

# Project Management Application in Construction Review

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**Abstract:** Construction projects are irreplaceable parts of our daily life. When such kind of program starts to operate, its finishing line and the final cost are determined by environmental factors and technical restrictions to some extent. Thus, this essay is going to talk about the Critical Path Method (CPM) and Program Evaluation and Review Technique (PERT), two of the practical tools for managers to wisely shorten a project's duration. "Human is the first element of management". Negative impacts could take place during the procedure of a construction project, while most of those unfavorable effect is strongly related to human resource. In order to defeat other competitors, managers should take the advantage of talent in competition into consideration. Invalid Human Resource Management (HRM) may reduce the productivity of a project, or even lead to irreversible failure. Therefore, the following passage also contains information on how a project manager should make full use of the human resource of the ongoing process.

## 1 INTRODUCTION

Project management is the process of leading a team to achieve all project goals within certain constraints. The goal of project management is to complete a project that meets the client's goals. The main constraints are the scope, content, start and end times, and budget of the project. The main challenge in terms of project management is to optimize the allocation of resources necessary to invest and apply them to meet pre-set goals. The Project Management Body of Knowledge (PMBOK) mentions that the whole project management including the process of integration, scope, schedule, cost, resource, procurement, communication, risk and stakeholder management. (Project Management Institute, issuing body. 2017).

Projects can include producing a unique product, providing a service, or giving the customer the desired result. Projects must have definite start and end markers. The projects usually have time constraints and are constrained by funding or staffing as well. Projects can meet unique goals and requirements, usually by making a beneficial change to the customer or adding value to the product.

Projects can be temporary in nature or regular business. Regular business is the activity of producing products or providing repeatability. In practice, the management of this different mode of production requires the development of different technical skills and management strategies. (Murray-Webster, Ruth; Dalcher, Darren. 2019).

At present, project management has become an independent field, with independent research topics, its theoretical basis, the use of specific research methods, and widely used in life. (Trocki and Bukłaha 2016) The application of project management extends to other industrial fields, such as the pharmaceutical industry, telecommunications sector, software production. And the application of project management is very wide, the production of biscuits, the development of games, engineering construction, project management can be used everywhere. Project management is a team collaboration, the better the collaboration, the fewer errors, the better the project completion.

The research direction of this paper is the application of project management in the construction industry. The main research is how to optimize the completion time of the project so that

the project can be completed effectively in the shortest possible time, but also in line with the budget requirements. The research includes human resources as well. In management, how to arrange employees, training employees and solidifying their hearts is also an important part of doing good project management.

At present, the construction management industry does not pay enough attention to the innovation of management technology, and the management scheme is not clear and detailed. (Wang 2021) These problems may lead to the quality of the building problems. At the same time, the real estate industry in recent years is increasingly depressed. For example, the project cannot deliver by the schedule as the plan is unreasonable, construction companies and contractors are unable to complete projects due to bankruptcy. The above problems often occur in the construction industry. Therefore, it is necessary to strengthen the management of project time and cost to improve the efficiency of project management.

This report is organized as follows, first is going to talk about the literature review of the project management. This part is aimed to discuss the

significance of construction management and the methods of project management use in construction management. The literature review will focus on the 3 directions of construction management, which is the schedule, delay factors with the following cost, and human resource management. Then this report will analyse the finding in the literature review and mainly talk about the methods using in the construction. The last section will be a conclusion for the whole project.

## 2 LITERATURE REVIEW

The research idea of this paper is to select the research direction. Base on the research direction to do the literature review, and then found the issue of the construction industry from the literature review. The following will analyse the issue, give the solution and provide the recommendation. The following figure is the brainstorming map of the research approach.

