

A STUDY OF PROJECT MANAGEMENT APPLICATIONS AND INFLUENCE ON SUCCESSFULLY COMPLETING CONSTRUCTION PROJECTS

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Project management methodologies have failed to deliver consistent project success. There is, however, a need to understand the real relationship between the application of project management techniques and their impact on projects finishing according to pre-set criteria. Project success depends on project management success and the success of the end-product. Project success can be influenced by many different factors, outside the control of the project management team. This paper reports on the research analyses of project data gathered from practitioners from over ten nations. The paper examines the current status of project management tools and techniques and their impact on the level of project success. The findings suggest that most successful projects implement, but do not fully utilize, contemporary project management tools and techniques to their capabilities. The impact of such project management tools and techniques on projects depends on several factors including the development of practitioners' skills, and the rigour, timing and level of implementation achieved. It is important to stress that the human factor plays an essential part in securing project success. This research concludes that there is a direct connection between achieving project success and successful implementation of project management tools and techniques.

Keywords: project management principles, tools and techniques, project success factors and criteria, construction, UAE

INTRODUCTION

Project management as a technique has increasingly become recognized as a factor of competitive advantage for companies managing projects (Mathur et al. 2014). This position is a clear improvement on the perception that project management lacks a theoretical foundation and is based on a narrow and implicit theory that requires further development and enrichment as traditional project management causes self-inflicted problems which impact project performance negatively or cause projects to fail and that there is no measurable value added by implementing best practices of project management (Koskela and Howell 2002).

Despite the vast array of project management literature available, the complex question about the contribution of project management toward project success remains unanswered. To some extent, there is general agreement on the cornerstones of project success, whereas on others there is massive disagreement (Cooke-Davies 2004). Apparently, scholars, researchers and practitioners have different views on the influence of the application of project management methodologies on project success and that a lot of ground has yet to be explored (Joslin and Müller, 2016; Mathur *et al.*, 2014; Rolstadas *et al.*, 2014; Nguyen *et al.*, 2004).

DEFINITION OF PROJECT

A project is temporary and unique with a defined beginning and end and a specific set of objectives to be achieved (PMI 2013). Projects have specific characteristics and rules in comparison to operational work (Turner 2004). A project achieves specific objectives through a series of activities and tasks; it consumes resources and complies with a certain set of defined specifications (Munns and Bjeirmi 1996). Contemporary literature offers many definitions, highlighting the uniqueness of every project. Projects are temporary organisations, established to achieve desired goals and objectives (Turner 2004), resulting in project teams were also temporary, redundant or reassigned after the completion of the project (PMI 2004). A major drawback in temporary organisations is that project teams know that their contribution is only required for a limited period. Shenhar (2001) places emphasis on the common misconception that projects are alike and argues that one of the reasons why projects fail is that project managers are using the same tools and techniques for all projects similarly. Projects are unique and demand distinctive judgment. Therefore, it appears difficult to implement a static management methodology capable of successfully managing projects on a consistent level. The “unique”, “particular aim” and the individual project “objectives” point towards aiming at a moving target.

PROJECT MANAGEMENT

Project management methodologies date back as far as 2550 BCE (Kozak-Holland, 2010). It is reported that the Pyramids were delivered by following a systematic approach featuring a project charter and a business justification, incorporated into a life-cycle approach (Kozak-Holland 2010).

Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements (PMI, 2013). Project management practices attempt completion of the project as intended, and in the most efficient way by minimizing cost and achieving external goals related to customer needs (Koskela and Howell 2002). Although project goals may appear straightforward and achievable, projects continue to run late, exceed their budgets and/or fail to meet their objectives (Hyväri 2006). It is suggested that modern project management was introduced during the Manhattan Project in the early 1950s (Kerzner 2006), but certainly, projects had been realised before that time. Project management tools developed and being applied nowadays started with the Swiss engineer Hermann Schuerch in 1912 when he developed and successfully utilized the bar chart as a scheduling tool on a bridge project few years before Henry Gantt developed the now commonly used bar chart in 1916 (Weaver 2006).

