Criteria for Construction Project Success: A Literature Review

G. A. S. K. Silva* *(phd6115fm2014013@sjp.ac.lk)*
B. N. F. Warnakulasuriya *(neville@sjp.ac.lk)*
B. J. H. Arachchige *(bhadra@sjp.ac.lk)*
University of Sri Jayewardenepura, Sri Lanka

Abstract

Execution of construction projects in an efficient and effective way is a core competency of project-based organizations. Evaluation of project success plays a key role in improving project management competency. Project success is an elusive topic and goes beyond project management success and traditional criteria. The lack of an agreed definition and a set of criteria for construction project success have long been the reasons for failing to evaluate success. The main possible causes for such disagreement would be the abstract nature of the concept itself and studies including different industry projects and different participants' viewpoints with different priorities. Therefore, the objective of this paper is to define construction project success and to develop a framework with a practical set of measurement criteria to evaluate the same.

This study has followed the Systematic Review Approach recommended by Tranfield et al. (2003). The recommended check-list by Saunders et al. (2007) was used to ensure the criticality of the review. A definition for Construction Project Success and ten criteria – subjective and objective have been identified. The criteria are Time, Cost, Quality, Safety, Client's Satisfaction, Employees' Satisfaction, Cash-flow Management, Profitability, Environment Performance and Learning and Development. The paper stresses the need for a long-term perspective rather than having a short-term perspective of Construction Project Success. Further, it has disentangled complications in literature over some criteria such as Quality and Satisfaction. Employee Satisfaction and Learning & Development have been completely overlooked as a result of short term perspective. Criteria should facilitate measuring project success during the execution stage as well as at the end of the project. It is recommended that, through the studies of relationships between critical success factors and success criteria a stronger model to ensure project success could be established. Proposed framework will be tested in Sri Lankan context in future and findings would be added to the project management body of knowledge. Proposed framework will be instrumental for filling the existing empirical gaps.

Keywords: Construction Industry, Project Management, Success Criteria, Project Success, Success Measurements

INTRODUCTION

Project success is the foundation for managing and controlling current projects, and for planning and orienting future projects (Chovichien and Nguyen, 2013). It is believed that things that cannot be measured cannot be improved. Pinto and Slevin (1988) state that advantages of evaluation of project success include but not limited to: increase ongoing surveillance capacity in order to track key project result areas, project managers are evaluated within their organizations based on their track records of managing successful projects, performance bonuses, raises, and promotions often ride on their ability to bring in these successful projects. Project success is an abstract concept and determining whether a project is successful is subjective and extremely complex (Parfitt and Sanvido, 1993; Chan, 2002). Han et al. (2012) stress that the lack of an agreed definition for project success has long been the reason for failing to define and evaluate success. The topic may become more complicated in the context of construction industry. Chan and Chan (2001) stress that the concept of project success has remained ambiguously defined in the construction industry. Further Chan and Chan (2001) and many other researchers opine that though many researchers have proposed various criteria to measure construction project success, there is no general agreement.

The main possible cause for this disagreement would be the abstract nature of the concept of project success. Shenhar et al. (2001) explain this problem and recommend using a more project-specific approach. Another contributory factor for disagreement would be that a construction project involves many stakeholders with diverse objectives. Diversity in opinions leads to further disagreement on criteria. Therefore, participant specific criteria would be another positive step towards enhancing agreement. Further, Yong and Musttaffa (2012) mention that with rapid changes happening in the construction industry, findings have become obsolete and unable to reflect the current development in the industry. Therefore, the main purpose of this paper is to develop a definition for construction project success and a framework with a practical set of measurement criteria to evaluate construction project success in Sri Lankan context in the future. Accordingly, this study will seek specifically answers to following research questions.

RQ1 – How the concept of construction project success is defined?

RQ2 – What are the criteria for measuring construction project success?

RQ3 – How dimensions of the construction project success are linked to the definition**?**

RQ4 **–** What are the major themes in construction project success?

SIGNIFICANCE/APPLICATION

Definitions mean for achieving agreement and contribute towards a better understanding of differences (Pryke and Smyth, 2006 as cited in Han et al., 2012). Therefore, proposed definition will help to disentangle confusions in literature. Proposed evaluation criteria and measures would be instrumental for practitioners to improve project management competency of construction companies and for academics to fill the empirical gaps existing in construction project context. As the construction sector has an influencing bearing on project management practice (Crawford et al., 2006 as cited in Han et al., 2012) findings of this study will be a significant contribution to the project management body of knowledge as well. Further, this paper brings to fore employee/staff satisfaction, learning and development and cash-flow management as critical success measurement criteria that have been completely overlooked in the literature.

METHOD/RESEARCH STRATEGY

This study has followed the Systematic Review Approach recommended by Tranfield et al. (2003) and Ng and Peh (2010) as the systematic review process increases methodological rigour and helps developing a reliable knowledge of studies. The four steps as per Ng and Peh (2010) performed are;

1. Selecting
2. Appraising,
3. Synthesizing
4. Reporting evidence

A thematic analysis has been performed according to the recommended steps by Clarke and Braun (2013) in order to identify and organize themes. The steps are;

1. Familiarization with the data
2. Coding
3. Searching for themes
4. Reviewing themes
5. Defining and naming themes
6. Writing up

Finally, the checklist presented by Saunders et al. (2007) was used to evaluate the criticality of the literature review.

