PERFORMANCE MANAGEMENT IN CONSTRUCTION PROJECTS

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Abstract- Construction industry plays a major role in the development and achieving milestones in the economy of a country. Effective monitoring of the construction projects requires the integration and quantification of various aspects of performance. The traditional performance indicators are Time, Cost and Quality. Most project control systems only consider these indicators and ignore the factors such as project team satisfaction, safety, client satisfaction and cash flow. This study shows how the project team satisfaction, client satisfaction, safety and cash flow affect performance indicators (Time, Cost and Quality) of construction projects and recommend solutions to improve the performance of projects. In this research, an attempt was made to find the effect of project team satisfaction, client satisfaction, safety and cash flow on performance indicators of construction projects and to find the critical performance indicator affected by each factor (project team satisfaction, client satisfaction, safety and cash flow). The research methodology consists of a detailed literature review followed by data collection via a questionnaire survey and analysis of data and formulation of results. The study mainly focused on building projects in Sri Lanka.

Keywords- Performance Management, Construction.

I. INTRODUCTION

Construction Projects are organized to accomplish complex tasks with the help of different teams in the construction industry. Performance Management is the process of planning, implementing, monitoring and improving the efficiency and effectiveness of the organization. Therefore, for the development and achievement of goals in the construction industry, performance management is important.

Helen,et al.(2015) stated that construction industry is complex in nature because it contains large number of project parties as clients, consultants, contractors, stakeholders, shareholders and regulators. The complexity and fragmented nature of the industry and its highly casual employment of labor makes it sensitive to poor contract performance.

For effective performance, it is required to measure the performance of the organization. Time, cost and quality are considered as the performance indicators to measure the performance.

The Sri Lankan construction industry is considered as a developing industry and is still facing many challenges regarding the performance. Strategies incorporating major aspects of project performance like cash flow, safety, project team satisfaction and client satisfaction will be useful to improve the performance. Therefore, those factors should be taken in to consideration for effective performance of construction projects.

II. LITERATURE REVIEW

Performance Management is the process of planning, implementing, monitoring and improving the efficiency of an organization. Performance can be assured by identifying and eliminating the factors that cause poor project outcomes. Project is a complex, non-routine, one-time effort limited by time, budget and resource and performance specifications designed to meet customer needs (Babu and Subhakar, 2007). A construction project is completed through a combination of many events and interactions, planned or unplanned, over the life of a facility, with changing participants and processes in a constantly changing environment (Babu and Subhakar, 2007). Since the outcomes of the capital projects have strategic implications on the success and profitability of the business, the ability to deliver based on pre-determined objectives should be critical to the company's success. Project success can be defined as meeting the required expectation of the stakeholders and achieving its intended purpose. Success criteria or a person's definition of success as it relates to construction often changes from project to project depending on participants, scope of services, project size, sophistication of the owner related to the design of facilities, technological implications, and a variety of other factors (Babu and Subhakar, 2007). Chan and Chan, (2004) reported that criteria to measure project success play a key role and have been widely adopted in the construction industry. Success criteria can be defined as the set of principles by which favourable outcomes can be completed within a set specification. Time, cost, and quality, known as the “iron triangle”, have long been the benchmarks of project success.

Helen et al. (2015) stated that construction performance embraces client’s satisfaction, time performance, cost performance, construction quality and sustainable development.

Safety in construction sites is very important to be considered in order to reduce the risk of being injured at work. Safety is also identified as one of the major factors affecting the image of the project manager and the organization (Grandjean, 1983). As reported by Nair (2015), cash flow can have a serious impact on the project and there can be a serious communication problem.

Kagioglou,et al., (2001) reported that the importance of identifying an organization's performance is evident throughout the world-wide markets, the results of which are to attract future investment, increase share value and attract high caliber employees. Therefore, it is important to consider how an organization's performance is measured and how it can be communicated to the wider market i.e. how can it be understood and interpreted by the potential investors, employees and customer performance of a construction company affects not only to a single project but for the organization's behavior.

Time, Cost and Quality as performance indicators

Performance measurement is defined as the process of evaluating performance relative to a defined goal. It provides a sense of where we are and, more importantly, where we are going (Rose, 1995).

