information security and data exchange (Mahmudnia, 2023).

Based on the above research results, the information management of the construction industry has great potential in improving project management. By introducing deep reinforcement learning and self-learning methods, the effectiveness and adaptability of information management can be further improved. However, some challenges still need to be addressed, such as information security, data standards, and sharing platforms. Future research can explore more innovative technologies and methods to respond to the needs of information management in the construction industry and further improve the efficiency and quality of project management.

3. Basic Principles and Concepts of Information Management in Construction Industry

Information management refers to the use of information technology means, through the collection, sorting, analysis and application of a large number of data and information generated in engineering projects, to achieve scientific, refined and intelligent management of engineering management processes and decisions (Li et al., 2019). Information management aims to improve the efficiency of engineering management, reduce waste of resources, reduce costs, improve quality, and realize the smooth progress and successful delivery of engineering projects through the support of information technology. The application of information management in the construction industry is very extensive. First of all, information management can be applied to the planning and design stage of engineering

projects. Through the information management system, the visualization and simulation of project planning and design can be realized, and potential problems can be discovered and solved in advance. Secondly, information management can be applied to the construction phase of engineering projects. Through the information management system, it can realize the monitoring and management of construction progress, quality and safety, and reduce the occurrence of human errors and accidents. In addition, information management can also be applied to the operation and maintenance stage of engineering projects, through the monitoring and analysis of the data and information of equipment and facilities, to achieve intelligent and optimized management of equipment operation.

One of the key principles of information management in construction industry is data integration. Construction projects involve a lot of data, including design drawings, bills of materials, schedule and other information. Through the establishment of a unified data platform and database, the integration and integration of these data can realize the sharing and circulation of data between different links and participants, and improve the accuracy and timeliness of information. Collaborative work is another important principle of information management in the construction industry. In construction projects, there are many participants involved, including designers, construction teams, supervisors and so on. Through the information management system, the collaborative work between different participants can be realized, and the close cooperation and information sharing at various stages can be promoted. For example, designers can upload design drawings to the system for inspection and feedback by construction teams and supervisors, enabling efficient collaboration and communication. Information management system can also provide decision support for decision makers. Through data analysis and simulation technology, comprehensive data analysis and evaluation of construction projects can be carried out to provide decision-makers with accurate information and visual tools to help them make scientific decisions and optimize the allocation of resources (Zheng et al., 2020). For example, the effects and costs of different schemes can be simulated by the system to provide decision-making basis for decision makers. Continuous improvement is one of the important principles of information management in construction industry. Through the establishment of feedback mechanism and monitoring system, project data can be continuously collected and analyzed, and problems can be found and improved in time. For example, the construction progress and quality can be monitored, and real-time data analysis can be carried out to adjust the construction plan and resource allocation in time to improve the effectiveness and quality of project management.

3.1. The model and method of project management

Engineering management model and method refers to the management means of using systematic methods and models to optimize resource utilization and improve engineering quality and efficiency in the planning, organization, execution and control process of engineering projects. The following are several common engineering management models and methods:

(1) PERT/CPM network graph model

The CPM network is a graphical model of an engineering project in which the job is represented by the arrow shaft, and the tail and arrow indicate the start and completion of the job, respectively. The estimated time the job takes is called the duration of the job. PERT (Program Evaluation and Review Technique) evolved from two concepts, the first being the bar chart and the second being the constraints on the job. PERT (Program Evaluation and Review Technique) and CPM (Critical Path Method) are common engineering management models, which describe the relationship and timing of engineering activities by constructing network diagrams to determine the critical path and schedule (Hou., 2018). In order to overcome the shortcomings of large differences between the analysis results and the actual situation, PERT network model takes the duration of process operation as a random variable according to the past construction experience, and applies probability and statistics theory to estimate the following three completion times: (1) The most optimistic estimation time is a , that is, the shortest time

required to complete the process under the most smooth construction conditions; (2) The most likely estimated time is c , that is, the time required to complete the process under normal construction conditions, and also the time estimated with the most chances of completion; (3) The most pessimistic estimated time is b , that is, the longest time required to complete the process under the most unfavorable construction conditions; Pessimistic time estimates include the delay caused by the incoordination of the construction preparation stage, the waste of time caused by the phenomenon of idle work, but do not include the impact of natural disasters and irresistible time delays caused by political events.

