Evaluating the Critical Factors in Effective Project Management

Chan KH, China

Key words: Project Management, Budgets, Critical Path, Feasibility Study, Project Planning.

SUMMARY

Project management (PM) is a carefully planned and organized effort to complete a project (e.g. building construction) satisfactorily in fulfilling major stakeholders' requirements (Karim et al., 2014). PM includes developing a project plan, which includes defining project goals and objectives, specifying tasks or how goals will be achieved, what resources are need, and associating budgets and timelines for completion (Parker et al., 2013). It also encompasses implementing a project plan, along with careful controls for its critical path to ensure everything is done as desired, especially in terms of time/cost/risk/quality controls; with feasibility study, project planning, implementation, evaluation and support/maintenance. Both qualitative and quantitative approaches e.g. interviews and structured questionnaires will be adopted for this research, to identify the different PM techniques in managing small or large scale projects. The collected data will be analyzed statistically and tabulated with appropriate exhibits for better illustration.

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1. INTRODUCTION

As a discipline, Project Management (PM) developed from several different fields of application, including construction, mechanical engineering, military projects, etc. (Adedokun et al., 2013). In the United States (US), the forefather of PM is Henry Gantt, called the father of planning and control techniques, who is famously known for his use of the bar chart as a PM tool, for being an associate of Frederick Winslow Taylor's theories of scientific management, and for his study of the work and management of navy ship building. His work is the forerunner to many modern PM tools, including the work breakdown structure (WBS) and resources allocation (Zecheru and Olaru, 2016).

The 1950s marks the beginning of the modern PM era. Again, in the US, projects were managed on an ad hoc basis using mostly Gantt Charts, and informal techniques and tools (Ong, Wang and Zainon, 2016). At that time, two mathematical project scheduling models were developed: (1) the Program Evaluation and Review Technique (PERT), extended as part of the US Navy's (in conjunction with the Lockheed Corporation) Polaris missile submarine program; and (2) the Critical Path Method (CPM) developed in a joint venture by both DuPont Corporation and Remington Rand Corporation for managing plant maintenance projects. These mathematical techniques quickly spread into many private enterprises.

In 1969, the Project Management Institute (PMI) was formed to serve the interest of the project management industry. The premise of PMI is that the tools and techniques of PM are common even among the widespread application of projects from the software industry to the construction industry. In 1981, the PMI Board of Directors authorized the development of what has become *A Guide to the Project Management Body of Knowledge* (PMBOK), containing the standards and guidelines of practice that are widely used throughout the profession (Eastham et al., 2014).

2. LITERATURE REVIEW

The base planning of PM solutions focus on rigid methodologies, arbitrary metrics, idealized control systems, fixed budgets, pinpoint accurate timelines and other such unrealistic anchor points (Hanafizadeh, Moosakhani and Bakhshi, 2009). For 25 years, this has been the norm and according to the Standish Group, only 26% of IT projects succeed in achieving their original goals. It is recognized that real projects always involve moving targets, shifting budgets, shrinking deadlines, slipping dependencies and last-minute revisions. Enact offers real-time project status, gives early warning to problems, integrates just-in-time changes to the plan, and focuses instant attention on problems that need to be resolved. Instead of trying to ignore the inevitable bumps in the road, our approach concedes the inevitability of those bumps and offers companies an effective way to solve problems when thing go wrong, to embrace new decisions quickly and to keep everyone focused on the project ultimate success. After all, great project managers depend principally on accurate communication, close collaboration and rapid course corrections to ensure that their projects

succeed (Yang et al., 2012).

The secondary of PM provides a very effective means for an organization to create a common definition and understanding of the PM discipline. Establish a common understanding of the role PM will play for the total business organization. Understand how each part of the total business organization must contribute to the success of the PM process. Identify a repeatable PM Framework that may be understood and used by the total business organization. Define specific roles and responsibilities that must be performed to insure a project's success (Saunders, Mann and Smith, 2007).

Moreover, PM focuses on the responsibilities and contributions needed from each member of the *Project Organization*. These roles are evaluated as the project moves through a predictable and repeatable *Project Life-Cycle*. Special attention is given to the early stages of a project (Project Initiation). It provides a detailed examination of a project agreement called the *Project Charter*. While other components of PM may require time to fully implement, the Project Charter may become a popular and powerful new tool subsequently (Swan and Malik, 2007).

