A REVIEW OF SUCCESS FACTORS ON COST MANAGEMENT FOR IBS CONSTRUCTION PROJECTS IN MALAYSIA

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ABSTRACT: *Globally, the adoption of Industrialised Building System (IBS) has been acknowledged as a sustainable construction method. However, the perspective towards the implementation of IBS in Malaysia is negative in term of cost management compared to the conventional method. Success factors on cost management of IBS construction project are essential to be applied to help contractors and developers to produce a successful project. Therefore, this paper reviews the success factors that can influence the IBS and general construction in term of cost management and determine the top success factors based on the past studies. Matrix analysis was conducted to rank the success factors in which contribute to the cost management in IBS construction. This outcome of the review listed forty-eight success factors that can affect the cost management in IBS which highlighted five top success factors based on the percentage calculated including contractor's construction planning and control (6.48%), manager's experience (5.56%), communication among all project team (5.56%), project manager's competent (4.63%), and quantity of materials ordered (4.63%) in order to archive a successful construction project.*

Keywords: Construction; Cost; Industrialized Building System; Management; Success factors

1. INTRODUCTION

An Industrialized Building System (IBS) is a construction system that re-emerged worldwide as a solution to cope with a high demand of building construction such as cost, labors, quality and productivity of the construction [1]. Based on the 8th Malaysia Plan, the country was continued to construct affordable low and medium residential units. However, Malaysia is struggling to meet the target of 600,000 – 800,000 houses during this period. While, in 9th Malaysia Plan, 709,400 residential units to be built by 2009 and 38.2% was for low and low-medium cost houses and 61.8% was medium and high types [2]. The traditional building system that currently and commonly being practiced by the construction industry is failing to produce good quality of construction, high in cost and do not manage to complete the project within the scheduled time [3].

Therefore, Malaysia has made a transformation to implement IBS in construction system as this technology offers numerous advantages which lead to a profitable and sustainable technology. Due to its cost-effectiveness and environmentally friendly, the requirement for labor works in the construction site is low. Moreover, it is supported by [4-6] whereas IBS can reduce the cost, the construction period while at the same time can produce a good quality of buildings and good control of human resources and improve occupational health and safety. Further-more, past researchers also mentioned that to reduce construction waste, the most beneficial methods are based on IBS implementation in building construction [4], [7-8]. Hence, to avoid the negative perspective towards the implementation of IBS in Malaysia in term of cost, this study aims to review the success factors and determine the top success factors of cost management that can be implemented in IBS construction industry in order to archive a successful project.

1.1. Significant of the Study

The findings of this review will benefit to construction professionals and practitioners considering that cost management plays an important role in constructions nowadays. An understanding of success factors would be able to help the experts to improve their performances and take proactive measures for an effective cost management project. Thus, this review can create a common point of references so that the professionals enable to direct and measure the success of a project [9-10]. Moreover, each of everybody in the project enables to know precisely which factor is absolutely important. In term of new research findings, a model can be developed which would basically be used to analyze the relationship between success factors and cost management or any performance criteria in the construction project. In addition, to verify the reliability of the success factors identified from the past studies, in-depth case studies of various construction projects can be initiated in the future.

2. INDUSTRIALIZED BUILDING SYSTEM (IBS) IN MALAYSIA

[3],[11] defined IBS as construction system which its components for example wall, beam, column, slab and staircase are produced and manufactured either in a factory or on-site with minimal additional site activities which also has been stated by [12],[13]. Moreover, IBS construction was widely implemented in another country such as Sweden, Finland, Japan and Germany in order to cope with the challenges in the construction industry [14]. The Crystal Palace in London was built in 1851 which the components are mainly made up of wood, glass and steel windows [15]. Meanwhile, IBS has been implemented in Malaysia since the '60s by using by the utilization of precast concrete beam-column component and penalized framework and it became popular only in 1998 [3, 14]. Since then, IBS has been actively promoting in Malaysia by Construction Development Board (CIDB) by formulating [13] to promote the benefits and use of IBS construction with the purposes of decreasing the foreign workers in site construction and also to improve the quality of the performance in the industry [16]. Malaysia also takes the opportunity to implement IBS in the construct construction industry as the government's purpose to accelerate the construction project and at the same time can provide affordable housing units to Malaysian. In Malaysia, projects that are famous with IBS construction are 17 stories flats, 3000 low-cost flats and 40 shop lots along Jalan Pekeliling, Kuala Lumpur which took only two years and

three months to be completed [15]. In general, there are many advantages when implement IBS construction compared to the traditional method. According to [3], a comparison between IBS and conventional method in term of benefits has been done. The advantages of IBS are cost-saving due to its repetition of using the steel or aluminum formwork, reduce the site workers because the prefabrication works are at the factory, does not affect by the weather condition, fast completion of project, flexibility in term of architectural design and precast components and lastly is high quality of building system.