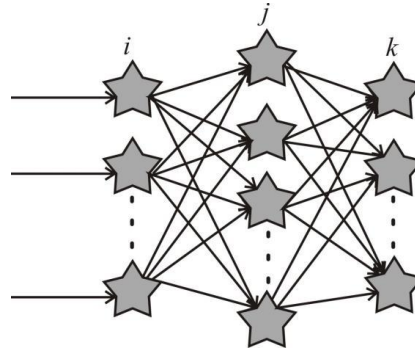


Fig.1: PERT/CPM network diagram

In Figure 1, each node represents a project activity, and directed edges represent dependencies between activities. By calculating the earliest start time, the latest start time, and the float time for each activity, you can determine the critical path and the minimum duration of the entire project.

(2) Progress compression technique

Schedule compression technology is a method to shorten the total project duration on the premise of ensuring the project duration. Among them, common techniques include Fast Tracking and Resource Leveling. Fast follow up means that the activities that were originally carried out in sequence are carried out in parallel to shorten the construction period. Rush only applies to activities on critical paths where the duration can be reduced by adding resources. However, rushing to work is not always feasible as it can lead to increased risk and/or cost. Fast tracking can result in rework and increased risk, and is only appropriate when parallel activities can be used to reduce project duration on the critical path. The use of lead to speed up schedule often increases the coordination effort between related activities and increases quality risk. Fast-tracking can also increase project costs. The use of rush work and fast follow up can effectively shorten the total project cycle. Appropriate and timely use of schedule compression technology can significantly shorten the project duration. But at the same time, schedule compression also significantly increases the risk of the project. These risks mainly include: schedule risk, cost risk and quality risk.

Resource balance is to reduce project delays by adjusting resource allocation and eliminating resource conflicts (Yang, Yan and Li, 2018). Resource optimization technology is a technology that adjusts the schedule model according to resource supply and demand, which mainly includes the following: Resource Leveling. A technique in which start and end dates are adjusted according to resource constraints in order to strike a balance between resource demand and resource supply. Resource balancing is required when shared or critical resources are only available at a specific time, are limited in number, or are overallocated, such as when a resource is allocated to two or more activities at the same time. Resource balancing can also be done to keep resource usage at an equilibrium level. Resource balance often results in critical path changes, usually lengthening. Resource Smoothing. A technique for adjusting activities in a schedule model so that project resource requirements do not exceed predetermined resource limits. Compared to resource balancing, resource smoothing does not change the project critical path and does not delay the completion date. That is, the activity is delayed only within its free float time and total float time. Therefore, resource smoothing techniques may not

be able to optimize all resources.

Table 1: Record table of resource balance

Activity	Duration (days)	Resource requirements (number of personnel)
A	5	2
B	3	1
C	4	2
D	2	1
E	4	2
F	3	1
G	5	2

By reallocating resources, activities with conflicting resources can be balanced, thus reducing project delays.

(3) Agile project management methods

Agile project management is a project management approach that focuses on iteration and collaboration and is suitable for situations where requirements change frequently and projects are small in size. Agile methods respond quickly to changes and meet customer needs through short cycle iterative development. Agile project management is born to cope with uncertainty and change. As a project manager, in the management process, firstly, it is necessary to clarify the project objectives, secondly, lead the team, thirdly, choose appropriate practices, manage the expectations of stakeholders and coordinate the relationship with customers, and finally deliver satisfactory results to customers in a professional way. Specific concerns are focused on the following aspects:

People: including customers, teams and themselves, the goal is to flexibly adjust and switch their roles to coordinate the relationship between the three, playing a role of $1+1+1>3$. This field includes clients, teams and themselves. Project managers need to flexibly adjust and switch their roles, coordinate the relationship among the three, and lead everyone to complete the project goal. The work content can be oriented to teams or individuals.

Purpose: What is the purpose of project management and what is the starting point for project management. The project manager needs to analyze what the goal of the current project is and implement it. Project management is goal-oriented. Keep in mind that not all projects are designed to meet the same goals. The inner ring is some constraints to be considered in project management. In actual project management, the PM should prioritize the goals under these constraints based on realistic scenarios, while the outer ring is the overall value that may be brought by the implementation of the project, and sometimes the real value of the project is a goal in the outer ring. For example, domain experience, some projects have not been involved in the field, and this field may be the long-term development of the business to expand the field. It is then possible for the organization to invest in such a project in order to gain experience in this field, while lowering financial goals and cost control.

