

Integrated Engineering Project Management Approach for Typical Small to Medium Manufacturing Companies

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Abstract

The aim of this paper is to identify the problem extents and successfully applying project management in SMEs with a focus on manufacturing industries. The organization of the study was mainly divided into the activity of literature study and the investigation through a survey conduct aimed to measure the awareness and implementation of project management at the selected SMEs in Malaysia. The questionnaire was designed with a section (Section A) involving project management in general and another section (Section B) involving the implementation of it. It was found that the level of awareness and implementation of project management especially in the selected small and medium manufacturing companies in Malaysia was quite satisfying. Most of the manufacturing companies were implementing project management, but the level was depending on the organization in the company itself.

Keywords: Project management, Manufacturing companies, Small to Medium Enterprise

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1. Introduction

Project management was initially developed in the heavy engineering industries, particularly construction, defense, aerospace, and shipbuilding [1]. It later evolved to address smaller projects such as medium-sized projects in large firms [2]. Project management can be defined as a well-established discipline that aids in defining, plan and implement successful projects. It is a significant component because all organizations, small or large, are involved in implementing new procedures such as new production line in a manufacturing company, the improvement of a new product or service, a major building program, and a public relations promotion campaign.

Project management aims to improve the current resources of finishing the work assigned to the company. To ensure that it is performed more smoothly throughout the system, project management approach can help, and it requires organizations department communication.

Morris [1] indicates that the origin of project management comes from the chemical industry just before World War II. He further observes that project management is distinctly specified as a separate discipline in the Atlas missile program, peculiarly in the Polaris project.

In the middle of the twentieth century, projects were accomplished based on an improvised basis utilizing mostly simple techniques, tools and Gantt Charts. The modern Project Management period began in 1950. Two scientific project development models were established which are The Program Evaluation and Review Technique or PERT, created by Booz-Allen & Hamilton and The Critical Path Method (CPM) created in a joint venture by both DuPont Corporation and Remington Rand Corporation for managing plant maintenance projects.

1.1 Project Management in Small and Medium Scale Manufacturing Companies

Today, small and medium scale enterprises (SMEs) play an essential role in the economy, in terms of both employment and economic development and growth. SMEs consistently contributed to the increment in the percentage of gross domestic product (GDP), employment share rose, and exports. SMEs contributed 36.3% to GDP in 2015 from only below

30% in 2005 while the employment share rose from 8.7% to 56.8% in 2005, to 65.5% in 2015. In addition, exports showed better growth momentum from 16.4% in 2010 to 17.6% in 2015.

For SMEs company, competitiveness and quality should be built to match or surpass the rivalry in this competitive period. Here, project management is the golden key required to perform an excellent role in the management and growth of SMEs economy. Project management benefits SMEs the most in their economical part. SMEs failure rates decline in an economic system that practice project management [3].

1. 2 Challenges in the Implementation of Project Management at SMEs

Project management benefits SMEs the most in their economical part. Problems regarding project management in SMEs must be itemized along with its way forward in order to support SMEs be the golden key to economic growth. The way forward or the solutions can be applied in SMEs operations is a stepping stone to SMEs to rise and also eliminate all the problems in applying project management in SMEs.

In the absence of essential management frameworks, technologies, tools and widely accepted standards of practice, many SME projects have either failed or been abandoned. A set of areas focusing on SMEs problems were enlisted. It varies from common management problems, finances, lack of knowledge, problem awareness, labor mobility, and the lack of experiences. Thus, it is urgent to eliminate the problems and carry out the effective project management by proposing the solutions to solve the issues.

SMEs failure rates decline in an economic system that practice project management [3]. In the absence of essential management frameworks, technologies, tools and widely accepted standards of practice, many SME projects have either failed or been abandoned. To achieve economic development and growth, SMEs should devote three percent of their turnover on innovation. Nevertheless, successful innovation is not a simple task for SMEs [4]. Small firms have quite a few disadvantages in innovation such as limited cash flow, low pool of knowledge and skills, and a small value of sales over which to spread innovation costs [5].

The aim of this paper is to identify the problem extents and successfully applying project management in SMEs with a focus on manufacturing industries, as well as to recommend solutions and ways forward against identified problem extents.