It is accepted that, performance measures of a project are based on time cost and quality (Barkley and Saylor,1994). Atkinson (1999) reported that these three components of project performance as the 'iron triangle'.

The time overrun in construction projects has become one of the most common problems in the industry that cause multitude of negative effects on the projects and its stakeholders. Time overrun in the construction phase of a project can be defined as the non-completion of the project within the original or stipulated agreed contract period. Therefore, this aspect has been constantly investigated by the researchers across the world with great enthusiasm (Dolage and Rathnamali, 2013).

Hisham and Yahya, (2015) demonstrated that delays in a construction project can cause very serious issues for the parties involved such as client, consultants and contractors. There are many adverse effects that can occur as a result of the delays. To reduce this problem from occurring, site management should be carried out very carefully. Since countries are advancing towards industrialization, the role of the construction industry is greatly enhanced. When a project is delayed, the client or user will have an impact not only that the building cannot be used, but they will need to postpone their early planning in addition to bearing the cost overruns that will increase. This issue is a major problem in the construction industry not only in Malaysia but the phenomenon is a global problem for the construction industry worldwide.

Cost is among the major considerations throughout the project life cycle. The gap between the cost at completion and that originally estimated known as cost overrun can be regarded as one of the most important parameters reflecting the success of projects. Despite its proven importance, it is common to see construction projects failing to complete within the originally estimated cost. Cost overrun is a frequent phenomenon and is associated with most of the projects in the construction industry in Sri Lanka. This trend is seen in the other developing countries where these overruns sometimes exceed 100% of the original cost of the project (Wijekoon and Attanayake, 2013)

Enshassiet al. (2009) stated that keeping construction projects within estimated costs and schedules requires sound strategies, good practices, and careful judgment. To the dislike of owners, contractors and consultants, however, many projects experience extensive delays and thereby exceed initial time and cost estimates. This problem is more obvious in the traditional or adversarial type of contracts in which the contract is awarded to the lowest bidder, which is the strategy used in majority of public projects in developing countries.

It's customary in construction industries to award the projects to the lowest bids. Therefore, without controlling key cost influencing factors, construction companies will not be able to control the expenditure effectively, which will in turn increase project costs and affect overall profit. In fact, construction cost overrun is a common problem in the construction industry (Cheng, 2013).

Quality is described as the totality of features required by a product or service to satisfy a given need; fitness for purpose. In other words, quality in construction industry emphasizes the capability to establish requirements with conformance to the quality standard. Requirements will be predefined by client in contract agreement and the requirements consist of the established characteristics of products, processes, and services. All the parties involved in the project must fully understand those requirements and expectations in order to achieve a complete project that meets clients' quality expectation (Leong, et al., 2014).

Jha and Iyer,(2006) reported that in the realm of project management, the schedule, cost and quality achievement is also referred to as the iron triangle. Out of these three aspects, it is the achievement of schedule and cost compliances that the project management is attending to most of the time. This results in a half-hearted attempt to achieve quality at project sites. In order to achieve the schedule and cost objectives, project quality is sometimes overlooked. Although many studies have recognized the importance of maintaining and doing quality projects, these aspects are sacrificed in lieu of achieving short-term objectives.

Therefore, for effective monitoring of the construction projects it requires the integration and quantification of various aspects of performance. The traditional performance indicators, Time, Cost and Quality can be used to measure the performance.

Factors effecting performance indicators

Project team satisfaction, safety, client satisfaction and cash flow can have an effect on time, cost and quality of a project.

Helen et al. (2015) stated that construction performance embraces client's satisfaction, time performance, cost performance, construction quality and sustainable development.

Cash flow is one of the most critical aspects in the proper management of any company or industry. Success or failure in proper cash flow management ultimately plays a huge role in determining the success or failure of the company or industry as a whole. The cash flow can have a serious impact on the project and there can be a serious communication problem. Cash flow problems can be accounted for in the various reasons for failure. Problems can start from failure to convince creditors and possible lenders of money that this inadequacy is only temporary and would not result in bankruptcy. Therefore, forecasting cash requirements is essential in order to make provisions for difficult times in the future (Nair, 2015).