In addition, Project Initiation is further defined via the components of a *Base Project Plan*. This plan is based on the certified completion of well-defined intermediate and final deliverables. The Project Plan must be *iterative* as all components of the plan will be constantly reviewed and adjusted due to new project conditions and realities. Today's professionals spend up to 75% of their time in project-related work. Much of this work consists of small projects that we fail to manage as projects. Rather we treat it as work that needs to be done by the end of the month. Thus, this unmanaged work just happens. Because we are in an era where responsiveness and effectiveness are crucial, letting small projects happen is no longer acceptable.

PM methods can help small projects in the same way the methods help larger projects. It demonstrates how to apply basic techniques to managing, understanding, and coordinating small projects; whilst the techniques are fully compatible with the method for larger projects (Maldonado, 1995). The learning objectives for small scale PM will involve:

- Discuss the unique challenges of small projects, the skills needed to make small projects successful, and the methods that can keep them small.
- Describe the 3D Life Cycle, discuss the purpose and benefits of each project phase.
- Use business case analysis to clarify the need, then produce one good objective.
- Determine the business requirements.
- Begin planning the project by prioritizing it compared to other projects.
- Describe the activities of the Design phase, and the value of each to the project.
- Tailor the Small Project WBS Template to create a work plan framework at an appropriate level of detail.
- Estimate activity effort and duration using the Small Project Worksheet. Describe how communicating assumptions produces more accurate, useful estimates.
- Schedule the project, using methods that are useful for one-person and multi-person staffing.
- Discuss the importance of involving others in appropriate project activities, and the challenges and strategies for doing so.

- Describe the use of Quality Reviews and Change Control in small projects.
- Describe the Deliver Phase activities and the value of each to the project.
- Apply minimum-effort project tracking methods; evaluate project progress.
- Scale Small PM techniques for smaller Just Do It (JDI) and Very Small Projects (VSP), or for larger projects.
- Describe the personal and enterprise benefits of implementing small PM.

Appoint a project manager for large project is the most. A construction manager is essentially a high level manager who focuses on the coordinating the different needs of a project on a large scale. In particular, the construction manager is responsible for maintaining the relationship with all the contractors and subcontractors to ensure the smooth and timely completion of a project. The most important aspect of the position is that of defining the structure of the PM team and assigning responsibilities to each member. Beyond this, the construction manager arranges and maintains project relationships with the trade contractors and designers associated with particular aspects of the project, including setting timetables for the completion of certain sections and resolving conflicts as they arise. Beyond coordinating the internal workings of a project, the manager must develop plans to handle external concerns. These include handling equipment and materials suppliers, developing plans with local emergency and fire departments for on-site safety, and risk management (Fowler, Lindahl and Sköld, 2015).

Like any human undertaking, projects need to be performed and delivered under certain constraints. Traditionally, these constraints have been listed as scope, time, and cost. This is also referred to as the PM triangle, where each side represents a constraint. One side of the triangle cannot be changed without impacting the others. A further refinement of the constraints separates product quality or performance from scope, and turns quality into a fourth constraint. The time constraint refers to the amount of time available to complete a project. The cost constraint refers to the budgeted amount available for the project. The scope constraint refers to what must be done to produce the project's end result. These three constraints are often competing constraints: increased scope typically means increased time and increased cost, a tight time constraint could mean increased costs and reduced scope, and a tight budget could mean increased time and reduced scope.

The discipline of PM is about providing the tools and techniques that enable the project team (not just the project manager) to organize their work to meet these constraints. Another approach to PM is to consider the three constraints as finance, time and human resources (Radu, 2014). If one needs to finish a job in a shorter time, one can throw more people at the problem, which in turn will raise the cost of the project, unless by doing this task quicker we will reduce costs elsewhere in the project by an equal amount. For analytical purposes, the time required for each task is estimated. It is important to divide the work into several smaller pieces so that it is easy to measure progress. A Work Breakdown Structure (WBS) is commonly used to develop the list of tasks each of which is then given a time estimate. Time is not considered a cost or a resource since the project manager cannot control the rate at which it is expended. This makes it different from all other resources and cost categories.