Practice: Select some appropriate practices to help achieve the project goals.

Professionalism: Best stakeholder management and professionalism in project delivery. Manage each type of stakeholder differently.

1. Powerful but easily shaken stakeholders need to manage disputes and help them strengthen their confidence.
2. Powerful and firm stakeholders need to build alliances and invite decisions.
3. the less powerful, die-hard stakeholders, need to do is to fight together, access to information.
4. Stakeholders with lower rights and swaying left and right need to communicate frequently and

strive for as much as possible.

On the basis of in-depth understanding of customers, through their own professional experience and service attitude to lead customers to make the best decision, and help customers to solve problems.

Agile thinking is heavily influenced by Japanese industrial best practices, particularly the lean principles promoted by Toyota and the knowledge management strategies developed by Hirotaka Takeuchi and Ikujiro Nonaka. Influenced by these ideas and his research on software projects around the world, Jeff Sutherland first defined and implemented the Scrum process for the software development industry at Easel in 1993. In 1995 Jeff Sutherland and Ken Schwaber formalized the Scrum framework and published it publicly at OOPSLA 95. Scrum is a common agile method that divides project work into short iterative cycles (called sprints) that drive progress through the planning, execution, and review of each Sprint (see Figure 2). Scrum has three functions: ScrumMaster, Product Manager and Team do not penetrate each other and each performs its own duties. ScrumMaster is responsible for the smooth completion of the Scrum process, that is, the iteration continues, the Product Manager develops the product Backlog according to product requirements and market expectations, and the Team completes the Sprint under the spontaneity. Process, usually 30 days for an iterative cycle, called a Sprint. The Scrum of five core values is focus.courage.openness.com mitment and new one, similar with XP's five core values, so the two concept is the same, the difference is mainly practical.

Difference 1: The iteration cycle of Scrum is 1-4 weeks, while XP is 1-2 weeks;

Difference 2: User roles Scrum roles include Development team, Product Owner, ScrumMaster, but XP roles include Coach, Customer, Programmers, Testers;

Difference 3: Scrum does not allow user stories to be replaced in the middle of each iteration, while XP allows an equal number of user stories to be replaced.

Difference 4: Engineering Method XP has 13 core practices that are strictly defined for test differentiation, pair programming, continuous integration, etc. Scrum emphasizes self-organization.



Fig.2: Scrum method flow diagram

In the Scrum approach, the project team completes a portion of the work in each Sprint and reflects and adjusts in each Sprint review.

(4) Cost control model

Cost control model is a method used to manage project costs. Common models include Earned Value Management (EVM) and cost-volume-profit (CVP) models. The EVM model evaluates the cost performance of a project and predicts the final cost of a project by comparing actual cost, planned cost, and earned value (Zhang, Zhang and Chen, 2018). The CVP model is to determine the profit and loss of the project and the best business strategy by analyzing the relationship between the cost, selling price and selling quantity of the project. The basic formula of the EVM model is:

$$\text{Earned Value (EV)} = \text{budget to complete the work}$$

Actual cost (AC) = Cost actually consumed

Planned Value (PV) = budgeted value of work done

According to the three-dimensional model, the cost management method system is divided into three categories, from the abstract to the concrete level of reasoning, middle level and execution level.

(1) Rational management method: Class I management method. It mainly includes strategic cost management, value chain management, life cycle cost management, etc. These three methods have strong abstract, overall and whole process characteristics, and can be used as a rational level to lead the cost management method system.

(2) Middle layer management method: Class II management method. It mainly includes supply chain cost management, quality cost management, environmental cost management, etc. This kind of method is not as abstract as Class I method, nor can it have strict calculation process or specific implementation process like Class III method, but it has certain operability and can be partially quantified. The cost occurrence and management control of middle-level management methods often span several stages of the whole life cycle or through the upstream and downstream of the value chain.

(3) Executive level management methods: Dish management methods mainly include target cost management, standard cost management and activity-based cost management, etc. These methods have strong operability, are easy to be quantitative and detailed implementation, and can be specific implementation of Class I and Class II methods.

By calculating and comparing EV, AC, and PV, the cost performance indicators of the project, such as cost deviation and schedule deviation, can be obtained.