Safety in construction sites is very important to be considered in order to reduce the risk of being injured at work. Safety is also identified as one of the major factors affecting the image of the project manager and the organization (Grandjean, 1983)

As reported by Coble and Kibert, (1994) traditionally, Cost, Quality and Time have constituted the parameters within which projects have been procured and managed. However, cost, quality and time can be indirectly compromised by lack of safety and health, or directly as a result of accidents and therefore it is important to consider the aspect of safety. There are three reasons for considering safety and health in construction industry, these are: human factor, legislation and financial issues. Environmental concerns are often interrelated with construction health and safety issues.

As construction projects are often associated with constraints such as time, cost and quality. Time and cost control is essential for a team to fully understand the whole project setup and how critical it is to develop an effective team. Construction team members are selected, based on the abilities of each team member, namely particular discipline skill, expertise, and experience, they have to offer to perform the technical contribution in an efficient and profitable way (Santosh, 2016).

Hapuarachchi and Senarathna, (2004) says that construction industry is highly susceptible to be benefited from teams as the construction products are delivered by a collection of diverse professionals. However, effective teams cannot be created at a stroke, and, they need time and opportunity to mature. This is normally referred as team development.

Clients who are closely involved in managing a project are usually the most satisfied with the project quality (Bubshait and Al-Musaid, 1992). However, the client has duties and responsibilities when involved in the construction process and client satisfaction is effecting performance.

III. METHODOLOGY

Questionnaire survey, Google forms and in depth interviews were used to collect data. To find out how the project team satisfaction, client satisfaction, safety and cash flow affect time, cost and quality, different sets of questions related to the project team satisfaction, client satisfaction, safety and cash flow were included in the questionnaire. For a particular site the data related to time and cost were taken from the progress reports. To get the data about quality another set of questions were provided.

Relative Importance Index equation was used to find the critical performance indicators which were affected by the factors (project team satisfaction, client satisfaction, safety and cash flow).

Graphs were drawn between each performance indicator and each factor to find the effect of project team satisfaction, client satisfaction, safety and cash flow on performance indicators.

IV. RESULTS

The data analysis was carried out to find the critical performance indicators affected by each factor (project team satisfaction, client satisfaction, safety and cash flow) by analyzing the 52 nos. of responses using Relative Importance Index (RII) and the results are summarized in Table 1.

Table 1: Values taken from the RII

Factors	Time	Cost	Quality
Project team Satisfaction	0.424	0.295	0.282
Client Satisfaction	0.146	0.411	0.442
Safety	0.423	0.218	0.359
Cash flow	0.449	0.455	0.097

The data analysis was carried out to find the effect of project team satisfaction, client satisfaction, safety and cash flow on performance indicators (Time, Cost and Quality) of construction projects by analyzing the 52 nos. of responses using degree of influences such as strongly disagree, disagree, may be, agree and strongly agree in the responses.

Cost performance and Time performance were calculated from the equations given below and the equations were based on the Earned Value Management System (EVMS) method.

Cost Performance = (Budgeted cost / Actual cost) * 100%

Time performance = (Scheduled time/ Actual time) * 100%

Graphs were drawn between each performance indicator and each factor.