Identification of Studies: Related papers were selected using key wards: Construction Industry, Construction Project Management, Success Criteria, Construction Project Success, and Success Measurements and snowballing technique. Search engines include Emerald Insight, Google Scholar, Taylor and Francis, and Science Direct.

Inclusion and Exclusion Criteria: The criteria that were used to include and exclude papers are, availability of further information required to make the assessment, relevance to the research questions and objectives of the study.

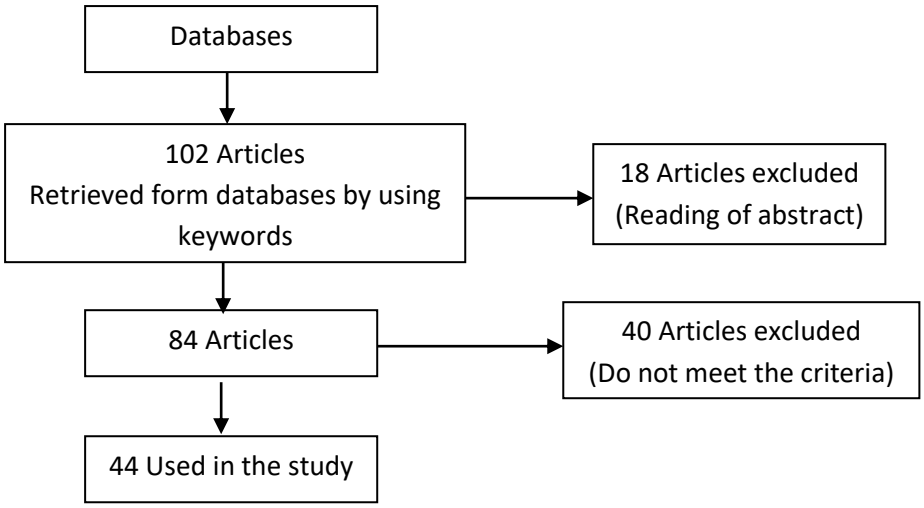

Figure 01: Flow chart for identifying eligible articles adopted from Ng and Peh (2010)

Quality Assurance: considered citations, methodology, authors' backgrounds and recognition of the journals.

Data Extraction and Analysis: Relevant data was extracted and analyzed qualitatively using a summary table. In the process, similar ideas/criteria were combined and some were modified in order to increase the level of clarity.

RESULTS

Projects and Construction Projects

Munns and Bjeirmi (1996) consider a project as the achievement of a specified objective, which involves a series of activities and tasks that consume resources. PMBOK@GUIDE (2008) defines a project as a temporary endeavor undertaken to create a unique product, service or result. Pinto and Slevin (1988) defines a project for their study as possessing

the characteristics of: a defined beginning and end (specified time to completion), a specific, preordained goal or set of goals (performance specifications), a series of complex or interrelated activities and a limited budget. Examples of projects include developing a new product or service, effecting a change in the structure, staffing or style of an organization, developing or acquiring new or modified information system, constructing a building or infrastructure or implementing a new business process or procedure (PMBOK@GUIDE, 2008). However, this study focuses on the construction industry projects.

Construction projects are naturally high risky and complex due to their wide divergence of project sites, high pressure on demanding construction time and cost, involve many project participants with different objectives as well as increasing complexity on construction techniques. Chitkara (2013) defines a construction project as a high-value, time bound, special construction mission creating a construction facility or service, with predetermined performance objectives defined in terms of quality specification, completion time, budgeted cost and other specified constraints. For the purpose of this study, a construction project could be defined as:

> *"A mission undertaken to create a construction facility or a service with predetermined performance objectives with the involvement of different project participants with different expectations" Examples for construction projects include: construction of road and highways, bridges, high-rise buildings, port, airports, dam and irrigation systems etc"*

Project Management

Project Management (PM) is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements (PMBOK@GUIDE, 2008). Today, PM has developed to be an independent discipline, however, its concepts and techniques are continuously evolving. The PM literature traditionally refers to two streams of studies of project success. One stream is the project success factors; these are the independent variables that make success more likely. Other one is the project success criteria; these are the dependent variables that measure success (Morris and Hough, 1987; Wateridge, 1998; Turner, 1999 as cited in Muller and Jugdev, 2012). In addition to the two said streams, Han et al. (2012) reviewed of the project success notions and proposes a conceptual framework for enhancing project success by identifying the relationship

between success factors and success criteria as a new researches area (third stream) in construction project context. It is believed that in construction project context, studies of these three streams will be instrumental to the development of the project management knowledge domain.

Project Success Factors

Han et al. (2012) define success factors as those factors that influence, constitute as well as determine the success of a project. According to De Wit (1988) and Cooke-Davies (2002), success factors are those inputs to the management system that lead directly or indirectly to the success of the project. Success factors are further classified under two main categories, one being hard, and objectives, tangible and measurable while the other soft, subjective, intangible and less measurable (Chan et al., 2004). Many studies have been focused on project success factors (e.g. Chan et al., 2004; Hatush and Skitmore, 1997; Nguyen et al., 2004; Parfitt and Sanvido, 1993; Salminen, 2005; Sanvido et al., 1992; Tabish and Jha, 2011; Terry, 2002 as cited in Chovichien and Nguyen (2013). Silva et al. (2015) extract critical success factors affecting construction project success from literature and grouped as internal and external factors.