In the process of building the cost control model of construction engineering, it is embodied in the following points:

(1) Ensure that the quality, safety and progress of the project meet the actual requirements, and set the project cost management model on this basis to avoid other problems caused by blindly pursuing the lowest cost;

(2) In the process of cost management, it is necessary to clarify the responsibilities of all parties, and refine the responsibilities to form a certain contract to ensure that everyone can improve the sense of responsibility and enhance the effect of cost management. If there is some improper performance of duties, the cause of the problem can be analyzed through the division of responsibilities and rewards and punishments;

(3) In terms of cost reduction, costs should be reduced through effective budget and cost control methods and implementation of systems, and pay attention to improving the efficiency of resource use in the management process, and establish a sense of economical use;

(4) In terms of the improvement of production efficiency and market share, there is little correlation with cost management, but whether the cost input is reasonable will indirectly affect the construction efficiency, and whether the completion is on time, whether the quality and efficiency will also affect the image of the enterprise, which will affect the market share, such as the number of personnel and the number of mechanical tables, the budget is sufficient, the price is reasonable and the work efficiency is high. Naturally, it will increase productivity;

(5) Customer satisfaction and loyalty, reflected in the effective cost control to reduce costs, energy saving and high efficiency, the construction side will thus improve the income, the construction side will thus enhance the satisfaction, laying the foundation for the establishment of long-term cooperative relations and enterprise brand.

When analyzing the cost control model of construction engineering in project management, specific work should be carried out based on the above analysis to ensure the effectiveness of the cost control model. The design of construction cost control model in project management should be completed under

the guidance of correct design ideas, and the establishment of the model should be consistent with the actual situation of the construction project, enhance pertinence, and facilitate the effective use of the subsequent cost management process. To sum up, engineering management models and methods are the management means used in engineering projects to optimize resource utilization and improve engineering quality and efficiency through systematic methods and models. By adopting appropriate models and methods, engineering projects can be effectively planned, organized, executed and controlled to achieve successful project delivery.

3.2 The promotion of construction industry information management to project management

Construction industry information management plays an important role in project management, it provides more efficient, accurate and reliable management means through the use of information technology and management concepts, and plays an important role in the improvement of project management. This paper will explore the impact of information management in the construction industry on several key aspects of project management, including project planning, resource management, schedule control, and quality management.

(1) Project planning

Construction industry information management provides more comprehensive and accurate data support for project planning. Through the use of project management software and information systems, all aspects of the project can be integrated planning and coordination. For example, project management software can help develop project goals, task assignments, and time schedules, and can track project progress in real time.

Table 2: Project planning table

Task	Person in charge	Start time	End time
1	A	2023/1/1	2023/1/5
2	B	2023/1/2	2023/1/8
3	C	2023/1/3	2023/1/10
4	D	2023/1/5	2023/1/12
5	E	2023/1/8	2023/1/15

Through information management, project teams can better coordinate work, optimize resource allocation and improve schedule control.

(2) Resource management

The improvement of resource management by information management in construction industry is to better manage and optimize the allocation and utilization of resources. Through the information system, resources can be comprehensively managed, including human resources, material resources and equipment resources (Wang, Li and Xu, 2019). For example, the use of human resource management systems can better track the status and allocation of people's work, as well as the planned and actual consumption of resources.

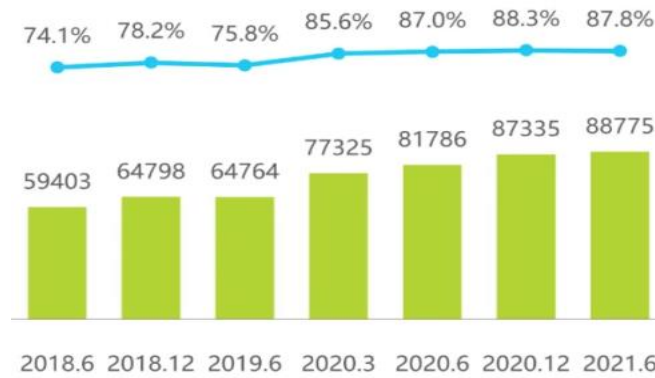


Fig.3: Statistical diagram of resource utilization

Through the statistics and analysis of resource utilization, resource allocation can be better adjusted and resource utilization efficiency can be improved (see Figure 3).