Meanwhile, [17,18] also stated that it can saves cost, reduce unskilled workers, decrease the amount of materials used, efficient, safe and enhance the quality of the building. As mentioned above, implementation of IBS can provide benefits in the construction industry but there are a number of barriers that have been identified by the past studies [1]. Besides, the small contractors prefer to choose the conventional method compared to modern construction because they do not familiar with IBS and conventional method suit well with small company and scale [1]. According to [2], they summarized the barriers into five main areas including finance, poor Knowledge and skill, delivery of project and supply chain, negative perception and lack of government incentives. Therefore, training and education have to be implemented in contractors' company to fulfil the demand of IBS construction.

3. SUCCESS FACTORS

According to [19], they described the success factors as characteristics, conditions, or variables that can have an important effect on the project whether it will succeed when properly sustained, maintained, or managed. In addition, to enhance the performance of the projects in construction companies, they explored the success factors which this approach has been established and popularized over the last 20 years [19], [20]. Based on the previous studies, the researchers mainly studied about critical success factors and perception of the industrialized building.

3.1. Success factors of cost management in constructions

From the literature review, a number of critical success factors for construction has been listed below in Table 1. Due to limitation of the studies in IBS construction, this paper also includes the success factors affecting the cost for general construction that can be used as references for any construction project in the future including IBS construction. According to Table 1, matrix analysis has been done to perform the critical review and about forty-eight factors were extracted. Based on the percentage calculated from the analysis, top five success factors were highlighted that mostly affecting the cost management in IBS construction and the description of success factors are given in the following sections.

3.1.1. Contractor's construction planning and control

From the analysis in Table 1, this success factor is the top factor for a successful construction project based on past researchers. In this case, the contractor's ability is required to manage effective planning and controlling the budget of the project. For example, advance planning is required to hire site workers at the site construction to avoid any shortage when the construction project started. Past researchers mentioned that this issue seems to be highly true because it is related to the contractor's site management and communication among the project participants [21,22]. Good planning can result in effective site management and produce good communication among construction parties. Moreover, [21,22] and [23] stated that to ensure effective cost control, it includes that design decisions are made inside general budgetary requirements because 80% of a project's cost is determined by its design. In addition, this factor is also mentioned as the top success factors in [24, 21,22] therefore, the planning stage of construction is important and the contractors have to has a good ability to plan.

3.1.2. Related experience of the manager

Related experience of a manager is the second top success factors of cost in construction. Past studies stated that the project manager's experience can control the cost in the project and it is essential to appoint an expert cost adviser to execute the cost control functions. In addition, according to [21, 25] in order to carry out the task, cost advisers must be talented in every aspect of cost administration and should have skills of projects of a common size, nature and complexity to the project. Experience manager will have the capacity to accomplish high requirements of value and workmanship, high level of a successful project and also its safety. In order to require more knowledge and skills, project manager's experience is important and as mentioned in [26] number of years of experience prior to becoming a project manager in a construction project is over 10 years which they have been experienced six to ten various posts. Moreover, from a survey in [26], it is stated that 64% of project manager acquire at least 10 projects before they achieve a project manager status.

3.1.3. Coordination and communication among the participants

Communication is a key to an effective working relationship among all project team including project manager, contractor and consultant whereby all participants enable to share the knowledge and understand the requirements and perform their expertise in a construction project. It is a two-way process to keep up to date with all participants in the project to identify any major problems or potential cost implications of further design development or during the construction stage [27]. Meanwhile, in Nigeria statistics have shown that over 50% of the construction projects are failed because of unsuitable

