

# **IMPROVING TIME PERFORMANCE FOR ASSET OWNING CLIENTS**

**Fei J Ying & Suzanne Wilkinson**

Department of Civil and Environmental Engineering, Faculty of Engineering, The University of Auckland, Private Bag 92019, AUCKLAND, New Zealand.

Email: [s.wilkinson@auckland.ac.nz](mailto:s.wilkinson@auckland.ac.nz)

The objective of this paper is to examine the factors affecting time performance in a large asset management company in New Zealand. The paper initially discusses the factors that are reported in the literature as known to affect construction time performance, for instance adequate project scoping, planning and scheduling. The paper then analyses the impact of these factors using a case study of a large infrastructure project in New Zealand procured and managed by an asset owning client. Whilst previously reported factors are critical to time performance, this paper demonstrates that, due to specific characteristics of infrastructure asset management projects, especially where projects are primarily based on managing and improving assets, other factors, such as company culture, are considered to have as much impact.

Keywords: asset management, time performance, New Zealand

## **INTRODUCTION**

In today's construction environment, timely completion is highlighted as a critical client requirement in order to attain 'first in the market' advantage over competitors (Kog et al., 1999). This trend is supported in the construction research literature that shows an increasing focus on time performance control.

The paper starts by reviewing relevant literature on the factors affecting construction time performance. The study provides a background on the time performance control and presents a case study of an asset rehabilitation project. In accordance with the analysis of the current situation and comments gathered in the project team, a guideline to improve the time performance is recommended. In particular, the paper focuses on how improving organisational culture can improve time performance

## **MANAGEMENT OF CONSTRUCTION TIME AND PERFORMANCE**

Chan and Kumaraswamy, (2002) highlight the need to identify the significant factors that affect construction duration when attempting to enhance construction time performance. They found the commonly accepted parameters for determining the success of a project are: timely completion, completion within budget, compliance with established quality standards, client satisfaction, and project completion without accident. Whilst time performance, quality performance and cost are three important criteria for project success, Laufer and Tucker (1987) point out that cost and time are two major goals of a construction project which receive relatively more attention than quality. This is possibly because that the owners likely start to appreciate in attaining 'first in the market' advantage over competitors and try to avoid the loss of expected profits as a direct result of delays in putting the facility into service (Mahmoud-Jouini

et al., 2004). Effort in research has been aimed at improving construction time performance to achieve a successful project (Sidwell, 1984, Chan and Kumaraswamy, 2002, Proverbs and Holt, 2000, Walker and Shen, 2002). Studies (Walker, 1995, Nkado, 1995, Walker and Shen, 2002, Frimpong et al., 2003, Chan and Chan, 2004) in various countries appear to have contributed significantly to the body of knowledge relating to construction time performance and delays in construction projects over the past three decades. Almost all the researchers agreed that construction duration of a project is affected by a vast number of factors and to a varying extent. Some researchers found an absence of consensus on the identification of factors which influence construction times in the literatures (Nkado, 1995). However, through a review of literature over the past three decades, it is found that some consensus have been achieved.

Researchers accept project scope as a determinant factor for project duration (Walker, 1995, Chan and Kumaraswamy, 2002), which can be measured by construction cost, gross floor area (GFA), the number of storeys. Project scope also covers the choice of construction materials and building systems, building type, and contractual arrangement.

Planning and control of construction operations is also seen as a determining factor. For instance, Chan and Chan, (2004) emphasized that accurate construction planning is a key factor in ensuring the delivery of a project on schedule and within budget. As almost all projects comprise a large number of interdependent items of work and involve many participants, reliable plans and accurate progress-recording mechanisms become essential to project success. Hence, a construction organisation needs a sound time-planning and control system that allows not only efficient and effective management of an individual project but also manage multiple projects simultaneously (Griffith et al., 2000).

Project management factors are necessary to be treated at least of equal importance, if not more important, than good project planning and scheduling (Laufer and Tucker, 1987, Kog et al., 1999). Jaselskis and Ashley (Jaselskis and Ashley, 1991) established a complete list of 27 management factors ranging from number of meetings per month with other project personnel to frequency of project budget updates per year.

Research (Proverbs and Holt, 2000) on European contractor performance illustrated generic concepts of the construction practice which have considerable influence on construction time performance. They were identified and classified as productivity rate, construction method and labour utilisation variables.

Several researchers concluded that the environment describes all external influences on the construction process from a systems point of view (Sidwell, 1984, Walker, 1995). Walker enumerated factors in the environment affecting the construction time performance of a project such as physical, economic, socio-political and industrial relations (Walker, 1995). Thus taking commonly accepted influential factors for construction time performance beyond those directly associated with the actual project.