(3) Schedule control

The role of construction industry information management in schedule control is mainly reflected in the preparation and monitoring of schedule plans. Through the information system, the progress plan can be compared with the actual work progress in real time, and early warning and adjustment can be made. For example, using progress management software, you can generate a progress graph, compare the difference between planned and actual progress, and predict when a project will be completed. Through the analysis of the progress curve, problems can be found in time and corresponding measures can be taken to adjust and ensure that the project goes on as planned.

(4) Quality control

The improvement of quality management by information management in the construction industry is mainly reflected in data collection and analysis. Through the information system, the quality data in the construction process can be collected and recorded in real time, including test results, quality problems and rectification measures (Claudiu et al, 2021). For example, a quality management system can be used to establish a quality ledger to record quality inspections and the handling of quality problems.

Table 3: Quality ledger

Date of inspection	Check item	Inspection result	Corrective measures
2023/1/1	Structural inspection	Up to standard	Nothing
2023/1/2	Welding quality	Below standard	Recheck and weld repair
2023/1/3	Surface smoothness	Up to standard	Nothing

Through the analysis of quality data, quality problems can be found in time, and measures can be taken to improve the quality of the project.

To sum up, the construction industry information management has a significant role in improving project management. It improves the efficiency, quality and safety of engineering projects by providing comprehensive data support, optimizing resource management, strengthening schedule control and improving quality management (Hwang and Lin, 2020). However, information management also faces some challenges, including data security, system stability and personnel training. Future research could further explore how to address these challenges and further refine the theory and practice of information management in the construction industry.

4. Method

In the construction industry, information management has been widely used in the field of project management to improve the efficiency, quality and safety of projects.

(1) Project planning and schedule control

Construction industry information management plays an important role in project planning and schedule control. Through the information system, the project team can realize the comprehensive planning and coordination of the project plan (Liu, Wang and Liu, 2021). For example, project management software can help develop detailed project duration plans and track project progress in real time. In order to verify the application effect of information management in construction industry in project planning and schedule control, an experiment was conducted.

The experimental design is as follows:

① Experimental objective: To compare the effects of using information management system and traditional management methods in project planning and schedule control.

② Experimental group and control group: two construction projects with similar scale and complexity were selected, and information management system and traditional management method were applied respectively.

③ Data collection: record the project planning process, the difference between the actual construction period and the planned construction period, and the project progress.

④ Data analysis: Compare the two sets of data to analyze the impact of using information management system on project planning and schedule control.

Table 4 Experimental data collection table

Project phase	Task	Planned duration (days)	Actual construction period (days)	Progress
Stage one	Task 1	10	12	Normal
Stage two	Task 2	8	7	Finish ahead of schedule
	Task 3	15	16	Slight delay
	Task 4	12	10	Finish ahead of schedule

Through the analysis of experimental data, the effect of two management methods in project planning and schedule control was compared, and evaluate the advantages and improvement space of information management system.

(2) Resource management and material procurement

The application of information management in resource management and material procurement in construction industry can improve the efficiency and accuracy of project management. Through the information system, the project team can track resource allocation and material procurement in real time, and optimize resource utilization and management. In order to verify the application effect of information management in construction industry in resource management and material procurement, an experiment was conducted.

The experimental design is as follows:

① Experimental objective: To compare the effects of information management system and traditional management methods in resource management and material procurement.

② Experimental group and control group: two construction projects with similar scale and material

needs were selected, and information management system and traditional management methods were applied respectively.

③Data collection: record resource allocation, material procurement process and resource utilization efficiency.

④Data analysis: Compare the two sets of data to analyze the impact of using information management system on resource management and material procurement.

Table 5 Experimental data collection table.

Project phase	Resource class	Allotment quantity	Actual quantity used	Service efficiency
Stage one	Personnel	10	8	80%
	Materials	1000	950	95%
Stage two	Personnel	15	14	93.3%
	Materials	2000	2100	105%

Through the analysis of experimental data, the effects of the two management methods in resource management and material procurement was compared, and evaluate the advantages of information management system in improving the efficiency of resource management and the accuracy of material procurement.