Construction Project Success

Previously, a definition for "a construction project" was discussed and the most elusive part is "success". Baker et al. (1988) suggest that there is no such thing as an absolute success in a project and there is only perceived success. Freeman and Beale (1992) illustrate that architects usually place emphasis on aesthetic aspect of a building while the engineers usually focus on the structural aspect of a building. According to De Wit (1988), measuring success is complex because it depends on the stakeholders' points of view, and it is time dependent. Oxford Advance Learners' Dictionary (2010) defines "success" as "the fact that you have achieved something that you want and have been trying to do or get". According to Parfitt and Sanvido (1993), the definition of project success is different for each participant, but it is based on the basic concept of overall achievement of project goals and expectations. These goals and expectations may include technical, financial, educational, social, and professional issues etc. Belout (1998) pointed out that a synonym for success is effectiveness: the degree of achievement of objectives. Chovichien and Nguyen (2013) mention that the project goals are the most appropriate

criteria for project success assessment. Anyhow the term 'goals' synonyms with the term 'objectives'.

Chua et al. (1999) defined project participants as the key players, including project manager, client, contractor, consultant, subcontractor, supplier, and manufacturers. However, according to Wai et al. (2012), there are many different sets of project success criteria, but none of them will be suitable for all of the different stakeholders involved in the construction industry. Therefore, the attention should be given to the main project participants. Often, a client is represented by a consultant(s). Frödell et al. (2008) categorized clients concerning whether the client is a private or a public company. The contracting company (contractor) is the next very important participant who is fully responsible for the successful project delivery/execution. Employees/staff are important for the achievement of long-term and short-term objectives. Therefore, construction project success could be defined as:

> *"The perceived degree of achievement of predetermined performance objectives and participants' expectations of the execution of a construction facility or a service"*

Success Criteria

De Wit (1988) and Cooke-Davies (2002) refer project success criteria as the measure by which success or failure of a project will be judged. Lim and Mohomed (1999) refer criterion as a principle or standard by which anything is or can be judged. Chan and Chan (2001) define project success criteria as the set of principles or standards by which favorable outcomes can be completed within a set specification. For the purpose of this study, definition used by De Wit (1988) and Cooke-Davies (2002) will be used. The criteria for measuring project success must be set out at the beginning of the project (Baccarini, 1999). Frödell et al. (2008) mention the characteristic of a measuring system; simplicity in use, credibility in results, fast feedback, action orientation, economical and efficient, few measures, broad collection of data and broad feedback.

Time and Cost Criteria: Almost every paper on success criteria never forgets to mention about these two traditional criteria which are often grouped under project efficiency dimension. Further, it could be noted that there is no confusion among researches on the usage of those two terms (e.g. Chovichien and Nguyen, 2013; Al-Tmeemy, 2011; Heravi

and Ilbeigi, 2012; Khosravi and Afshri, 2011). Time or schedule generally refers to the agreed/approved duration for the compilation of a project. Time can be measured in terms of construction time, speed of construction and time overrun (Naoum, 1994 and Chan, 1997 as cited in Chan and Chan, 2001). Heravi and Ilbeigi (2012) proposed schedule performance index and it is a measure of the schedule efficiency of a project. Cost generally refers to the degree of compilation of construction work within the estimated budget. Chan and Chan (2001) explain that cost should not be confined only to the tender sum and therefore, it includes any costs arise from variations, modification during construction period and the cost created by the legal claims, such as litigation and arbitration. The measure of cost can be in the forms of unit cost, percentage of net variation over final cost (cost overrun). Heravi and Ilbeigi (2012) introduce the cost performance index (CPI) which is a measure of the cost efficiency of the project.

The Quality Criterion: This is a traditional criterion but it is confusingly used. In literature, it could be noted that while some researchers used quality as a single main criterion (e.g. Lim and Mohamed, 1999; Chan and Chan, 2001; Pinto and Slevin, 1988; Atkinson, 1999) some other researchers use quality, technical performance and functionality as separate criteria (e.g. Chovichien and Nguyen, 2013; Al-Tmeemy, 2011). Heravi and Ilbeigi (2012) use product quality and process quality separately. Elattar (2009) also refers quality and technical performance as two distinctive criteria. However, the quality of a project was commonly defined as meeting technical specifications (Khosravi and Afshari, 2011). Prabhakar (2008) as cited in Serradora and Turnerb (2014) mentions that quality is intertwined with issues of technical performance, specifications, and achievement of functional objectives and it is the achievement against these criteria that will be most subject to variation in perception by multiple project stakeholders. It is assumed that product quality and process quality are embedded in the functionality and technical performance in construction project context. Chan et al. (2002) stress that quality, technical performance, and functionality are closely related and are considered important to the owner, designer, and contractor. Chan and Chan (2001) further mentions that the quality would be measured subjectively using a seven-point scale. Chan (2000) and Chan et al. (2002) as cited in Takim and Adnan (2008) consider project functionality as one of the success measures in the post-construction phase when the project is finished and delivered. According to them, project functionality correlates with expectations of

project participants and can best be measured by the degree of conformance to all technical specifications.