Table (1): Success Factors Affecting Cost Management

Factors	Authors	F1	%2
Contractor's construction planning and control	[21], [22],[23], [24], [25], [26], [27]	7	6.48
Related experience of manager	[22], [28], [29], [25], [28], [30]	6	5.56
Coordination and communication among project participants	[22], [31], [32], [33], [25], [27]	6	5.56
Project managers' competence	[23], [31],[32], [33], [24]	5	4.63
Quantity of components/materials ordered	[28], [21], [34], [23], [35]	5	4.63
Monitoring and feedback	[31],[32], [33], [25], [35]	5	4.63
Contractor's site management	[22], [36], [29], [23]	4	3.70
Owner's competency	[23], [31], [32], [24]	4	3.70
Progress Meeting	[22], [25], [35], [27]	4	3.70
Contractor' s planning and scheduling	[21], [22], [35]	3	2.78
Contractor's staff and workers	[21], [29], [24]	3	2.78
Top management support	[31], [32], [33]	3	2.78
Documentation	[25], [26], [35]	3	2.78
Realistic cost estimation	[23], [25], [26]	3	2.78
Realistic contingency	[25], [26], [27]	3	2.78
Cash flow monitoring	[22] , [36]	2	1.85
Design, moulds or construction techniques from previous projects are reused	[21], [34]	2	1.85
Scope clarity	[36], [32]	2	1.85
Contractor's management team	[21], [33]	2	1.85
Project managers coordinating and leadership skill	[31], [30]	2	1.85
Related experience of the designer	[28], [22]	2	1.85
Complexity of design and construction	[34], [36]	2	1.85
Construction method/technology	[34], [22]	2	1.85
Type of construction	[34], [36]	2	1.85
Site conditions	[34], [36]	2	1.85
Value management/engineering	[25], [27]	2	1.85
Specification and standards for prefabricated building design	[28]	1	0.93
Repeatability and standardization	[21]	1	0.93
Quality of design and specifications	[34]	1	0.93
Quality of finishing	[34]	1	0.93
Capacity of production line in precast component	[28]	1	0.93
Rationality of precast components (PC) split	[28]	1	0.93
Operant level on installation personnel	[28]	1	0.93
Coordination between designer and precast component manufacturer	[28]	1	0.93
Collaborative capacity among professional designers	[28]	1	0.93
Fast completion construction	[21]	1	0.93
Intensity of building services	[34]	1	0.93
Design planning	[30]	1	0.93
Price stability of building materials	[21]	1	0.93
Supply stability of building materials	[21]	1	0.93
Amount of specialist work	[34]	1	0.93
Coordination of connection nodes of precast components	[28]	1	0.93
Quality control and assurance	[32]	1	0.93
Favourable climatic condition	[31]	1	0.93
Comprehensiveness of IBS principles in the design	[21]	1	0.93
Client requirements on quality	[34]	1	0.93
Systematic control mechanism	[22]	1	0.93
Proper project costing and financing	[23]	1	0.93
	TOTAL	108	100

1 = Frequency, 2 = Percentage

construction method[28,29]. Besides, [28] studied on the effects of communication in the construction industry which may lead to wrong interpretation of working drawings, poor and unclear information if there is lack of proper communication during the construction process. In contrast, to improve project delivery, contractors and clients practice regular progress meeting or site meeting and using appropriate communication tools.

3.1.4. Project manager's competence

One of the top success factors is the project manager's competence and this factor has a significant effect on the cost of performance of the project. From previous research, competence plays an important role in order for a construction project to be a success. Therefore, a training program or education can be invested to produce skilled workers, professionals and also technicians. To become a competent project manager, [30] stated that four common qualities in a project manager: personal traits, an inspiring team, getting empowered and getting involved with the project. Moreover, the project manager needs to develop a thorough understanding of the scope of work to avoid major changes in the construction. Previous studies, [31] stated that if the project manager understands the scope clearly, it enhances the managerial ability to deliver results in cost. Based on [32], in order for any construction to finished within the budget and time, the project manager must have a skill and ability to ensure there is no major problem could occur.

3.1.5. Quantity of component or materials ordered

This attribute is considered as success factors in a construction project with a percentage of frequency of 4.63%. According to [33,34] the major problem in the construction site is material wastage, for example, buying wrong specifications or buying more than the actual needed which may lead to extra costs. The quantity of component or material ordered is essential to avoid additional usage of the budget, so the proper planning has to be implemented during the planning stage of the construction. Based on past studies, [35] materials management studies are very important in construction to manage and understand the proper management of materials methods for a successful project. They listed the purpose of materials management that consists of reducing the cost and time of the project, to control stock and waste, quality assurance and etc. Furthermore, minimization of the wastage of material should be done to avoid loss of cash flows in the project [36].

4. CONCLUSIONS

In order to lead a project to success, the researchers define the success factors that will benefit and help to provide a forecasting tool that will enable the contractors to access any possibility of a successful project. This success factors are very important in any project management and required to be taken into consideration from the first phase of construction until the completion of the construction. Despite all the barriers to implement IBS, the top success factors can take into account during the construction phase for example 'contractor's construction planning and control', 'manager's experience', 'communication among all project team', 'project manager's competent', and 'quantity of materials ordered'. Moreover, this study will be beneficial to all contractors or other parties that assist them in making a good decision for the construction industry.

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