Projects are better designed to respond to expected uncertainties (Turner and Müller 2003), whereas project tasks demand proper planning and may be more challenging to project teams when compared to routine work. In addition, the PMBOK® Guide (2000) points out that its project management methodology is only “...applicable to most projects most of the time” (PMI 2000:13).

Project management methodologies are not designed to be generic but applicable to all projects at any given time (PMI 2008). Project management methodologies need to be adapted to individual project objectives, in order to achieve consistent project management success. Therefore, it appears that either methodology is wrongly applied or, project management does not directly influence the success of projects. Several project management organisations relate project failures to improperly trained practitioners and project managers. PMI (2004) states that a reason causing projects to fail is that project practitioners pay inadequate attention to activities in the conceptual stage. Joslin and Müller (2016) concluded that there is a positive

relationship between the elements of the project methodology and the characteristics of project success.

PROJECT SUCCESS FACTORS

Table 1 provides a summary of the literature on criteria for project success as reported by Westhuizen and Fitzgerald (2005). There is clearly no agreed definition and consistency of the criteria for project success. Researchers are still searching for project management practices being implemented to achieve a common understanding of project success.

Table 1: Literature summary of project success criteria (Westhuizen and Fitzgerald E. (2005).

PROJECT SUCCESS CRITERIA	Booth 1996	Wateridge 1998	Baccarini 1999	Kerzner 2002	Thomsett 2002	Marchewka 2003
Quality of Project management process			X	X		X
Within time	X	X	X	X	X	X
Within budget	X	X	X	X	X	X
Specified quality	X	X	X	X	X	X
Specified service quality		X	X	X		
Project stakeholder satisfaction		X	X	X	X	X
User satisfaction	X	X	X	X	X	X
Net benefits		X	X		X	X

The traditional criteria, known as the iron triangle, including cost, time and quality, remain the commonly accepted measures of project success (Atkinson 1999). Rubin and Seeling (1967) studied the impact of the project manager's experience on the success of projects. Munns and Bjeirmi (1996) highlight the role of project management processes in achieving project success, noting that there are factors affecting project success that are beyond the control of project management. Some projects miss all three parameters and are still hugely successful (Peters and Horner, 1997). Dvir *et al.* (2006) are of the opinion that the traditional project success measures are incomplete and may be misleading.

Baccarini (1999) concludes that project success is the combination of project management success with product success, whereas Lim and Mohamed (1999) suggest that a project is only successful when achieving its objectives. Lim and Mohamed (1999) also introduced the micro and macro perspective that looks at project success from a different perspective. The micro view focuses and assesses project management success at project completion, whereas the macro perspective incorporates the operational aspect of projects and concentrates on long-range customer satisfaction. De Wit (1988) made the distinction between project success and project management success and highlighted that project success is measured against the overall project objectives following project completion. De Wit (1988) further concluded that project management success is measured during the project life cycle by focusing on classic performance measures.

Milosevic and Srivannaboorn (2006) focus on the link between project management and the project's final product as the new dimension for achieving project success, whereas project success is not achieved by completing the project within its constraints, but only after achieving end-user satisfaction. Even so, this approach may

be intended to deliver individual business outcomes, rather than managing project activities successfully to achieving successful project completion (Shenhar *et al.* 2007).