Time Performance

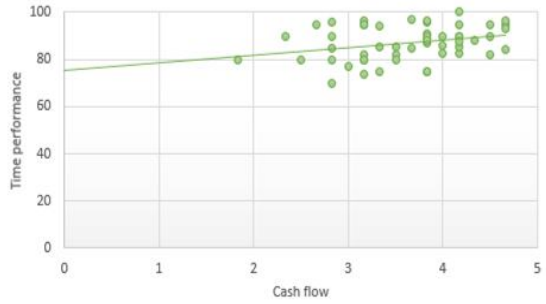

Figure 1: Time performance vs. Cash flow

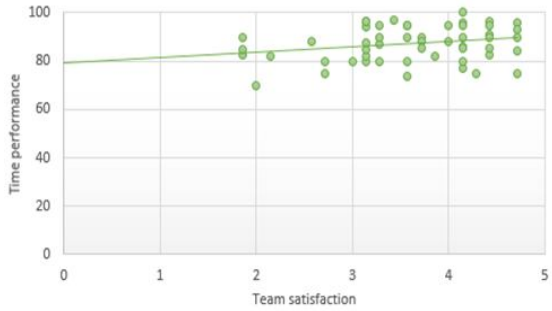

Figure 2: Time performance vs team satisfaction

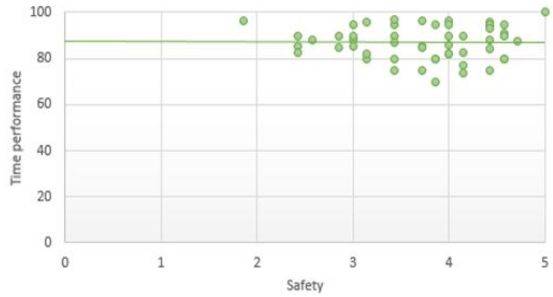

Figure 3: Time performance vs. Safety

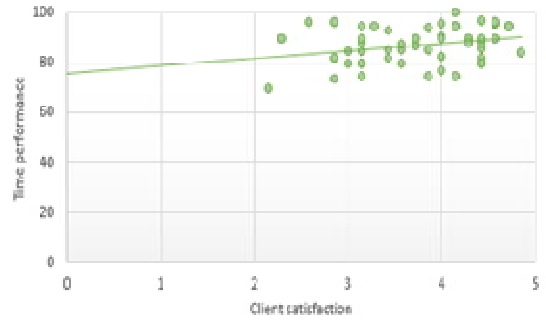

Figure 4: Time performance vs. client satisfaction

Cost Performance

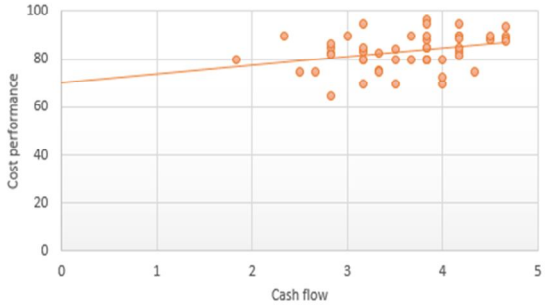

Figure 5: Cost performance vs. Cash flow

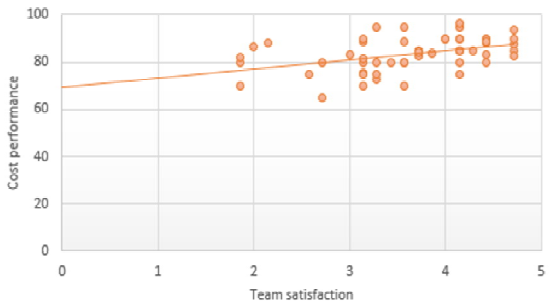

Figure 6: Cost performance vs. Team satisfaction

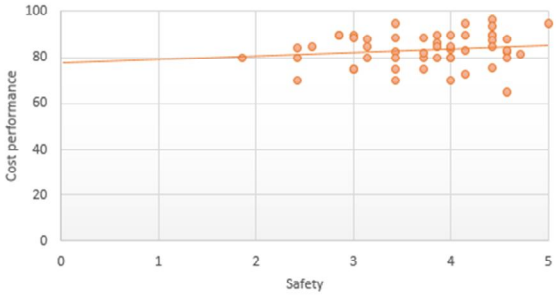

Figure 7: Cost performance vs. Safety

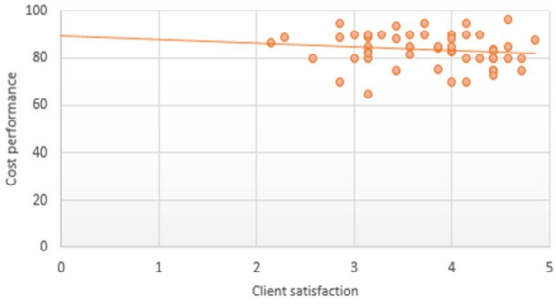

Figure 8: Cost performance vs. Client satisfaction

Quality Performance

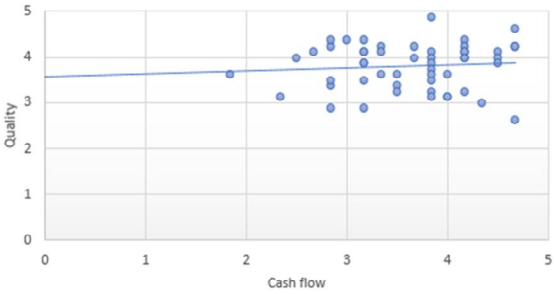

Figure 9: Quality performance vs. Cash flow

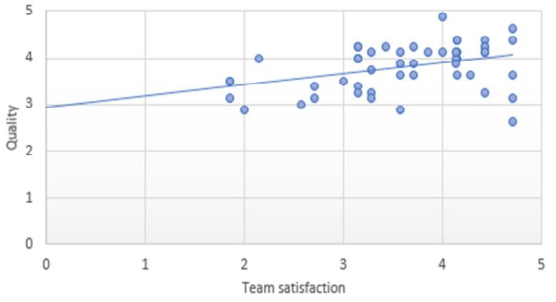

Figure 10: Quality performance vs. Team satisfaction

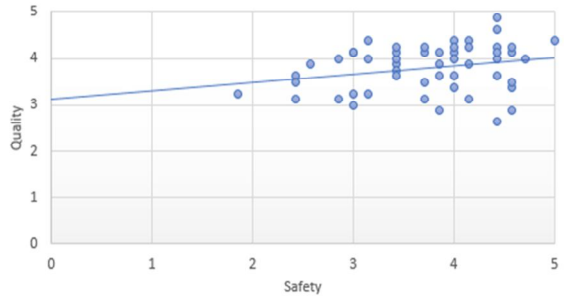

Figure 11: Quality performance vs. Safety

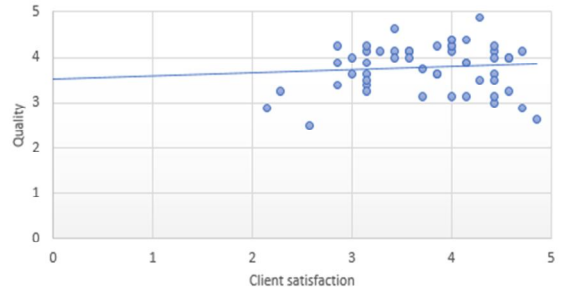

Figure 12: Quality performance vs. Client satisfaction

CONCLUSIONS

The main focus of this study was to find the critical performance indicators affected by each factor (project team satisfaction, client satisfaction, safety and cash flow) and to find the effect of project team satisfaction, client satisfaction, safety and cash flow on the three performance indicators (Time, Cost and Quality)

Critical performance indicators affected by each factor (project team satisfaction, client satisfaction, safety and cash flow) are as follows.

- Project team satisfaction
  - ✓ Time
  - ✓ Cost
  - ✓ Quality
- Client satisfaction
  - ✓ Cost
  - ✓ Quality
- Safety
  - ✓ Time
  - ✓ Cost
  - ✓ Quality
- Cash flow
  - ✓ Time
  - ✓ Cost

Effect of project team satisfaction, client satisfaction, safety and cash flow on performance indicators (Time, Cost and Quality) of construction projects are as follows.

Time

Project team satisfaction, well composed cash flow and client satisfaction positively affect the time performance of a project. Safety is not affecting the time performance indicator positively. When it is needed to ensure good safety practices at the site, it is needed to allocate additional time from the schedules.

Cost

Project team satisfaction, safety and well composed cash flow positively affect the cost performance of a project. Client satisfaction is not affecting the cost performance indicator positively. To ensure client satisfaction, more works have to be carried out to increase the quality of the project and it will lead to an increase in the budgeted cost of the project.

Quality

Project team satisfaction, safety, well composed cash flow and client satisfaction are positively affecting the quality performance of a project.

RECOMMENDATIONS

According to the above findings, following recommendations can be made to improve the performance of construction projects.

1. The traditional performance indicators are Time, Cost and Quality. Most project control systems only consider the above indicators and ignore the factors such as project team satisfaction, safety, client satisfaction and cash flow, are required to be considered since they affect performance indicators.
2. Well composed cash flow is important to increase the performance of construction projects.
3. Client satisfaction and project team satisfaction are vital factors to increase the performance of construction projects.
4. Safety in construction sites is very important to be considered in order to increase the efficiency of the project and therefore special attention should be given for safety to increase the performance of construction projects.

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