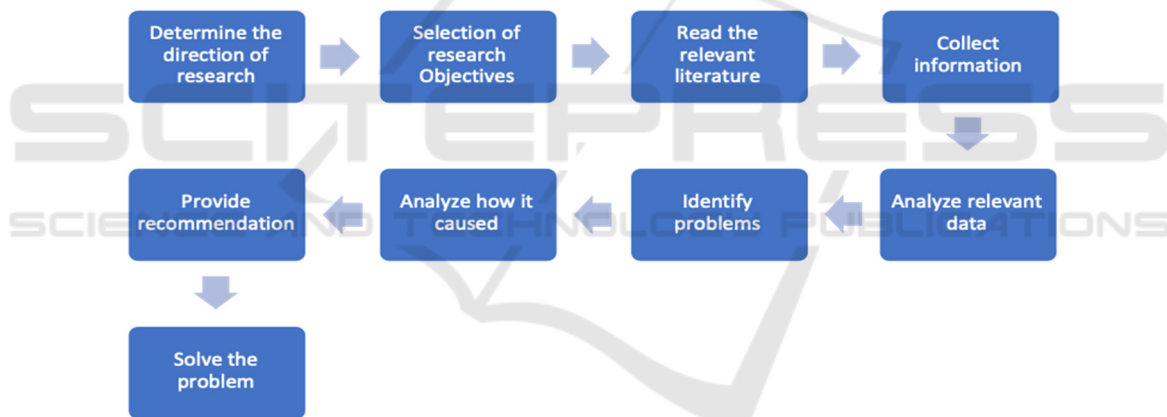


Figure 1. Research approach.

### 2.1 Construction Planning

Schedule management plays a very significant role in project management. Schedule management is to arrange the activities of the project and determine the project duration. Excellent project schedule management helps the company to get back the investment return as early as possible, maintain the good economic situation of the company, ensure the stability of the capital chain, and thus improve the economic benefits of the company. Therefore, in order to achieve the profit goal of the project, there must be reasonable project planning, scientific and reasonable control, and effective investment of resources. (Ge 2011).

For the same management category, construction management and project management are mutually connected. In construction management, there is a stage which is construction planning. It plays a similar role to schedule management in project management.

Planning refers to the overall prediction of the future course of action and is a conceptual word in architecture. Planning is the process of making assumptions and predictions about the future. Gather facts and opinions during the process to develop an appropriate course of action to achieve the proposed objectives. Planning is a very important phase in a project. The success rate of a project will be greatly increased if there is a reasonable plan, the plan is

carried out effectively, and the people involved are actively involved in the plan. (Kerzner 2013) In order to implement the plan smoothly, control is also a very important means. It is necessary to monitor the progress, find the deviation from the original plan in time, evaluate the impact of the deviation and update the plan.

Programming and scheduling are both approaches to construction planning. Programming specifically refers to the identification of the activities needed to complete a project, the relationships between the activities, and the order in which they will be executed. Scheduling is the process of quantifying a program in order to measure time, cost, and efficiency in allocating resources.

## 2.2 Construction Project Delay and Economic Response

Project delay is a phenomenon that all project managers will try their best to reject. Managers tend to make decisions with clear management of all possible consequences. In the past years, Project Management strategies did help companies enhance their effectiveness and avoid insufficient cost. However, a considerable number of uncertainties show up when people manage a project. The uncertainties, sometimes, will lead to a significant delay of the project process and will also result in economic responses like the increasing budget.

The uncertainties of building construction and other constructions are from many resources and regularly get different roles of people involved. A feeble identification and management of the unexpected situation will result in unnecessary costs to the project and serious delay of the project. The Specialty Plant Services (SPS) has stated that the common construction uncertainties poorly including project scope management, sudden increase in construction material, lack of project controls, issues with suppliers and subcontractors, poorly written contract, environmental or weather conditions, and unknown site conditions. (Specialty Plant Services 2021) The SPS also states that companies should identify those potential risks while the preparation of construction. The statement from SPS means that, people can avoid risks in advance with a well-performed project management strategy.

In another essay, Project Management and Delay Factors of Public Housing Construction by Yue Choose Kog, Ph.D. (Yue 2017), stated that the major factors of the delay in a construction project are the late release of the site, variation orders, delay by other contractors, shortage of building materials, inclement

weather, and other factors like amenities. The author's research is based on all 186 cases powered by The Housing and Development Board (HDB), a Singapore public housing development corporation. (Shah 2016) The consequence caused by the delay factors is that for 164 cases, they finished all the construction 854 months late and huge further cost. Since the project was late, the company will have to cover all the compensation to their customers and the document fees related to government activities.

Even more, the economic response of a construction project delay is an important consideration during the project management process. Doctor, Raj Kapur Shah, has done research about the causes for delay and cost overrun in construction projects. (Shah 2016) Raj has analyzed three cases and find out that for different countries, the most critical delay factors will be different, and the future economic response will be various. But one thing in the same is that all delay factors lead to a significant cost overrun situation.