Safety Criterion: The issue of safety has been raised for a long time (Sanvido et al., 1992; Parfitt and Sanvido, 1993) and it has been used without complication. Chan and Chan (2001) adopt the definition presented by Bubshait and Almohawis (1994). Accordingly, safety refers to the degree to which the general conditions promote the completion of a project without major accidents or injuries. Generally, safety assessments would be carried out by regulatory bodies such as Department of Labour of Sri Lanka and institutions offering certifications such as ISO, OSAHS. These evaluations which are commonly known as audits, form a strong base to measure safety in project sites. Heravi and Ilbeigi (2012) propose a safety performance index considering safety issues in executive project outcome.

Client Satisfaction Criterion: like quality different usage of this term could be observed. Chovichien and Nguyen (2013) use the term "satisfaction" while Elattar (2009) and Chan and Chan (2001) use "participant satisfaction" and "user satisfaction" separately. Pinto and Slevin (1988), Al-Tmeemy et al. (2011), Heravi and Ilbeigi (2012) and Khosravi and Afshari (2011) use only "the client/customer satisfaction". Takim and Adnan (2008) use client satisfaction and describe it with benefit to end user, benefit to client, project functionality, aesthetic value, client satisfaction on service, end user satisfaction on product, pleasant environment and easy to maintain. Heravi and Ilbeigi (2012) proposed client satisfaction index which is the result of a questionnaire consisting of 28 sub-factors. Chan and Chan (2001) proposes that participant satisfaction could be measured by the seven-point scale system as it is subjective. However, for the purpose of developing this framework, it is important to develop specific criteria to avoid confusions.

Employee Satisfaction Criterion: Though the construction industry based project management researchers and practitioners are giving an increasing attention in recent studies to satisfaction of client and user, the satisfaction of employees is often neglected**.** Employees are one of the main construction participants. Availability of experienced professionals & skilled workforce/staff is a very important success factor. e.g. De Silva et al. (2008), Mitra and Tan (2012) and Gunathilaka et al. (2013). Praveen et al. (2013) stress the extent of skill shortage and its effects on construction projects in Sri Lanka.

Similar situation exists in many other countries. Therefore, from the contracting company's point of view, employee satisfaction should be an important aspect of the project success which should be measured during the project execution and at the end of the project. Serrador and Turner (2014) include the team moral, skill development, team member growth and team member retention. However, it cloud be best measured through a point scale.

Learning and Development Criterion: this has been another criterion that has drawn a less attention. However, few researches have touched some aspects of learning and development (e.g. Takim and Adnan, 2008 and Wai et al., 2012). De Silva et al. (2008) identify this aspect also as an important factor affecting construction industry development. Learning and exploitation can be defined as the process of improving actions through better knowledge and understanding (Fiol and Lyles, 1985 as cited in Takim and Adnan, 2008). In construction project development, the lessons learned in executing a project (whether the project is a success or a failure) could be applied to future projects. Learning and development goes beyond personnel/employee training. Takim and Adnan (2008) include developing new knowledge and expertise and level of professional development while Wai et al. (2012) include personnel training, experience and knowledge gained and improvement of management. Shenhar et al. (2001) include developing new technology as a criterion of measuring project success. Serradora and Turner (2014) use the same measurement criterion for his investigation on the correlation of project efficiency and stakeholder satisfaction and overall project success.

Profitability Criterion: Heravi and Ilbeigi (2012) explain profitability performance as a measure of how profitable the project is to date. Nassar (2005) as cited in Heravi and Ilbeigi (2012) determines the profitability performance by an equation as one of the eight performance indices of his model. Takim and Adnan (2008) give a description on this criterion and say that profitability measures the financial success of the project (Parfitt and Sanvido, 1993). Norris (1990) measures profit as the increment by which revenues exceed costs; that is, profitability is measured as the total net revenue (in dollars) over total costs (in dollars). Profitability is measured in the post-construction phase when the final account is settled and both the paying and the paid parties can be sure of the financial result (Chan et al., 2002). Wai et al. (2012) mention commercial success and Chan and Chan (2001) refer commercial success to profitability.

Environment Performance Criterion: is considered as a critical point due to the significance for business success in the long run and for the wellbeing of all beings. This has been a major area of sustainability reporting as well. Chan and Chan (2001) explain the importance of environment performance in construction context and further mention that a score can be used as an indicator to reflect the environmental performance of a given project. Heravi and Ilbeigi (2012) proposed environment performance index which is considered the contractor's performance regarding environmental issues and expenses due to lack of observance of environment consideration in the project construction phase. Generally, in project management context, it refers to the degree of negative impact causing to the environment due to the execution of a project. This could be best measured subjectively using seven point scale in construction project context.

Cash-flow Management Criterion: or in other words, availability of adequate funds is undisputedly a predominant critical success factor that determines performance of any construction project. Almost all the studies, on critical success factors identify this factor (e.g. Gunasekara, 2009; Kazaz et al., 2012; Gunathilika et al., 2013; Gudienea et al., 2013) as critical. Contracting companies should maintain a healthy financial management system and it is mostly dependent on project performance and effectiveness of handling billing activities and claims. Client's and the contractor's financial capabilities also have a big impact on the cash flow management. However, there is some lacking in considering this as a measurement criterion. It could be due to the assumption that cash flow management is mostly dependent on achievement of cost and time criteria. However, Heravi and Ilbeigi (2012) present a billing performance index and emphasized its importance as a success measurement criterion. Accordingly, the billing or cash flow performance index shows the contracting company's ability and performance in receiving claims and demands. It is further explained that the contractor's lack of financial security (undesirable cash flow situation) may be the result of contractor's financial negligence or the client's negligence of his financial commitment to the project. Generally, cash flow management could be measured quantitatively and availability of positive cash flow balance at any given time is an ideal indicator.