Moreover, the cost to develop a project depends on several variables including primarily: labor rates, material rates, risk management, plant (buildings, machines, etc.), equipment, and profit.

When hiring an independent consultant for a project, cost will typically be determined by the consultant's or firm's per diem rate multiplied by an estimated quantity for completion. The overall definition of what the project is supposed to accomplish, and a specific description of what the end result should. A major component of scope is the quality of the final product (Ludovic-Alexandre and Marle, 2008). The amount of time put into individual tasks determines the overall quality of the project. Some tasks may require a given amount of time to complete adequately, but given more time could be completed exceptionally. Over the course of a large project, quality can have a significant impact on time and cost (or vice versa). Having reviewed the above, it could be summarized as follows:

- The PM skill methods are especially effective in time, cost and quality controls. Yet, it is noted that the definition detail of secondary PM is good for some large scale projects.
- For the small scale project, that may be no need to appoint a project manager which base on using techniques to make the work simple. Alternatively, the project manager will monitor the large scale of project to meet the high level goal requirement.
- The secondary PM techniques will use more IT computer methods and software than the base plan of PM. As the secondary PM have to use more budget. The PM techniques can make the project (even the small or the large scale) work more effective and efficient.
- The implementation of PM, a project is a temporary endeavor undertaken to achieve a given objective. PM is the process of managing that endeavor from conception to completion. Also, it is the process of managing the project scope and plan to meet deliverables. A successful project completes on time, within budget, delivers committed scope and its outputs meet agreed quality criteria.
- Achieving an agreed level of customer satisfaction may also be a success criterion. Projects can usually be divided into stages such as *Concept, Design, Build, Test and Implement.* Whatever the stages, each stage must be initiated, planned, executed, controlled and closed. PM methodologies often describe PM knowledge, skills, tools, techniques and practices under these headings.
- Even the techniques between the base and secondary PM are different, but the principle should be the same to complete the project on time within estimate/planned budget and quality.

3. RESEARCH METHODOLOGY

Qualitative research, by means of interviewing (plus a structured questionnaire) with major stakeholders i.e. project staffs of various ranks (where their identities kept anonymous) are adopted to obtain their respective comments in managing two construction projects: (1) a smaller scaled sample flat - named as GP, and a larger scaled new building - named as BH (with particular reference to their daily work, budget estimation, project planning/programming/monitoring, material purchasing, schedule monitoring, quality control, handing over, etc.). The questionnaire will address the following issues.

- To collect the personal/occupational profile of each management and supervision employee, e.g. age, gender, educational level.
- To examine the project team members' functions in PM.

- To study the nature/details of the projects.
- To assess each staff expectation in the projects.
- What are the common problems in managing projects?
- What are the solving methods?
- Suggest any improvements for the PM.

3.1 GP – Sample flat fitting out

This is a smaller scaled construction project of 800 s.f., with a budget of US$130000, using middle grade quality design and finishes, and target completion in one month. Base planning of PM methods involving basic techniques to managing, understanding, and coordinating for small projects are adopted. Minimum effort is applied in project tracking methods; such as evaluate bills of quantities, budget balance sheet, project progresses, site safety checklist etc. Small Project Worksheet is adopted to estimate the activity effort and duration. It is required to describe how communicating assumptions produces more accurate/useful estimates. A work plan framework at appropriate detail is required for small projects, to render it simplified for the mid-level staff, thus reducing the associated management/supervision cost. The management staff can use BQ, record photos etc. to monitor works processing, and control cost/quality in materials purchase for timely completion.

3.2 BH – Design and fitting out

This project involves a larger scale 5500 s.f. house design and fitting out construction, with a budget of US$1.93 million, and target completion of 180 working days. This building includes substantial purchasing processing and high management level, and coordination with major parties such as main contractor, specialist subcontractor, specialist consultants and specialist suppliers. As this project involves other specialist consultants, additional monitoring documents are required. The project is coordinated through tracking on following up items that stated in meeting minutes and punch list. Any variation works are properly documented via the Request Information Form (RIF) and Confirmation of Verbal Instruction (CVI) documents, and recorded through the authorized person for future final account preparation.