Other researchers note that measuring success should be done from the perspectives of the individual owner, developer, contractor, end-user as well as the general public (Lim and Mohamed 1999; Freeman and Beale 1992). Thus, it is broadly accepted that different projects may have individual success factors (Dvir *et al.* 1998). Liu (1999) highlights that every project may even have its unique set of success measures. Apparently, this complicates the effort to derive an agreed definition of project success. Stakeholder satisfaction is commonly agreed to be a valuable addition to the iron triangle whereas a successful project shall also satisfy its stakeholders (Baccarini 1999). Kam and Müller (2005) argue that if the end product of the project does not perform to customer satisfaction, although the project is delivered within the time, cost and quality constraints, the project appears successful from the project management perspective, but the product could be a failure. Therefore, in simple terms, project success comprises two main ingredients, project management success as well as product success (Baccarini 1999; Kam and Müller 2005; Baker *et al.* 1988; Lim and Mohamed 1999).

I. Project Management Tools and Techniques

Different projects have different project success factors. As a result, contemporary research lacks sufficient hard evidence for justifying the positive influence of project management on project success (Patanakul *et al.* 2010). Nevertheless, the definition of PMI (2008) for project management puts emphasis on the successful application of tools and techniques against project activities to achieve project success. Due to the rich variety of different tools and techniques, which are applicable to different project life cycle phases, it seems of utmost importance to apply the right tool and technique at the right time. Zeitoun (1998) suggests that the influence of the tools and techniques depends on the practitioners training as well as the implementation process. Hence, several success factors relate to human-influenced factors, the so-called soft project management (Kloppenborg and Opfer 2002) and do not relate directly to the tools and technique of the hard project management. Other researchers such as Nguyen *et al.* (2004), Scott-Young and Samson (2004), and Kloppenborg and Opfer (2002) partially confirm these findings.

The findings from a study by Thamhain (1999) showed that only 50% of project managers are familiar with project management tools and techniques, whereas only 28% implement them effectively. Al-Hajj and Sayers (2014) found that around 42% of practitioners in the United Arab Emirates do not utilize the Work Breakdown Structure (WBS) in their projects and around 48% do not feature an Organisation Breakdown Structure (OBS). Nevertheless, the investigated projects achieve a success rate (time, cost and quality) of around 66% (Al-Hajj and Sayers 2014). Such findings are surprising, and one may conclude that not all project management tools and techniques are directly influencing project success.

Studies by Pinto and Slevin (1988), Cash *et al.* (1992), Hatfield (1995), Thamhain (1999), Coombs and McMeekin (1998) and Milosevic *et al.* (2001) concluded that properly and timely applied project management tools and techniques may lead to project success. However, wrongly used project management tools and techniques may trigger the opposite result, leading to project failure (Cash *et al.* 1992; Hatfield 1995; Kerzner 2006).

The project manager is fully accountable for the success of the project and he or she is ultimately responsible for developing the project execution strategy and aligning it with the parent organisation's primary strategy (Globerson and Zwikael 2002). This

highlights the importance of having properly trained project managers. Turner and Müller (2003) conclude that the title “Project Manager” shall be restricted to individuals who possess professional certificates in order to create more confidence and trust among principals or sponsors, during the process of selecting competent project managers. Other studies suggest that competence is essential to achieve project success but does not guarantee it (Hobbs *et al.* 2001; Turner and Müller 2003). Such studies partially align with the micro and macro perspective for project success of Lim and Mohamed (1999) in that project management success does not necessarily translate into project success. Nevertheless, the competence of the project manager plays a vital role in choosing the right tools and techniques to deliver the necessary project life cycle deliverables.

According to Dvir *et al.* (2004), “Plans are nothing, changing plans is everything”. It is unlikely that every activity can be planned in the exact way it shall be accomplished. Project management practices need to cope with the ever-changing internal and external factors influencing project success. Thus, it is important to appreciate the competence of the project manager. Turner and Müller (2003) confirm this point, which leads to the conclusion that proper project management training is a predecessor to the top-ranked project success factors. Nguyen *et al.* (2004) identified five Critical Success Factors (CSFs) in their study of major construction projects in Vietnam; the first factor for the success of projects is the ‘competent project manager’