It could be observed that some criteria are vaguely used and some are broader terms. Some criteria are overlapping and some criteria are factors rather than measurement

criteria. Such confusing criteria would be disregarded. Based on the critical analysis of the available literature, a set of clear and measurable (both objective and subjective) criteria that are well connected to the proposed definition for construction project success have been identified and presented in Table 01.

Dimensions of Construction Project Success

Most of the researchers have grouped success criteria into different components of project success for which they often refer to dimensions. Baccarini (1999) proposed two distinct components (product success and project management success) of project success. According to Pinto and Slevin (1988) project success is suggested to have two major components: issues dealing with the project itself and issues dealing with the client. However, in recent literature, many types of categorizations could be observed. As examples, Shenhar et al., (2001) mention that there are "four major distinct components of project success: (1) project efficiency (2) impact on the customer (3) direct business and organizational success, and (4) preparing for the future". Wai et al., (2012) present five components for a building project from the developers' perspective. They are (1) company success (2) profitability success (3) primary product success (4) secondary product success and (5) branding success.

Project success, project management success and project performance are sometimes a bit confusing because, these words have been used in different ways by different researchers in the literature. Project performance often refers to project management success. Semantically, project success is measurable only after the project is completed (Morries and Hough, 1987 as cited in Han et al., 2012), while project performance is measured during the life of the project (Cook-Davies, 2002 as cited in Han et al., 2012). The concept of success in a construction project, according to some researchers, is corresponding to efficiency and effectiveness measures (Brudney and England, 1982; De Wit, 1988; Pinto and Slevin, 1988: 1989; Smith, 1998; Belout, 1998; Atkinson, 1999; Crawford and Bryce, 2003 as cited in Takim and Adnan, 2008). Efficiency measurers deal with time, budget and specifications, effectiveness measurers refer to achievement of project objectives, user satisfaction and the use of the project (Takim and Adnan 2008). On the other hand, key participants of a particular project is fully responsible for efficient and effective execution of the project. From the contracting company point of view, contracting company has to ensure the achievement of predetermined performance

objectives and expectations of main participants. Therefore, construction project success could be viewed as the degree of achievement of efficiency (short-term perspective) and effectiveness (long-term perspective) objectives of execution of a project. (Wateridge, 1998 as cited in Baccarini, 1999). Serrador and Turner (2014) have investigated to what extent project efficiency is correlated with stakeholder satisfaction and overall project success. Through a survey of 1,386 projects it was found that project efficiency is 60% correlated with stakeholder satisfaction and 56% with overall project success. They further stress that their findings corroborate with the findings of Turner and Zolin (2012) that project efficiency is an important contributor to stakeholder satisfaction and overall project success, but shows quite clearly that other factors contribute significantly to both.

CONCLUSION

Tuman (1986) as cited in Baccarini (1999) observes that the days when we could measure success in terms of cost, schedule and technical objectives are gone. Similarly, it was observed that the concept of construction project success has evolved drastically and gone beyond traditional criteria of Iron triangle. The project managers/professionals are often focusing achievement of the short term /efficiency criteria relating to the project process as opposed to the longer term/effectiveness criteria. It was understood that these traditional criteria which are often coming under efficacy dimension are a very important part of the construct but not enough to give the full picture of the construction project success. Therefore, the requirement of having a long-term perspective on project success is stressed and a comprehensive framework for construction project success (Figure 02) was proposed. In addition to that a wide range of criteria representing both subjective and objective attributes with the meaning of each criterion have been identified and summarized (Table 01). Capability to execute construction projects in an effective and efficient way is a core competency of project-based organizations and human factor is a critical component of core competencies. However, it was found that human resource criteria such as Employee Satisfaction and Learning & Development are not given due attention.

Quality and Satisfaction have been explained with more clarity as those were confusingly used in literature. Employee satisfaction, learning and development have been brought to fore as many researchers have overlooked them. Measuring project success at deferent

times plays a key role in improving project management competency. Success evaluation is not only an operationally important activity but also a strategically important activity. Also it should facilitate to measure project success during the execution stage as well as at the end of the project. It is recommended that, through the studies of relationships between critical success factors and success criteria, a stronger model to ensure project success could be established.