GP can be managed more effectively by a simplified project team, and appears to have lesser project risk; whilst BH has more documents and parties involved and appears to have larger project risk. *Define, Measure, Analyze, Improve and Control* tactics are engaged to improve the PM system, esp. to minimize variations, waste and defects.

3.3 Findings and analysis

23 interviews/questionnaires are conducted with the 23 assigned project staff involved in above projects (i.e. 100% response rate), where the results are tabulated/analysed as revealed below.

From Table 1, it reveals that majority respondents are male (83%).

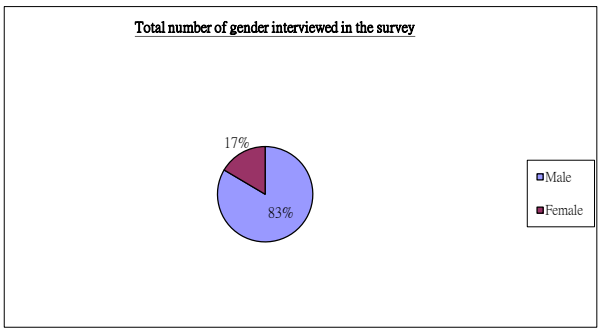


Table 1. Gender distribution

From Table 2, it shows that majority respondents are aged 36-40 (43%) and aged 31-35 (25%) respectively.

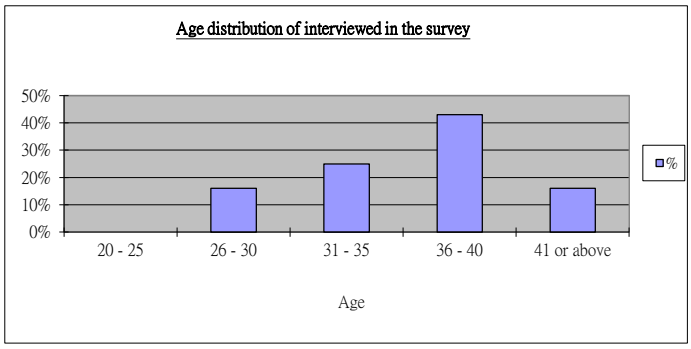


Table 2. Age distribution

From Table 3, it reflects that majority respondents possess postgraduate education and professional knowledge (63%).

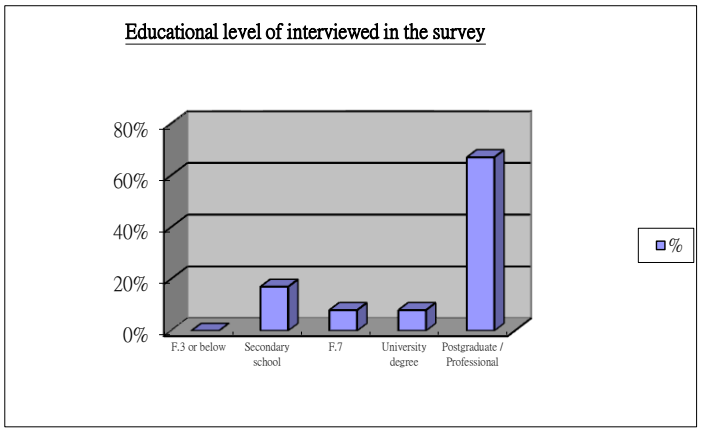


Table 3. Education level

From Table 4, it outlines that majority respondents have 1-3 years' experience (32%) and 4-6 years' experience (32%) in project management respectively.

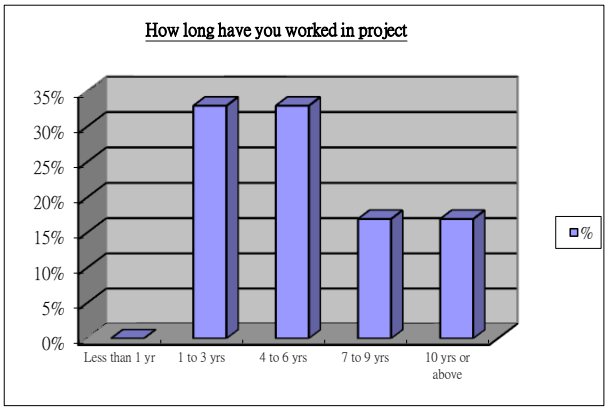


Table 4. Work duration

From Table 5, it illustrates that majority respondents devote more than 20% direct working time in project management (56%), and 15-20% direct working time in project management (22%) respectively.