2. Research Method

The organization of the study was mainly divided into the activity of literature study and the investigation through a survey conduct. Literature research was pursued to understand better the concept of project management, from the related books, journals, research papers, dissertations, article, internet-based articles and any related topics to the addressed terms. The survey was aimed to measure the awareness and implementation of project management at the selected SMEs in Malaysia, with characteristics listed in Table 1.

The selected companies were all in the domain of manufacturing-related services. They were located at Pahang and Sarawak, and were selected based on the category made by SMEs Corporation Malaysia, a central coordinating agency under the Ministry of International Trade and Industry Malaysia that formulates overall policies and strategies for SMEs and coordinates the implementation of development programs across all related ministries and agencies. The population size chosen is 50 because there are companies that have their policy not to comply to survey from outside their industry.

Table 1. The characteristics of selected small to medium scale enterprises

Country	Malaysia
State	Pahang and Sarawak
Main characteristics	<ul style="list-style-type: none"> • Small and medium enterprise • Manufacturing related services
Other characteristics	<ul style="list-style-type: none"> • Located based in Pahang and Sarawak only • Registered with SME Corporation Malaysia • Not state-owned enterprise • Not subsidiaries of: <ul style="list-style-type: none"> ○ Public listed companies on the main board ○ Multinational corporations (MNC) ○ Government-linked companies

The questionnaire was designed with two main sections. The first section (Section A) involves project management in general and the second section (Section B) involved the implementation of project management. Section B was multiple choice questions and also five-point scaled questions on the implementation of project management. Five scale points questions were divided into: 1 = never met, 2 = seldom met, 3 = sometimes met, 4 = often met and 5 = always met were developed for the project goals. A similar method was adopted for the importance of the success criteria where the points are: 1 = not important, 2 = slightly important, 3 = important, 4 = fairly important and 5 = very important. To ensure that the set of questions is effective, clear and meets the objectives, it was reviewed by academicians. The choice of reviewers were academicians from International Islamic University Malaysia (IIUM).

The questionnaire was distributed, targeting the specific type of respondent with good comprehension in project management and on engineer position, thus meeting the objectives of the study.

The data from the findings were converted to numerical data as it is more appropriate to allow better understanding and efficiency. The data collection was based on quantitative analysis where the data was obtained from survey questionnaires and was designed with a focus on project management and SMEs. The collected data were then analyzed using IBM Statistical Package for Social Science (SPSS) v23 software to ensure the reliability of the data.

3. Results and Analysis

Based on the response rate from 45 respondents, five respondents were (11.11% of the total 45 respondents) in manufacturing and small and medium enterprises (SMEs) that responded to the questionnaire. This section explained the results of research and at the same time is given the comprehensive discussion.

3.1. Reliability Test

Reliability test was done in all areas of study by SPSS software and value of Cronbach's Alpha. Reliability is an ability of a measurement to achieve consistent results. Using the same objectives, reliability test is the measure of consistency and whether the same results can be obtained twice over a period. Cronbach [6] introduced the measurement used to assess the reliability, internal consistency and a set of scale. In other words, the reliability of a given measurement refers to the extent to which it is a consistent measure of a concept, and Cronbach's Alpha is one way of measuring the strength of that consistency.

Section A has its four items in the questionnaire producing both 0.800 on Cronbach's Alpha and Cronbach's Alpha based on standardized items, respectively. This section also generated a mean value of 6.00, 0.500 for variance and 0.707 for the standard deviation. In this section, a total of four items produced Cronbach's Alpha of 0.8 which is the acceptable value based on a study done by Tavakol and Dennick [7]. If a lower value of Cronbach Alpha was obtained, the question in section A should be revised or discarded. If Alpha's value is too high, the questions may be redundant, i.e., repeated in a different statement.

In section B, number of items was based on all questions in that section. Cronbach Alpha and Cronbach Alpha's based on standardized items generated the values 0.631 and 0.542, respectively. For all questions in this section, the value of the mean was 35.20, 10.200 for a variance and the standard deviation was 3.194. Since the Cronbach Alpha falls within the acceptable range, thus it was confirmed that the internal consistency of the question in section B is reliable for all data analysis.

3.2. Data Analysis

There are several models to define the critical success factors of a project. Four were used in this study: the Pinto's model, Kerzner's model, Belassi and Tukel's model. All of the respondents have heard about the project management concept and 100% of the respondents which included all surveyed companies have implemented project management in their companies. However, only 80% of them (4/5) respondents agreed that the project management is very important to the company performance.