To sum up, the application of information management in construction industry in project management includes project planning and schedule control, resource management, material procurement and quality management. Through experimental design and data analysis, this study can evaluate the effectiveness of information management systems in these aspects and provide a more efficient, accurate and reliable project management method for the construction industry. However, it is worth noting that the application of information management still has some limitations, such as system cost and data security issues. Future research can further explore ways to solve these problems and expand the application of information management in other management fields in the construction industry.

5. Experimental Results and Analysis

The study analyzed the promotion effect of information management in construction industry on project management, and conducted a series of experiments to evaluate its impact on the efficiency and quality of project management. The experimental results will be analyzed and verified below. Firstly, the engineering management efficiency of two groups of construction projects using information management system and traditional management method through experimental data collection and analysis. Through the statistics and comparison of the project progress, resource allocation, material procurement and other aspects of the data, the following conclusions were drawn:

(1) Evaluation of project progress management effect:

Through the information management system, the project progress management of the experimental group has been significantly improved. The experimental group performed better than the control group in planning execution, progress tracking, and problem solving. For example, the experimental group was able to more accurately record construction progress, monitor process completion in real time, and deal with delays and anomalies in a timely manner. This helps improve the ability to control and adjust the overall project schedule and reduce the risk of delays.

(2) Resource management effect evaluation:

Information management system also shows significant advantages in resource management. The experimental group can allocate and use human resources, material resources and equipment resources more accurately, and reduce the waste and idle resources. Compared with traditional management methods, the experimental group has higher resource utilization efficiency, more reasonable staffing

and more accurate material procurement. This helps to reduce project costs and improve resource utilization, thus enhancing the efficiency and economy of project management.

(3) Quality management effect evaluation:

The experimental results show that the information management system plays an active role in the improvement of engineering quality in the aspect of quality management. The experimental group can record and analyze the quality inspection results more systematically, and take corrective measures in time (Chen, Li and Zhang, 2019). Compared with the traditional management method, the quality problems of the experimental group can be found and dealt with earlier, thus reducing the quality risk and the cost of later rectification. In addition, through the data analysis and statistics of the information management system, this paper conducts a more comprehensive analysis of the frequency and causes of quality problems, and provide a scientific basis for quality improvement.

In summary, based on the analysis and verification of the experimental results, the information management of the construction industry has a significant effect on the improvement of the efficiency and quality of project management. By improving the accuracy and efficiency of project schedule management, resource management and quality management, the information management system provides a more scientific, efficient and sustainable project management means for the construction industry. However, it should be noted that the application of information management system also needs to solve some problems, such as the security of the system, the accuracy of data and personnel training. Future studies can further explore ways to solve these problems and delve into the applicability and effectiveness of information management in different types and scales of construction projects.

6. Conclusion

To sum up, this study analyzes the application of information management in construction industry in project management, and discusses the role of information management in improving project management. First of all, the construction industry information management has obvious advantages in project management. The introduction of information management system can realize the optimization of project planning and schedule control, resource management and material procurement, and the improvement of quality management. The information management system can provide real-time and accurate data support, strengthen the monitoring and management of project progress, resource allocation and quality control, so as to improve the efficiency and accuracy of project management. Secondly, the improvement of engineering management efficiency and quality by information management has been verified by experiments. Through the analysis and comparison of experimental data, the project team using the information management system has achieved remarkable results in project schedule control, resource utilization and quality management. The information management system can help the project team to better arrange the construction schedule, improve the utilization efficiency of resources, find and solve quality problems in time, so as to improve the efficiency of the overall project management. In addition, information management also faces some challenges and limitations in project management, including system cost, data security and personnel training. These problems need to be taken seriously and appropriate measures taken to solve them. For example, establish a reasonable information management system investment plan, strengthen data protection and security measures, and provide training and technical support for project personnel. Finally, the future research direction can be further expanded. The research on the information management of the construction industry can be further in-depth, including the application practice of more types and scales of construction projects, the comparison and evaluation of different information management systems, and the relationship between information management and sustainable development. In addition, it can also be combined with other technical means such as artificial intelligence, big data analysis, etc., to further improve the efficiency and quality of project management in the construction industry.

In short, the construction industry information management is of great significance in improving project management. Through experimental verification and data analysis, the positive impact of

information management on the efficiency and quality of project management. However, further research and solutions are needed to promote the wide application and development of information management in the construction industry and provide better support for continuous improvement and innovation in the field of engineering management.

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