## **RESEARCH METHODOLOGY**

A case study was selected as the appropriate means for analysing time performance. Collection of information for the case study was accomplished by reviewing project documentation and reports and informal interviews with staff on the project. The project selected as a case study for this paper is a large rehabilitation project of a wastewater network in Auckland. This project was selected as the focus for the study because of the following:

- It is part of a long-term wastewater service delivery strategy for Auckland, therefore the project involved more than the creation of an isolated object.
- The reasons for the existence of the asset and the overall service it provides have a strong influence on the project characteristics. Influences on the security of the service provided by the asset are the key drivers for timely project delivery.
- Much of the available literature focused on construction projects rather than infrastructure asset projects. For an infrastructure management mechanism, lifecycle asset management is a critical part of the strategic planning process. Therefore, the managerial actions adopted in construction projects and infrastructure asset projects are different.

## **FACTORS INFLUENCING TIME PERFORMANCE**

The project encountered extreme time delays. Further study and analysis of the information and comments gathered from the company revealed following key factors influencing time performance in this particular project. These factors are identified as follows:

- Long project scope identification,
- Low speed of decision making
- Inadequate managerial skills during the planning phase
- Insufficient contractor competition
- Lack of a strong organisational culture

### **Long project scope identification**

For an infrastructure rehabilitation project, it is critical that service organisations have a clear knowledge of the condition of their assets and how these are performing. Since all management decisions regarding rehabilitation revolve around these two aspects, the project scope identification relies on the condition assessment.

In the project, project scope identification was a major factor influencing the time performance for the following reasons.

Firstly, the lack of historical information made a site investigation necessary. Due to the important function of system, it was not possible to shut down the whole network for any length of time for a thorough examination. A trial shut down between two main gates was seen to be uneconomic and unsafe. The actual inspections carried out gave only a snapshot of the specified network section, without telling the condition of the rest of the network and its performance. Consequently, a more detailed inspection and condition analysis was needed. Therefore, it took much more time to identify a

clear scope of the project than the company expected at the very beginning of the project.

### **Low speed of decision making**

This factor caused major delays during the project and concerned the financial approval for the project and the approval of trial application. The start date of the project is postponed for two months due to delayed approval from the company board. The delay caused the investigation to miss the right season. Consequently, the entire programme had to be postponed to next summer. Delays for the approval of the trial application caused similar postponements. Due to the lack of a clear project scope, it was difficult for the company to prepare a tender document for an open bid. Therefore, the project team suggested having an experienced contractor to do the trial. However, the board preferred to have at least two contractors to quote for the job, so that a comparison was possible. Finally, the board compromised on this point, because it was difficult to find another qualified contractor the company had confidence in. All these decisions caused significant delay.

### **Inadequate managerial skills during the planning phase**

Lack of project management skills contributed to delay. In particular, the following were encountered:

- A work breakdown structure with the activity list was set up as part of the programme but no supporting details of the activity list were attached.
- Project network diagrams were developed and updated fortnightly based on the information gathered in the regular progress report meetings.
- The range of possible results for activity duration estimation was not included in the programme and there was no basis for the estimates.
- The resources plan was not covered in the project programme.

The programme of this project was produced with Microsoft Project without using the network tools and techniques, resulting in insufficient communication and coordination. Both Griffith et al., (2000) and Lewis, (2001) deem planning software only as a tool to manage the project. The managerial skills are significantly important during the planning phase. Due to the inadequate managerial skill, the information flow between different departments was slow. For some activities in the programme, the time duration estimated was unrealistic. The planners had a lack of knowledge concerning certain activities in the programme. Therefore, the possible risk and unforeseen factors could not be identified. If a more constructive communication system was used between the operating departments and the planner, a better understanding of the activity scope could have been achieved. Hence, a range of possible results for the activity duration estimation can be initiated. This process would then produce a more comprehensible and practical programme increasing the efficiency in the time performance programme.

Furthermore, no resource planning was completed, describing the amount of individual resources an existing schedule requires during specific time periods. This resulted in the delay of materials delivery as per scheduled times, due to the lack of

specific materials, as these projects often demanded specialized resources. Without resource planning, the company failed to order the material in time, resulting a delay of 10 weeks.

### **Insufficient contractor competition**

The team was faced with a shortage of potential contractors to invite to bid for the tender, therefore decreasing the level of competition and choice that influenced the time performance. The company invited four contractors to bid for the main contract. Two of the contractors withdrew from the bidding after their visit to the site, due to a lack of experience. The other two contractors submitted quotations. The contractor with the higher quotation was involved in the trial at that time, which increased his credibility. The company evaluated the other quotation, and found them unsuitable as they had insufficient confidence in them and that this contractor had not visited the actual site prior to submitting his quotation. The project team intended to award the contract to the bidder with higher price, but the board was not satisfied with a non-competitive bid. Therefore, the board advised the other contractor to visit the site and resubmit a quotation. The wet weather postponed the visit for a further two weeks, and it took another six weeks for the company to wait for the quotation. This did not change the original decision but caused a delay of four months in total.