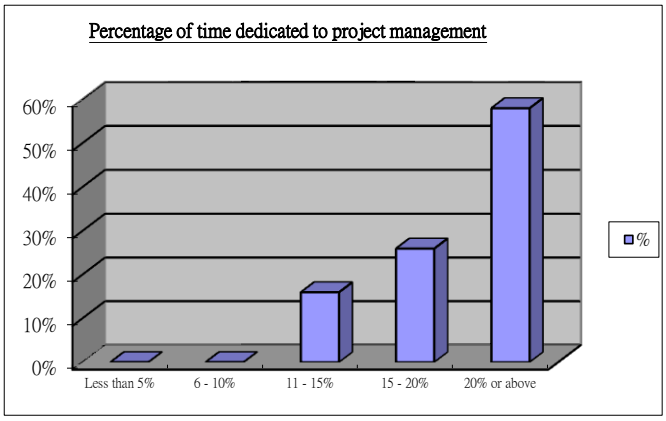


Table 5. Direct working time in project management

From Table 6, it demonstrates that majority respondents have managed 1-3 projects (38%) and 4-6 projects (38%) respectively.

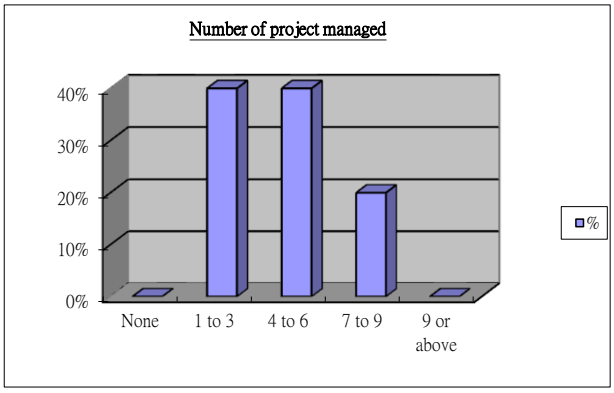


Table 6. No. of projects managed

From Table 7, it reveals that majority respondents have to fulfil rigid completion date (70%) and business objectives (60%) also.

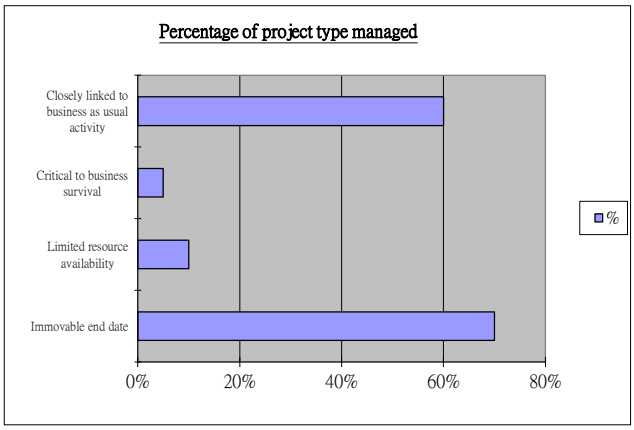


Table 7. Type of project managed

From Table 8, it shows that majority respondents have managed projects valued HKD 1 to 10 million (66%).

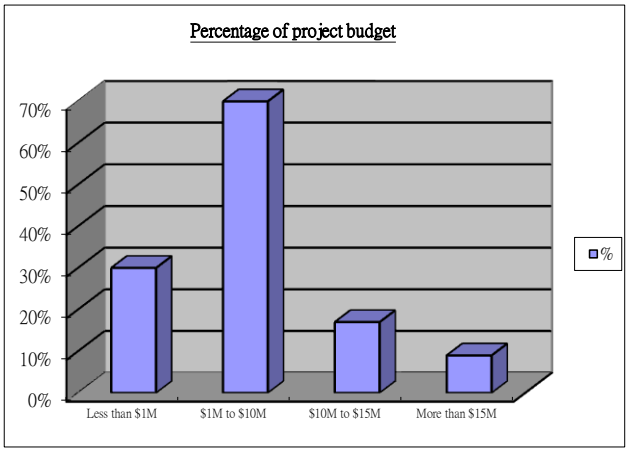


Table 8. Project budget distribution

From Table 9, it reflects that majority respondents have managed projects of duration less than 6 months (50%) and 6-12 months (30%) respectively.