In terms of tools, the largest percent (27%) which is equal to 3 respondents each, have selected project planning and project teams as project management tools that they are familiar with. The second share, (18.2%), which included two respondents each, chose Gantt charts and

project control. The last one, which was one respondent (9.1 %) selected critical path method to describe project management tools that they are familiar with.

The project schedule and budgeted plan were probably one of the most important factor in a project. Based on the survey, in terms of the budgeted plan for a project, 80% (4/5) respondents considered that their company often met the budget plan, but the one respondents (20%) stated that their projects always met the budget according to plan.

In terms of schedule, three respondents (60%) rated on scale three since their projects met the scheduled goals sometimes. One respondent (20%) stated that they often met their goals and the highest scale (always met) was recorded by one respondent (20%). Time estimation to complete project leads the overall question in section B which involved the implementation of project management. 'Iron Triangle' also includes the life cycle's elements of project management which are planning, monitoring, and control. It comprises of all aspects of a project to achieve the objectives on time, within estimated cost and also meet the quality and performance [8]. The respond of the companies towards the question of schedule and budget can be seen from Figure 1.

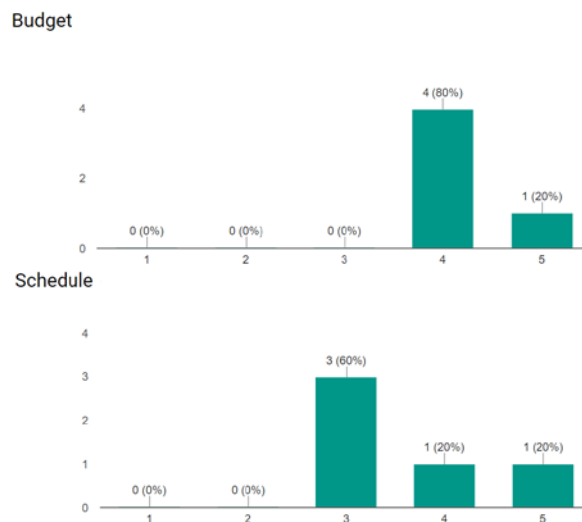


Figure 1. Companies respond over Budget and Schedule factors in project management

In terms of performance, the least percent (20%) which expressed one respondent rated that their projects sometimes met the performance goals according to the plan. On the other hand, both scale 4 (often met) and 5 (always met) showed the same value (40%) which is corresponding to two respondents each on both scales.

In terms of top management support criteria as success criteria, 60% of respondents which is three respondents chose top management criteria is fairly important to their projects and organization. The largest scale (scale 5) was obtained from 40% (two respondents) believed that top management criteria are very important for the success of their projects and organization. Pinto's model top management support was listed as one of the critical success factors in project management. Kerzner's model is using executive commitment and leadership approach that was presumed as top management support from the executive and leadership words. Belassi and Tukul's model categorized the factors related to the project manager, the team members, and organization. Every single detail discussed in three models explained the top management support. It is a strong argument as a critical success factor that would have a huge influence on the implementation of project management.

In terms of clear goals and objectives, 80% which represents four respondents, rated for clear goals and objectives to be fairly important as success criteria for projects and organization based on Table 1. The remaining one respondent (20%) rated that clear goals and objectives is very important as success criteria. To achieve precise goals and objectives, plans

should be performed. Planning is one of the aspects of the project management lifecycle, and it shows that they had implemented project management based on project planning. Project mission in Pinto's model, a clear understanding of project management in Kerzner's model and factors related to the project from Belassi and Tukul's model, are all included in clear goals and objective success criteria.

In terms of important planning and control, 80% (4 respondents) somewhat agreed that planning and control = are very important for successful projects and organization (scale 5-very important). While, 20% (one respondents) thought that planning and control is relatively not important as success criteria. According to Pinto's model, they stated that project proposal and schedule were their critical success factors in their model. Kerzner's critical success factors were the sixth points which demonstrated a commitment to planning and control. Belassi and Tukul's [9] included factors related to the project and all indeed could be listed as critical success factors.

4. Conclusion

The level of awareness and implementation of project management especially in the selected small and medium manufacturing companies in Malaysia was quite satisfying. Most of the manufacturing companies were implementing project management, but the level was depending on the organization in the company itself. Most of the problems and the solutions listed were from the organization itself. From top management to the workforces, a project management concept must be fully understood by all levels to help the companies to gain the confidence to move forward.

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