Thus, delay factors and following cost overrun should be considered thoroughly while having project management. Strategies should be applied to make proactive control of the potential delay factors and reject all possible uncertainties.

## 2.3 Construction Project Human Resource Management

A construction project is often hard to achieve its target within the budget and time. Such a tough situation is mainly caused by the following factors, for instance, project complexity, environment, economic, material, project parties and statutory regulations.

Cost overrun is a very common problem facing by the construction industry. Cost is always related between the contract amount and the actual cost. The contract amount is agreed upon by the employer and the contractor during the signing contract stage. The actual cost is the final cost of a completed construction project. In a practical situation, the actual cost is extremely difficult to predict due to various reasons, such as unnecessary employers' interference, low productivity of workers, the managers' lack of experience, etc.

Hence in the year 1989, the idea of Human Resource Management Effectiveness (HRME) was mentioned in Ulrich's Periodicals Directory, by using which will solving similar circumstances (Yang 2021).

Human Resource Management (HRM) is the function within an organization that focuses on

recruitment, management, and providing direction for the people who work in the organization. HRM is the organizational function that deals with issues related to people such as compensation, hiring, performance management, organization development, safety, wellness, benefits, employee motivation, communication, administration, and training. ("Caused Of Employer Related Cost Overrun Construction Essay" ukessays.com. 2018)

The purpose of HRM is to hire, train and develop staff and where necessary to discipline or dismiss them. Through effective training and development, employees at Enterprise achieve promotion within the company and reach their full potential. This reduces the need for external recruitment and makes maximum use of existing talent. ("Strategic Human Resource Management In Asda." ukessays.com. 2018) In this way, the process of managing people during business issues should be easier and more cost-effective.

The evaluation of the efficiency of HRM by the enterprise can improve the strategic role of corporate human resources, make HRM work more closely related to the development of the company, and provide more targeted suggestions for formulating development strategies. Only by continuously evaluating the effectiveness of corporate HRM can we continuously improve its methods and practices and enable HRM to play its strategic role. (Describe Human Resource Management in Organisations in New Zealand." ukessays.com. 2018)

Therefore, the following content will review the objects, perspectives, and methods of human resource management both at home and abroad.

### 3 RESULT AND DISCUSSION

#### 3.1 Construction Planning

To ensure that the project can achieve the expected benefits within a reasonable time frame. During the planning stage, efforts should be made to coordinate resources as much as possible to make the project have sufficient return. So as to meet the full expectations of customers. The following section lists the tools and methods commonly used in the time planning phase of project management.

#### 3.1.1 Management Tools

Work Breakdown Structure(WBS) is to break down the large project by layer-to-layer into its smaller components or activities. Decomposition structure elements can be products, data, services, activities, or other elements which can divide the project with logic. The WBS provides an implementation step for the construction of the project, provides the necessary framework for detailed cost estimation and control, and provides guidance to help control the project schedule and supervision (Munier, Jiménez-Sáez, & Fernández-Diego 2013).

Critical Chain Project Management (CCPM) is a Project Management method proposed by Dr. Eliyahu M. Goldratt in his book Critical Chain in 1997 (Goldratt, 1997). It is proposed to solve the problem that many projects end up taking longer than expected to complete, resulting in increased cost over budget and project delivery quality that does not meet the original promise (Kumar Mishra, & Kumar Muktan, 2019). CCPM can avoid delayed delivery due to task uncertainty. The longest time chain in the critical chain determines the final delivery time of the project. The core of CCPM is to constrain the duration, allowing projects to be completed in a shorter time with limited resources.

#### 3.1.2 Presentation of Plan and Schedule

Critical Path Method (CPM) network and Program Evaluation and Review Technique (PERT) network are commonly used in engineering to assist in time flow planning. Both Networks can display simple diagrams of information flows or workflows, including the order of activities and their relationships. They cannot intuitively display the project completion time and the use of resources. These are graphical models that show strong logical sequences and relationships.

Different from the above two charts, Gantt Charts can well reflect the process and time of the project. Gantt Charts can list the objectives which need to be completed, the tools or the equipment that to be used, the duration of the activities, and the specific time. The chart is very logical as well.

#### 3.2 Construction Project Delay and Economic Response

The delay factors and economic response of cost overrun have shown their significance in the project management of construction projects. To avoid delay factors and cost overrun, proactive movements

should be generated and covered all possible presumptions. Since then, the following parts will talk about the technologies, and methods researchers used to find those legacies and weaknesses in the project management process.