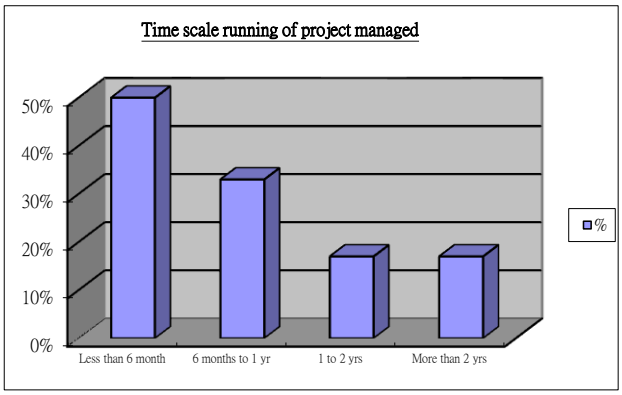


Table 9. Project duration

From Table 10, it outlines that majority respondents have to offer updated estimates to fulfil budget control by others (80%).

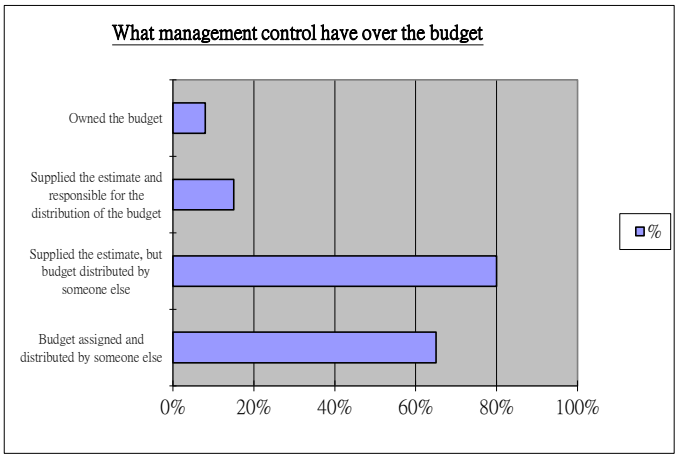


Table 10. Type of budget control

From Table 11, it illustrates that majority respondents have project team size of 4-7 staff (76%).

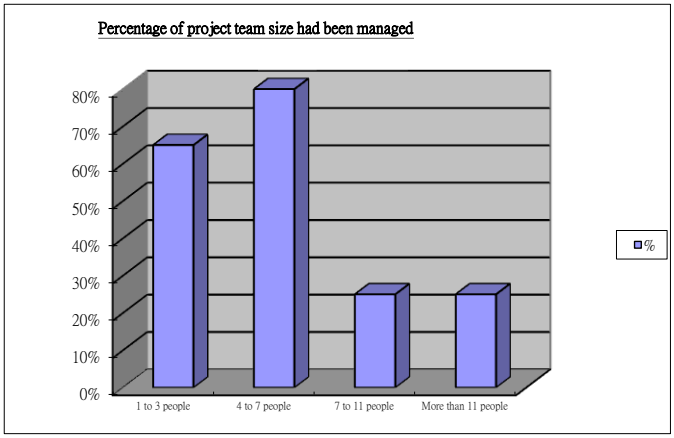
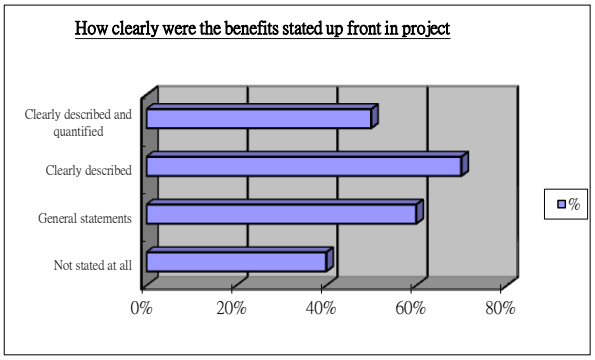


Table 11. Project team size

From Table 12, it states that majority respondents have managed projects with objectives clearly defined (68%), and general descriptions (58%) also.