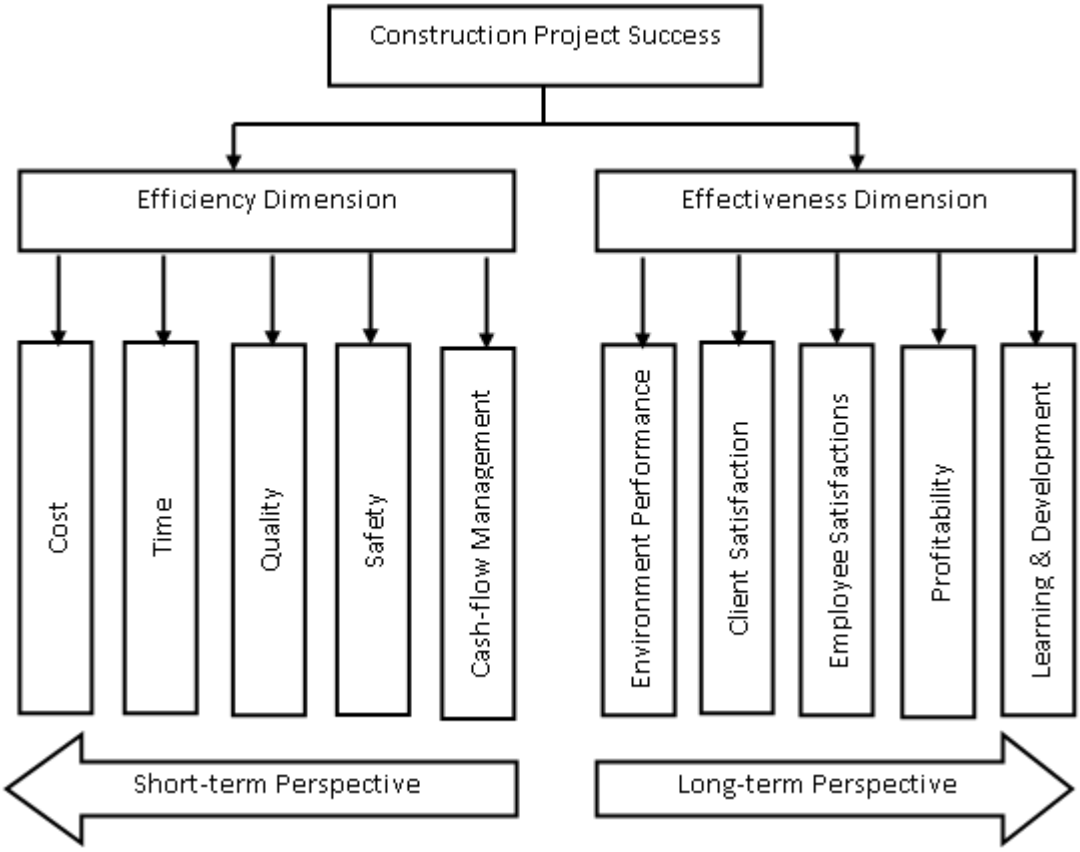

Figure 02: Proposed Framework for Construction Project Success

Table 1: Criteria and Measurers of Construction Project Success

S/N	Criterion	Authors	Meaning	Measurers
1	Cost/Budget	Lim and Mohamed (1999), Chan and Chan (2001), Pinto and Slevin, (1988) Atkinson (1999), Hughes et al. (2004), Al-Tmeemy et al. (2011), Heravi and Ilbeigi (2012), Khosravi and Afshari (2011), Chovichien and Nguyen (2013), Serradora and Turner (2014), Elattar (2009), Wai et al. (2012)	The degree of compilation of construction work within the estimated budget.	The measure of cost can be in the form of unit cost, and cost overrun
2	Time/Schedule	Lim and Mohamed (1999), Chan and Chan (2001), Pinto and Slevin, (1988), Atkinson (1999), Hughes et al. (2004), Al-Tmeemy et al. (2011), Heravi and Ilbeigi (2012), Khosravi and Afshari (2011), Chovichien and Nguyen (2013), Serradora and Turnerb (2014), Elattar (2009), Wai et al. (2012)	The degree of compilation of construction work within agreed/approved duration.	The measure of time can be in the form of construction time, speed of construction and time overrun
3	Quality	Lim and Mohamed (1999), Chan and Chan (2001), Pinto and Slevin, (1988), Atkinson (1999), Khosravi and Afshari (2011), Hughes et al. (2004), Al-Tmeemy et al. (2011), Heravi and	The degree of conformity to all technical specifications	Quality can ideally be measured subjectively using a point scale.

		Ilbeigi (2012), Chovichien and Nguyen (2013), Elattar (2009), Serradora and Turner (2014), Wai et al. (2012)		
4	Safety	Lim and Mohamed (1999), Chan and Chan (2001), Hughes et al. (2004), Heravi and Ilbeigi (2012), Khosravi and Afshari (2011), Chovichien and Nguyen (2013), Elattar (2009), Wai et al. (2012)	The degree to which the general conditions promote the completion of a project without major accidents or injuries	Safety can ideally be measured in terms of accident rates, safety trainings, safety signs and precautions taken to avoid hazards and availability of resources.
5	Client/Customer Satisfaction	Pinto and Slevin, (1988), Al-Tmeemy et al. (2011), Heravi and Ilbeigi (2012), Khosravi and Afshari (2011), Takim and Adnan (2008), Serradora and Turner (2014), Wai et al. (2012)	The degree of satisfaction over the achievement of client's expectation in executing the project	Client satisfaction can ideally be measured subjectively using a point scale.
6	Employee/ Project Staff Satisfaction	Serradora and Turner (2014)	The degree of employee job satisfaction	Employee satisfaction can ideally be measured subjectively using a point scale.
7	Cash-flow Management	Heravi and Ilbeigi (2012)	The availability of adequate funds to carry out construction work without interruptions.	Availability of a positive or negative cash-flow balance at any given time is an ideal