### 3.2.1 Diagnosis Tool

Relative Importance Index (RII) is a tool that can identify the most critical factors causing the delay. When applying the RII method, the company must create a questionnaire and send them to three main parties: consultant, client, and contractors. For each cause, there will be a rank of importance which will be selected by the three main parties. The importance is shown in terms of 1 to 4 with increasing essentiality.

### 3.2.2 Proactive Movements

Since the major project delay factors have been identified, people have a clear view and understand about those factors. With a considerable analysis of the factors, companies will be able to work out a plan in advance to solve and overcome the potential delay factors. For example, the case of the HDB project mentioned previously. The unexcused delay factors like inadequate information can be limited by improving the communication efficiency before beginning of a specific task or even the beginning of the project. A more specific example mentioned in the essay is that the Contract Department should check with the Civil Engineering Department to check on-site availability prior to calling a tender for a building contract (Yue 2017). Another possible proactive movement is to hold meetings between project managers and actual workers more frequently. The meeting will help the administration party well contact construction teams with effective information.

## 3.3 Human Resource Management on Construction Project

Compared with those unsteady and random elements, artificial factors are clearer to be discovered and easier to be taken under control. A good business strategy is one that is likely to succeed, is informed by people factors. (Yang 2021) Accordingly, Performance Management is often recommended to assist the process of managing people who work for the project.

The process of planning, implementing, monitoring, and improving the efficiency and

effectiveness of the internal units of organization and staff can be called Performance Management. Within each organization, Performance Management is a key issue affecting all other components of human resources management. The goal of Performance Management is to improve the performance of individuals, teams, and organizations. ("Strategic Human Resource Management In Asda." ukessays.com. 2018)

The following content includes basic missions for both the managers and the employees. By doing so, the former could manage to facilitate their supervision, while the latter may timely check on the completion of their tasks.

### 3.3.1 Managers: Leaderships, Strict Standard for Recruitment, Communication

A manager may be recognized as the leader of the team. What kind of leadership style does the leader adopt to have a great influence on the development of the team. Leadership can determine the efficiency and future height of a team. The team which has correct or suitable leadership is getting stronger and stronger. On the contrary, it is easy for the team to be lazy and lack creativity. Meanwhile, it will also do more harm than good if the schedule of the project doesn't take emergency and risks measures seriously, or the entire plan is far too vague to comprehend. Therefore, it is necessary to choose the appropriate leadership method for the team according to the actual situation.

Finding the right employees through recruitment is crucial to the completion of projects and the expansion of the team's competitive advantage. Fair recruitment allows the team to have more talent. All kinds of managers should avoid unconscious bias in the recruitment process and give everyone an equal opportunity. Hiring the person best suited for the job without being affected by stereotypes. (B.Kaviya, C.Hema. 2015) Giving the employees a sufficient amount of training is a good idea to be taken into consideration.

Focusing on communication between team members is necessary as well. Employees need to be aware of the goals and deadlines of ongoing projects, so it's important to communicate well with them and inform them about the situation within the organization. In order to control the project process well, doing a good job of time management is very necessary.



### 3.3.2 Employees: Teamwork Culture, Motivate Participation, Accepting Appropriate Training

If the team relationship is not harmonious, then the team members have no cohesion, which is not conducive to the completion of the project. Without cooperation, excellent performance cannot be achieved. Team members should develop the ability to teamwork. The so-called teamwork ability refers to the ability to build on the team, give play to the team spirit, complement and help each other to achieve the maximum work efficiency of the team. For team members, it is not only necessary to have individual abilities, but also the ability to do their best in different positions and coordinate with other members.

Creating a sense of belonging among employees can effectively increase their participation in the work. If the team is always full of contradictions whether the speed and quality of the project completion will have a great impact. Team members should trust each other, be inclusive, maintain open communication and be willing to share ideas. (Bika, 2020) Therefore, in order to better cultivate employees' sense of participation, the most important thing is communication and feedback. Meanwhile, to stimulate the enthusiasm of employees to work, the competition mechanism can be created appropriately. The implementation of competition mechanism in the enterprise, excellent staff promoted, poor performance eliminated so that employees aware of the sense of crisis. In this way, employees can be motivated to improve their enthusiasm, understand that society is the strong kill the weak.