Table 12. Are projects' objectives well defined?



From Table 13, it demonstrates that majority respondents reckon the risk in meeting project deadlines or lack of product clarity (80%), and the risk in resource constraints (62%) also.

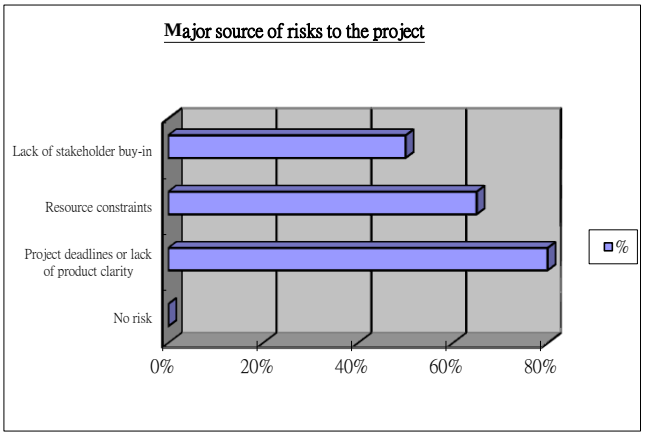


Table 13. Major risks of projects

From Table 14, it reveals that majority respondents admit the time constraint in project management (75%).

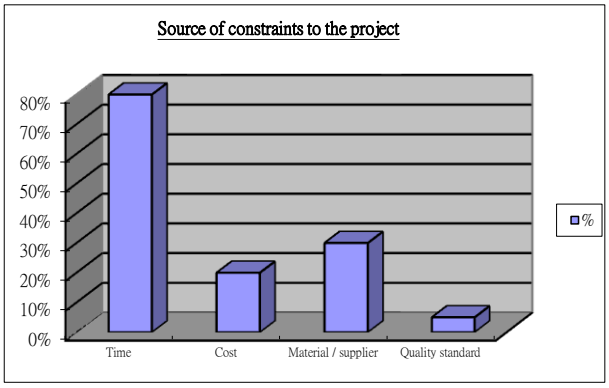


Table 14. Constraints to project

From Table 15, it shows that majority respondents reckon to improve the time in project management (75%).

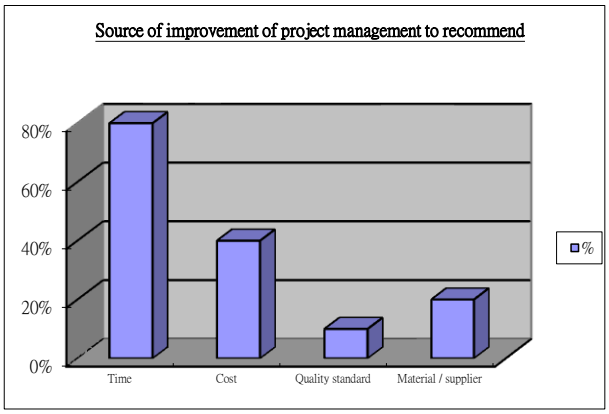


Table 15. Area for improvement in project mgt.

CONCLUSION

From the above findings and analysis, it reveals that project management in the construction industry appears to be dominated by male, with age ranging from 31 to 40, possessing postgraduate education and professional knowledge, with project team size of 4-7 staff, having 1-6 years' experience, devoted 15-20% direct working time in managing projects, and managed 1-6 projects, each valued HKD 1 to 10 million. These respondents have to fulfil rigid completion date and business objectives, with project duration of less than 12 months, project objectives clearly defined, and offer updated estimates to fulfil budget control by others (top management). They reckon the risks in meeting project deadlines or lack of product clarity, and the risk in resource constraints also. They admit the time constraint, and reckon to improve the time in managing projects. With these findings, it is hoped to cast some lights to offer some areas of improvements for project management in the construction industry.

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