Project Management and Project Success

Table 2: Summary of ranking of project success factors in construction projects

Ran	Ashley <i>et al.</i>	Nguyen <i>et al.</i>	Toor <i>et al.</i> (2008)	Rohaniyati (2009)
1	Organisational planning effort	Competent project manager	Effective project planning and control	Project manager's capabilities and experience
2	Project manager goal commitment	Having adequate funding until project completion	Sufficient resources	Clarity of project scope and work definition
3	Project team motivation and goal orientation	Multidisciplinary/competent project team	Clear and detailed written contract	Organisational Planning
4	Scope and work definition	The commitment to project	Clearly defined goals and priorities of all stakeholders	The use of control systems
5	Project manager capability and experience	Availability of resources	Competent project manager	Project manager's goal commitment
6	Control system	Top management support	Adequate communication among related parties	Project team motivation and goal orientation
7	Safety	Awarding bids to the right designer / contractor	Competent team members	Safety precaution and applied procedures

Project management practices, in combination with several other factors, influence project success (Munns and Bjeirmi 1996). The studies of Thamhain (1999) and Al-Hajj and Sayers (2014) suggest that not all project management tools and techniques are directly associated with project success. Nevertheless, even a thorough literature review could not identify any project which had been successfully completed without the utilization of basic project management practices.

Thus, many researchers (Pinto and Slevin 1988; Cash *et al.* 1992; Hatfield 1995; Coombs *et al.* 1998; Milosevic and Inman 2001) highlight that correctly applied tools and techniques may positively contribute to project success. The contemporary literature refers to project management practices, as the combination of concepts, processes, tools and techniques (PMI 2013). Besner and Hobbs (2004) highlight the difference of applying tools and techniques and using generic concepts and procedures to illustrate the importance of correct implementation of generally available tools and techniques, rather than the generic concept and procedures, which are partially also applicable in operational management.

Table 2 shows the ranking of project success factors compiled from Ashley *et al.* 1987; Nguyen *et al.* 2004; Toor *et al.* 2008; and Rohaniyati 2009. The literature review revealed interesting facts, supporting the conclusion that project management positively influences project success. Leading researchers in the field referred to in this paper argue that a project may have individual sets of success criteria and factors. Thus, it is also recommended that studies be initiated on a global scale, for identifying a possible generic set of project success parameters.

RESEARCH METHODOLOGY

Data were collected using a web-based questionnaire featuring 20 questions sent to 142 selected project managers in ten different countries. The participants were selected based on their background, geographical location and the current employment position they held. More than 75% of the respondents occupy managerial positions. The questionnaire features closed and five-point Likert scale questions in combination with matrix ratings.

ANALYSIS OF RESULTS

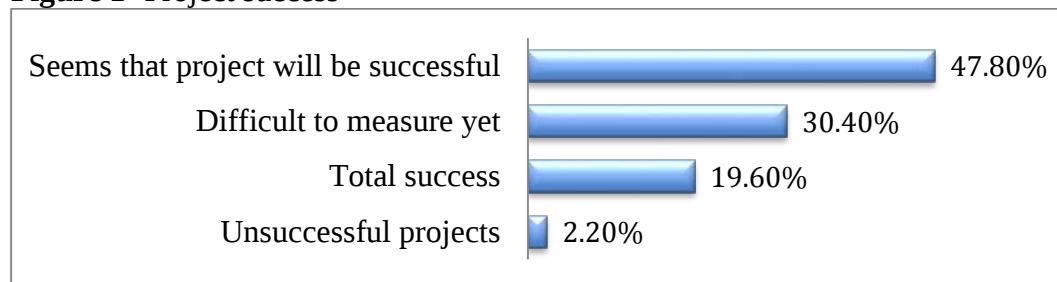
The data collected shows that one-third of the surveyed projects failed to achieve their objectives of being within the iron triangle, but despite this finding, 86.3% of the clients and 90% of the contractors were satisfied, as stakeholders, with their achievements in the projects they were involved in, showing that stakeholders' satisfaction should be perceived independently. This finding may indicate that project management success influences project success. Some 78% of the respondents were working on unfinished projects at the monitoring and control phases. Therefore, the level of satisfaction reflects satisfaction at that particular construction phase and not related to success of the product. This finding contradicts the observations of researchers such as Baccarini (1999), Kam and Müller (2005), Baker *et al.* (1988) and Lim and Mohamed (1999), who widely agree that project success is a combination of project management success and product success. The findings show that the traditional success criteria are not the only and main measure of success and achievements on projects.