				measure.
8	Profitability	Takim and Adnan (2008), Shenhar (2001), Heravi and Ilbeigi (2012), Wai et al. (2012), Chan and Chan (2001), Elattar (2009)	Degree of financial success of the project	Profitability can ideally be measured as an increment by which revenues exceed costs; that is measured as the total net revenue over total costs.
9	Environmental Impact	Chan and Chan (2001), Heravi and Ilbeigi (2012), Khosravi and Afshari (2011), Chovichien and Nguyen (2013), Wai et al. (2012)	The degree of negative impact causing to the environment due to the execution of the project.	Environment impact can ideally be measured subjectively using a point scale.
10	Learning & Development	Takim and Adnan (2008), Wai et al. (2012)	The degree of improvement in terms of new knowledge and expertise, level of professional development and exploitation of new technology.	Learning and development could be ideally measured subjectively using a point scale.

REFERENCES

Al-Tmeemy, S.M.H.M., Abdul-Rahman, H. and Harun, Z. (2011), "Future criteria for success of building projects in Malaysia", *International Journal of Project Management,* Vol. 29, No. 3, pp. 337-348.

Atkinson, R. (1999), "Project management: cost, time and quality, two best guesses and a phenomenon, its time to accept other success criteria", *International Journal of Project Management,* Vol. 17. No. 6, pp. 337-342.

Baccarini, D. (1999), "The logical framework method for defining project success", *Project Management Journal,* Vol. 30, No. 4, pp. 25-32.

Baker, B.N., Murphy, D.C. and Fisher, D. (2008) "*Factors affecting project success*" Project Management Handbook, 2nd ED, pp.902-919.

Bannerman, P.L. (2008), "Defining project success: a multilevel framework" *In Proceedings of the Project Management Institute Research Conference* (pp. 1-14).

Belout, A. (1998), "Effects of human resource management on project effectiveness and success: toward a new conceptual framework", *International Journal of Project Management,* Vol. 16, No. 1, pp. 21-26.

Bubshait, A.A. and Almohawis, S.A. (1994), "Evaluating the general conditions of a construction contract", *International Journal of Project Management,* Vol. 12, No. 3, pp. 133-136.

Chan, A.P. and Chan, A.P. (2001), "Key performance indicators for measuring construction success", *Benchmarking: An International Journal,* Vol. 11, No. 2, pp. 203-221.

Chan, A.P., Scott, D. and Chan, A.P. (2004), "Factors affecting the success of a construction project" *Journal of Construction Engineering and Management*, Vol. 130, No. 1, pp. 153-155.

Chan, A.P., Scott, D. and Lam, E.W. (2002), "Framework of success criteria for design/build projects", *Journal of Management in Engineering,* Vol. 18, No. 3, pp.120-128.

Chen, H. L. (2002), Predictor of project performance and the likelihood of project success. [Online]. Available from http:/www.jimsjournal.org. [Accessed on 10/01/2015].

Chitkara, K. K. (2013) *Construction Project Management; Planning, Scheduling and Controlling*. 2nd Edition, McGraw Hill Education (India) Private Limited.

Chovichien, V. and Nguyen, T.A. (2013), "List of indicators and criteria for evaluating construction project success and their weight assignment", *4th International Conference on Engineering Project and Production.*

Chua, D.K.H., Kog, Y.C. and Loh, P.K. (1999), "Critical success factors for different project objectives", *Journal of Construction Engineering and Management*, Vol. 125, No. 3, pp. 142-150.

Clarke, V. and Braun, V. (2013), Teaching thematic analysis: Overcoming challenges and developing strategies for effective learning, *The psychologist*, Vol. 26. No. 2, pp.120-123.

Cooke-Davies, T. (2002), "The real success factors on projects", *International Journal of Project Management*, Vol. 20, No. 3, pp. 185-190.

De Silva, N., Rajakaruna, R.W.D.W.C.A.B. and Bandara, K.A.T.N. (2008), "Challenges faced by the construction industry in Sri Lanka: perspective of clients and contractors", [Online].Available from http://usir.salford.ac.uk [Accessed on 10/01/2015].

De Wit, A. (1988), "Measurement of project success" *International Journal of Project Management*, Vol. 6, No. 3, pp. 164-170.

Elattar, S.M.S. (2009), "Towards developing an improved methodology for evaluating performance and achieving success in construction projects" *Scientific Research and Essays*, Vol. 4, No. 6, pp. 549-554.

Freeman, M. and Beale, P. (1992), "Measuring project success", *Project Management Institute.*

Frödell, M., Josephson, P.E. and Lindahl, G. (2008), "Swedish construction clients' views on project success and measuring performance" *Journal of Engineering, Design and Technology*, Vol. 6, No. 1, pp. 21-32.

Gudienė, N., Banaitis, A., Banaitienė, N. and Lopes, J. (2013), "Development of a conceptual critical success factors model for construction projects: a case of Lithuania", *Procedia Engineering*, Vol. 57, pp. 392-397.

Gunasekera, H. A. D. P. M. (2009), *Managing critical factors in construction projects: applicability of compensatory model for effective project management,* A Thesis Submitted in partial fulfillment of the Requirements of Sri Jayewardenepura University for the Degree of Doctor of Philosophy.