### **Lack of a strong organisational culture**

Based on the analysis of time performance in the project, it was found that communication and coordination were fundamental factors for the success in the planning stage of the project. This result confirms the importance of managerial approaches in programme development. Peters and Waterman (1982) contend: 'Without exception, the dominance and coherence of culture proved to be an essential quality of the excellent companies. Moreover, the stronger the culture and the more it was directed toward the marketplace, the less need there was for policy manuals, organisation charts, or detailed procedures and rules'.

The case study analysis revealed that inadequate communication and coordination is an obstacle for the company studied to achieve higher efficiency in the planning and designing process. Hence, creating a change in organisational culture to encourage cooperation is a vital part of developing better time performance. If the company can institute an atmosphere where people are encouraged to cooperate, it would help to set the communication as a custom or habit of managerial behaviour. Therefore, the information flow can be transferred smoothly among the departments to avoid meaningless delays. In the literature, a structured approach is identified as a key point in time performance control. The outcome of an appropriate organisational structure is achieving integration, efficient communication, and teamwork. Incorporated with it, appropriate organisational culture may maximise the effort and improve efficiency.

## **DISCUSSION**

It is interesting to find that some of the major factors influencing time performance in the case study project are not exactly covered in the literature review. The main

factors mentioned in the literature review affecting time performance are project scope identification and project management factors. In contrast, low speed of decision-making and insufficient contractor competition are not covered. The concept of project scope identification in the context of the company studied is different to the one in construction industry. The scope covers the construction costs, gross floor area, choice of construction materials, and building type in a construction project. These elements can be easily determined at the very beginning of the project life, normally during or before the design stage. Due to their low visibility, the project scope of underground asset rehabilitation is difficult to identify. The scope of the project relies on the information gathered during condition assessment of the underground asset. Therefore, the procedure to determine the scope is a time consuming activity.

In the construction industry, project management factors influencing time performance are cited as, for example, devoted project manager time, frequency of meetings the project manager holds with project personnel, monetary incentives to designer, implementation of a practicable programme, and project manager scope experience (Kog et al., 1999). In the case study, these management factors slightly impact on the time performance, except the implementation of a practicable programme. The lack of integration of construction knowledge, especially the degree of coordination and the effectiveness of communication have been shown to be one of the main obstacles to achieving a good project programme. Unfortunately, the project programme is the baseline to measure the project time performance. An unpractical project programme will make the project control difficult to practice.

Furthermore, low speed of decision-making does not get a high ranking in the literature, but it significantly delayed the case study project. These delays were about the financial approvals, which may be caused by the characteristics of infrastructure asset management. Investment in asset rehabilitation is large and has a long-term span, which made the board deliberations take considerable, unexpected, time. These delays were also relevant to other factors, seasonal requirement and insufficient contractor competition.

Insufficient contractor competition is not mentioned frequently in the literature. However, in the case of the company studied, the project required a contractor with good reputation and experience in asset rehabilitation. Due to the difficulty to access the asset and the necessity of specific equipment, only a few of contractors were available in local market. The shortage of the eligible contractors complicated the bidding process. Insufficient contractor competition may have also be affected by the construction industry context in New Zealand. The statistics show that more than 96% of the businesses in the construction industry are in the category of small to medium-sized enterprise (SME). SME's are owned and operated by five to twenty full time staff. Despite large engineering consultancy businesses, architectural practices and contractors, the New Zealand construction industry is underpinned by many SMEs (Wilkinson and Scofield, 2003). Therefore, when encountering a specific, labour-intensive, comprehensive project like the project studied here, the client is constrained by insufficient contractor competition.

Finally, organisational culture was seen to impact on time performance. Lack of cooperation amongst departments and groups created delays. The inability to share knowledge, or understand the process, compounded this.

## CONCLUSION

The highly ranked factors influencing time performance named in the literature are project scope, project planning and scheduling, management factors, construction practice and environment factors. However, it is not expected that all these factors would be critical in any particular project. In this study, scope identification was one of the most critical factors influencing the time performance of the project. However, the difficulty in project scope identification related to the restricted access of condition inspection, weather, and material availability. As the project belongs to the infrastructure asset, the management strategy is different to that of individual construction projects. It focuses on the most cost effective solution in the long term instead of the short term, due to the long life of the infrastructure asset. Therefore, the project team has to consider all options to restore the asset condition to achieve a pre-defined level of service. These characteristics require high managerial skills, especially communication and coordination, during the planning phase to set up a practical programme. The special constraint in the New Zealand environment should also be noted as a potential to impact on time performance. However, from this study, changing organisational culture, which would help the organisation to set a better communication standard for managerial behaviour, has to be seen as one of the key determinants to improved time performance. Focussing on culture may help the organisation to improve the time performance in the future.

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