About 43% of unsatisfied stakeholders reported that the projects they were working on were on time, 71.4% were within the budget and 28.6% deliver the project as per contract terms and conditions. Demonstrating the iron triangle of Atkinson does not necessarily fully serve as an appropriate success measurement. None of the unsatisfied stakeholders works for a client organisation, whereas 50% of the respondents work for a contractor. Although the overall result illustrates projects with satisfied stakeholders, the above finding aligns with the reviewed project management literature. Nowadays, considering time, cost and quality, as primary success measures appears insufficient. Therefore, as suggested in the literature, additional parameters shall also be considered for evaluating project success. The majority of the surveyed projects are within the given time (66.7%), within the agreed budget (72.5%) and comply or exceed quality requirements (66.7%). The analysis

unambiguously demonstrates that around two-thirds of the surveyed projects operate within the iron triangle and achieved stakeholder satisfaction.

Figure 1 shows that these projects achieve the broadly agreed definition of project management success. Only 47.8% of the respondents predict their project successful and only 19.6% of practitioners are confident in achieving project success. Based on the respondents' opinions, the adequate funding until project completion strongly influences the success of a project. However, market or industry fluctuations, on a global scale, may have influenced such a rating. Nevertheless, it is apparent that global changes may influence the success of an individual project, a finding that consolidates the micro and macro perspective of project success. Nonetheless, a project does not operate in a vacuum.

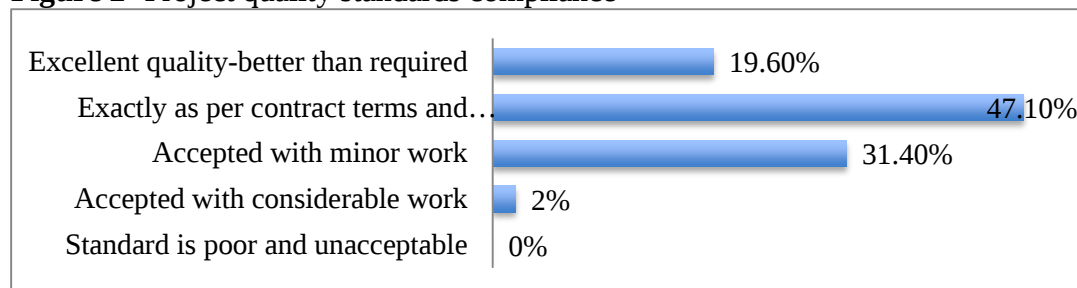
Figure 1- Project success



Beyond stakeholder Satisfaction

Figure 2 shows that about 20% of respondents reported over satisfaction in the quality of work that was seen as better than required. Some 70% of these answers originated mainly from Singapore. These findings are in line with Ashley *et al.* (1987) who emphasised on success being achieved only when delivering a product that supersedes the contracted specifications. It is worth noting that this does neither align with advanced quality management thinking, nor with good project management practices. The practice of exceeding specifications in Asia is seen as a way of building confidence and good relationships with the client. Chinese stakeholders rate the importance of relationships over the iron triangle as a measurement for project success. Also, Shenhar *et al.* (1997) rank stakeholder satisfaction before time, cost and quality. Nevertheless, this practice is not recommended by the Project Management Institute (PMI) and is seen as “*gold plating*” as a project manager shall not deliver extras to customers and shall only deliver what is necessary to meet the project objectives. The response to this question partially indicates that Asian stakeholders attempt to foster relationships by going beyond the contractually agreed obligations whereas 47.1% of the participants deliver their projects as per contract terms and conditions.