Gunathilaka, S., Tuuli, M.M. and Dainty, A.R. (2013), "Critical analysis of research on project success in construction management journals", *in 29th Annual ARCOM Conference.* 2nd to 4th September 2013. UK. pp. 979-988.

Han, W.S., Yusof, A.M., Ismail, S. and Aun, N.C. (2012), "Reviewing the notions of construction project success", *International Journal of Business and Management,* Vol. 7, No. 1, pp. 90.

Heravi, G. and Ilbeigi, M. (2012), "Development of a comprehensive model for construction project success evaluation by contractors", *Engineering, Construction and Architectural Management*, Vol. 19, No. 5, pp. 526-542.

Hughes, S.W., Tippett, D.D. and Thomas, W.K. (2004) "Measuring project success in the construction industry" *Engineering Management Journal,* Vol. 16, No. 3, pp.31-37.

Kazaz, A., Ulubeyli, S. and Tuncbilekli, N.A. (2012), "Causes of delays in construction projects in Turkey", *Journal of Civil Engineering and Management*, Vol. 18, No. 3, pp. 426-435.

Khosravi, S. and Afshari, H. (2011), "A success measurement model for construction projects", *In International Conference on Financial Management and Economics IPEDR,* Vol. 11, pp. 186-190.

Lim, C.S. and Mohamed, M.Z. (1999), "Criteria of project success: an exploratory re-examination", *International Journal of Project Management,* Vol. 17, No. 4, pp. 243-248.

Mitra, S. and Wee Kwan Tan, A. (2012), "Lessons learned from large construction project in Saudi Arabia" *Benchmarking: An International Journal*, Vol. 19, No. 3, pp.308-324.

Müller, R. and Jugdev, K. (2012), "Critical success factors in projects: Pinto, Slevin, and Prescott-The elucidation of project success", *International Journal of Managing Projects in Business*, Vol. 5, No. 4, pp. 757-775.

Munns, A.K. and Bjeirmi, B.F. (1996), "The role of project management in achieving project success", *International Journal of Project Management*, Vol. 14, No. 2, pp. 81-87.

Ng, K.H. and Peh, W.C.G. (2010), "Effective medical writing. *Singapore Med J,* Vol. 51. No. 5, pp.362-366.

Norris, W.E. (1990), "Margin of profit: Teamwork", *Journal of Management in Engineering*, Vol. 6, No. 1, pp. 20-28.

Oxford Advanced Learner's Dictionary of Current English (2010). 8th Ed, Oxford University Press.

Parfitt, M. K., and Sanvido, V. E. (1993), "Checklist of critical success factors for building projects", *Journal of Management in Engineering,* Vol. 9, No. 3, pp. 243-249.

Pinto, J.K. and Slevin, D.P. (1988), "Project success: definitions and measurement techniques", *Project Management Institute.*

Praveen, R., Niththiyananthan, T., Kanarajan, S. and Dissanayake, P.B.G. (2013), "Understanding and mitigating the effects of shortage of skilled labour in the construction industry of Sri Lanka".

Project Management Institute (2008), *A Guide to the Project Management Body of Knowledge* (*PMBOK@GUIDE)*. 4th Ed. Newtown Square, Pnnsylvania.

Sanvido, V., Grobler, F., Parfitt, K., Guvenis, M., and Coyle, M. (1992), "Critical success factors for construction projects" *Journal of Construction Engineering and Management,* Vol. 118, No. 1, pp. 94-111.

Saunders, M., Lewis P., and Thornhill (2007), *"Research methods for business studies"*, 5/e. Pearson Education Limited, England. 58-59.

Serrador, P. and Turner, J.R. (2014), "The relationship between project success and project efficiency", *Procedia-Social and Behavioral Sciences*, Vol. 119, No. pp.75-84.

Shenhar, A.J., Dvir, D., Levy, O. and Maltz, A.C. (2001), "Project success: a multidimensional strategic concept", *Long-range Planning*, Vol. 34, No. 6, pp. 699-725.

Silva Susil, G.A.K., Warnakulasooriya, B.N.F. and Arachchige, B.J. (2015), "Critical Success Factors for Construction Projects: A Literature Review" *In 12th International Conference on Business Management (ICBM).*

Takim, R. and Adnan, H. (2008), "Analysis of effectiveness measures of construction project success in Malaysia", *Asian Social Science*, Vol. 4, No. 7, pp.74.

Tranfield, D., Denyer, D. and Smart, P. (2003), "Towards a methodology for developing evidence-informed management knowledge by means of systematic review", *British Journal of Management*, Vol. 14, No. 3, pp.207-222.

Turner, R. and Zolin, R. (2012), "Forecasting success on large projects: developing reliable scales to predict multiple perspectives by multiple stakeholders over multiple time frames", *Project Management Journal*, Vol. 43, No. 5, pp. 87-99.

Wai, S.H., Yusof, A.M. and Ismail, S. (2012), "Exploring success criteria from the developers' perspective in Malaysia" *International Journal of Engineering Business Management*, Vol. 4.

Yong, Y. and Emma Mustaffa, N. (2012), "Analysis of factors critical to construction project success in Malaysia", *Engineering, Construction and Architectural Management*, Vol. 19, No. 5, pp. 543-556.