Firing people is never the ideal thing to do, and it's something no hiring manager wants to face. But this method should always be used as a last resort. Employees should be given the opportunity to improve themselves before leaving the team, thus they are not supposed to give in to difficulties so easily. However, if the situation does not change, then consider whether the employee is fit to stay with the team since keeping consistently underperforming employees on the team can lead to negative outcomes and consistently unsatisfactory work quality. (Indeed. 2020)

### 3.4 Suggestions for Concrete Examples

#### 3.4.1 A Construction Project Located in Nanjing, Jiangsu Province, China

In this particular event, the author managed to make a survey about the response of the workers involved in one of the construction projects of a company. The result turned out to be disappointing due to the poor performance of each department. Consequently, the finishing time was postponed to nearly three weeks, leading to an unexpectedly high increase in the cost of the project as well. What's worse, plenty of the employees complained fiercely about the poor organization of the whole procedure. Some of them even claimed that they would never work on such a project again, which indicated that the necessary communication between the managers and the workers was neither enough nor effective at all. (Ting 2020)

To effectively solve the existing problems and to avoid or reduce the possibility of the same problems occurring in the future, our team came up with two suggestions down below:

In the first place, making full use of the realistic capacities of the employees by in-time communication. Truly, CPM and PERT methods are smart implements to shorten the working time, but one should never make the schedule too perfect or too idealistic. In the real world, there will always be some unexpected situations, and we should set aside some time to deal with these problems. At the same time, the projects on the schedule should be broken down into as many details as possible so that more people can manage and monitor the quality of work being done. Additionally, managers ought to regularly ask for or give feedback on their workers' performance. By the means, supervisor understands what employees think, and whether they are faced with any difficulty, employees might provide constructive suggestions about the project. Asking and giving feedback does not only make the task completed more efficient, but it also facilitates the relationship between employee and supervisor. (Vdovin, 2017)

In the second place, it is highly recommended to prepare the right amount of awards for encouragement and stimulation. This is also one of the good method to cultivate both the relationship between the workers and the managers and the pleased and effective environment for cooperating tasks. While the theories of CPM and PERT has already been practiced, a united working team might make the procedure even better than expected.

### 3.4.2 Terminal 5 Project at Heathrow Airport, London

The Terminal 5 project at Heathrow Airport was recognized as a success since it met high standards for safety and quality, remained within budget and was completed on time, and met all its objectives. Its successful completion is credited to the client. British Airports Authority (BAA) had also established relationships with stakeholders that were mutually dependent, contributing to team building, and promote commitment to the project at all levels of the supply chain. (UKEssays. 2018)

According to the writer, from the successful event mentioned above, we may safely arrive at some beneficial advice for HRM on construction projects:

Firstly, the scope of the project should be always under attention. The areas and processes affected by the project are defined as its scope, which needs to be clearly understood by all stakeholders. Therefore, the scope of the project should not be changed without the client's approval, which will also require new estimates of costs and new plans.

Secondly, stick to the final goals once they are clear. If the goals are settled, the project manager is ought to establish the technical and business objectives of the project that will contribute to meeting these goals, which will inform the detailed planning for the project.

Lastly, the final stages of the construction project require careful management. The project manager needs to ensure all elements of the project have been completed, and that the client is given any support needed when taking ownership of the construction, as well as any operational arrangements that are required.

## 4 CONCLUSION

In conclusion, this study exhibits the significance and importance of project management in construction. Following the main leitmotiv of project management is to complete a project meeting client's goal, tools like CCPM and WBS can help project the process with an effective plan and methods like CPM and PERT can help to form up a logical schedule. Further to overcome the uncertainties and delay, RII and BIM tools are being used to predict potential risks, which can cause later cost overrun situations. Though people can never completely prevent unpredictable circumstances, people can use tools to record each happened case to remind future project managers.

Last but not least, HRM plays an essential role in the entire procedure of a program as well. Orderly management of the human resource could simplify numerous tasks and stabilize the routine. Performance Management has been proved to be one of the effective ways to enhance the HRM productivity of them, which will later benefit the process of the whole project management.

A construction project must depend on the management of the project, which reflects the importance of management in the construction process of the project. Therefore, in the construction process to the construction project management as the center, improve the quality of the project, dare to manage innovation, ensure the progress of the project, reduce the cost of the project, improve the economic benefits.

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