Figure 2- Project quality standards compliance

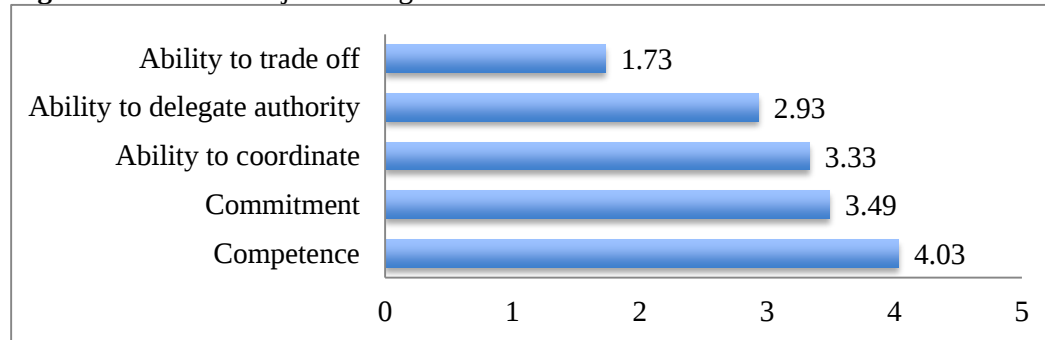


Project management traits

Turner and Müller (2003) concluded that a competent project manager should have proper training as well as a professional certificate. Later on, in 2005, the same authors argued that project managers style of leadership and their level of competence

did not impact project success. This research study addressed the traits of project managers as well as the impact of professional affiliations. Figure 3 presents the findings of data gathered on project managers traits. It clearly shows that the most important trait of all for project managers is ‘competence’ and followed by ‘commitment’ then ‘ability to coordinate’, then ‘delegation, and finally the ‘ability to trade off’.

Figure 3- Traits of Project Managers



Project managers were asked about their affiliations with world-famous professional institutions that look after construction project management as follows: CIOB (Chartered Institute of Building), RICS (Royal Institute of Chartered Surveyors), PMI (Project Management Institute), IPMA (International Project Management Association), ICPMA (International Construction Project Management Association), AIPM (Australian Institute for Project Management) and PPMA (Professional Project Management Association) and others. Only 20% of all the respondents have affiliations with only three internationally known professional institutions. These are 15.2% with PMI, 2.2% with RICS, and 2.2% with ICPMA.

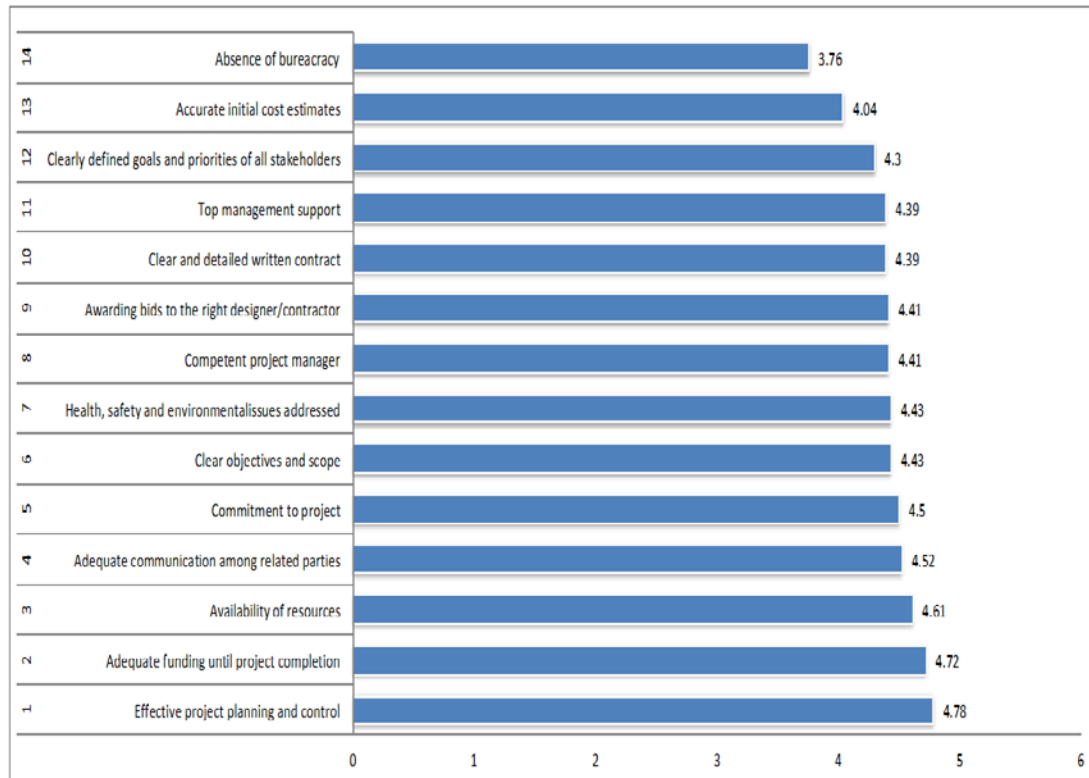
About 13% of respondents got training internally inside the company. Furthermore, 6.5% of respondents had affiliations different from the selected list provided in the survey. Perhaps the most surprising finding of all is the fact that about 61% of respondents did not have any kind of professional affiliation or any proper project management training, at all. Such results indicate that practitioners perceive that competence can be gained without obtaining professional training or professional certification process, which puts it in contradiction with the literature. More than three-quarters of participants occupy a manager's position; about 22% of them are senior project managers or project directors. The age range of the participants is between 25 and 65 years. About 56% of participants have a bachelor's degree or higher. One-third of practitioners have less than five years of project management experience. Nevertheless, as stated earlier, the extent of affiliation with internationally recognised project management organizations reveals that most of the respondents do not have professional training directly organized or recognized by the project management renowned institutions. Based on this, one may conclude that specific project management training may not necessarily be related to project success.

The analysis of the information collected shows that the majority of construction project managers enter the project management profession through experience rather than through an academic and/or professional certification process, a finding contrary to the suggestion by Turner and Müller (2003) in that the title “Project Manager” shall be restricted to individuals having obtained professional certificates.

Project Success Factors

In Figure 4, ‘Effective Project Planning and Control’ is ranked by respondents as the most important factor for the success of construction projects. It received the highest score of 4.78 out of 5. ‘Competent Project Manager’, however, was ranked in eighth place of the success factors.

Figure 4- Project Success Factors from Data



A. PM Tools and Techniques Utilisation

Figure 5- Project Management Tools and Techniques

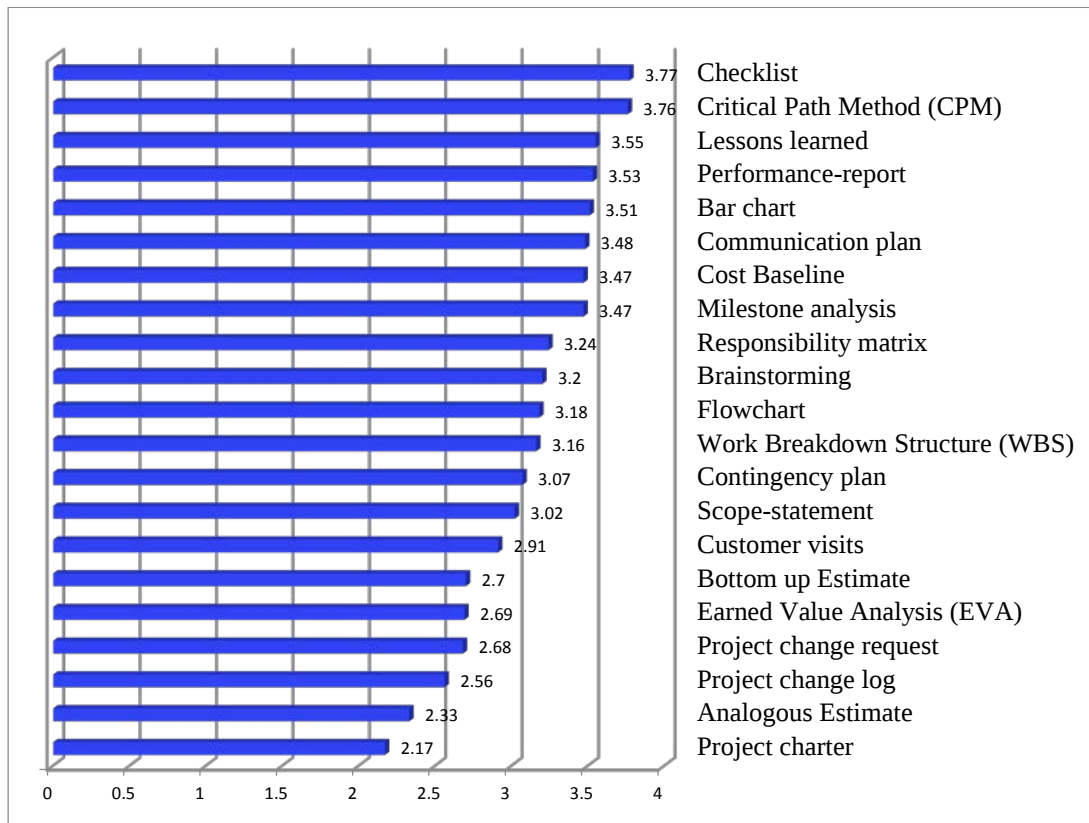


Figure 5 provides the ranking tools and techniques used in projects respondents are involved with. 21 techniques are ranked. Earned Value Analysis (EVA) is considered very important, whereas 19.5% report that they rarely use EVA, representing a

conflict. EVA is an essential tool for performance measurement and control of projects (Nagrecha 2002). It is also pertinent to note that 16.7% of respondents do not use and 16.7% only rarely use a work breakdown structure (WBS). These, in sum 33.4% of participants, rate effective project planning and control as the most important factor leading to project success, representing another contradiction in that the WBS is of utmost importance for performing project planning and control. Moreover, the respondents rank clear objectives and scope only on the sixth rank of the project success factors. A finding which partially aligns with the responses of EVA and WBS in that it appears that contemporary project practitioners perceive project planning and control as independent tools and techniques, rather than an integrated concept, leading to the assumption that practitioners do not fully appreciate project management tools and techniques, indicating a lack of professional training of the surveyed practitioners.

CONCLUSIONS

A clear and strong correlation exists between project management success and successful projects. Although, the traditional cost, time and quality criteria remain as the preferred method to measure projects' success it does not guarantee stakeholders' satisfaction. It can be said that project success is a perceived measure, irrespective of the individual success criteria and factors. There is no indication that project success was achieved in isolation from the optimization of project management tools and techniques. There is a universal set of project success measures, applicable to all projects in the construction industry. The data features significant similarities representing a new insight. The research findings show that project practitioners do not fully utilize available project management tools and techniques, the vast majority of project managers implement project management methodologies though. It is recognized that project management practices and techniques are widely used in successful projects and therefore, project management positively influences project success. It can be concluded from this research that successfully delivered projects utilize tools and techniques of project management practices. Finally, competent and properly trained project managers who demonstrate a strong command of project management tools and techniques, relevant to produce the project life cycle phase deliverables directly influence project success.

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