A review on construction of additional building school using Industrialized Building System (IBS) in Sarawak, Malaysia

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Abstract- ***Education forms the pillar for the quality and expertise of the workforce, the social network thus formed and the economic growth of the country. In order to produce citizens with the potential to drive the future of the country, the need to provide a safe and conducive education physical infrastructure is very important. The Government of Malaysia has provided an annual budget allocation for the construction of additional school buildings using Industrialized Building System (IBS). Further, this study will look at the relationship between IBS and the implementation of additional school building construction projects that have been carried out in Malaysia. This study will be using questionnaire distributed to targeted respondents who involved directly in the implementation of this projects. While scopes of study will only focus on the projects that have been implemented in Sarawak, Malaysia in the year 2018. The results from the questionnaires will be analyzed using Statistical Package for the Social Sciences to identify causes of project delay and to develop a criteria for construction of additional school building using IBS that can be completed within approved allocation, quality and agreed timeframe in the future.***

Keywords – Industrialized Building System, IBS, School Construction, Criteria, Project Delay

I. INTRODUCTION

The construction sector is one of the main contributors to the national economy. Based on the Economic Planning Unit [1], the country's Gross Domestic Product (GDP) for 2018 was 4.7% of the total RM1,446.8 billion. Meanwhile, Central Bank of Malaysia [2] through its annual report stated that, 4.2% of it was contributed by income from the construction sector. The use of IBS in the national construction industry was first introduced in the early 1960s, brought about by the influence of European countries which had been using it extensively then, in their respective construction sectors. In initiatives taken to promote the use of IBS in the construction industry in this country, the government has also introduced various measures, for example, tax exemption, provision of development strategic plans, guidelines and annual budget allocation.

IBS is generally a product manufactured to reduce waste on resources, while indirectly providing added values to users [3]. IBS components, in the forms of building structures which comply with set quality controls are manufactured in factories to minimize in-situ activities at construction sites [4]. A clearer and more commonly used

definition of IBS in Malaysia is a construction technique, where components are manufactured in a controlled environment, either inside or outside the construction site, before they are delivered to the site and subsequently assembled to form the structure with minimal additional work [5]. The use of IBS in the construction industry in such countries as Japan, Argentina, Singapore, Thailand, the United Kingdom, Australia, Germany, the Netherlands, the U.S.A, Canada, Denmark, Sweden and Finland has grown rapidly due to various factors [6]. Among the advantages of using IBS method in the construction industry, compared to conventional methods, are as follows:

a. Reduced project implementation costs: In general, there are three main aspects in evaluating the success of a project, namely, the overall cost spent, the quality of construction and the project completion period. The use of IBS is able to reduce the cost of project implementation as a whole [7]. With the IBS components being manufactured in factories, it enables the labour cost at the construction site to be reduced [8]. Factory-built IBS components can be mass-produced using the same mold, while the procurement of materials for the production of these components can also made in large volumes and on continuous basis.
b. A short project completion period: The completion period for a project using IBS components is faster, compared to those where conventional methods are employed. This is because, the preliminary work on construction sites, for example, survey work, foundation work, site cleaning, earthworks and others can be carried out simultaneously, while IBS components are being produced in the factory. This enables the construction period to be shortened [9]. This shorter project completion period is achievable through a meticulous planning in both the preparation work outside the construction site, in terms of the production of IBS components and the site installation work which is smooth and simple [10].
c. Improved level of hygiene and safety at the construction site: Hygiene and safety aspects also play a key role in determining the success of a construction project. Activities on construction sites carried out using conventional methods often result in haphazard layouts, dust, noise, air pollution, traffic congestion and others. This indirectly creates an unhealthy work environment and situation environment, not only to employees at the workplace, but also to the local community. The use of factory-made IBS components can minimize this situation [11]. Safety aspects in the pre-construction, construction and post-construction phases are enhanced with the use of IBS, with reduced construction activities at site, thus minimizing associated hazards [12].
d. Reduced dependence on foreign workers: The influx of foreign workers is viewed as causing negative impacts on the country, including low quality workforce, delays, waste, social problems, diseases and others [9]. The government aimed to achieve a 100% use of IBS, and this is expected to reduce dependence on foreign workers up to 15% in the construction industry by 2010 [13]. This target is achievable, because the use of IBS can reduce 40-50% of manual labour compared to conventional methods, particularly, for work which requires machines such as the production of IBS components in factories [8].
e. Use of quality components: Every construction process using IBS starts right from the material selection process for the manufacture of IBS components, until the installation of these IBS components at the construction site. Each of these processes must comply with the required standards and quality, while being monitored by various parties [14].

These factors have caused industry players to change their construction method from the conventional method to the IBS method. IBS is more than merely a construction method, it is a change agent for the ideas and thinking, the development of more reliable collaboration, the cooperation and trustworthiness among industry players in the country towards producing innovation, integrity, productivity and also effectiveness of the national construction industry [15].

The demand for the implementation of construction projects for additional school buildings is also increasingly on the rise, in line with such factors as increased population, the opening of new settlement areas and replacement of dilapidated school buildings currently still being used. Taking into account the factor of urgency as well as the advantages of using the IBS method in the construction sector, the Malaysian Government has provided an annual budget allocation to implement construction projects for additional school buildings nationwide using the IBS method. Through the 2017 Budget, a total of RM570 million was allocated to implement 120 additional school building construction projects [16] while RM1.25 billion was allocated to upgrade 2,000 dilapidated using the IBS method in 2018 [17]. In 2019, a total of RM100 million was allocated to implement the same program [18].

For the implementation of the project in 2018 in Sarawak, a total of nine contractors were directly appointed through the direct negotiation method, for the construction of 66 additional school buildings. Based on the contracts signed between the Government and the contractors, the agreed project completion periods were between one (1) to

five (5) months. The projects were awarded in packages, each package comprising between one (1) to twelve (12) projects. However, the Auditor General's Report Series 2 of 2018 stated that, as of 02 December 2018, 77.9% of these additional school buildings construction projects using IBS method were behind schedules. Accordingly, this study was conducted to identify the causes of the project completion delays and to develop criteria for on-time project completion.

II. METHODOLOGY

The study conducted was using a questionnaire. The questions in Part A was intended to get feedback and views of respondents regarding the causes which delayed the completion of the additional school buildings construction projects using IBS method, in 2018. A 5-Point Likert Scale was used for the questions in Part B to measure the level of agreement of the respondents on the factors which would enable the additional school buildings construction projects using IBS method to be completed within the stipulated period. The scope of this study involved the additional school buildings construction projects using IBS method implemented in 2018. The respondents were selected from among the parties directly involved in the implementation of the project, namely the project team in the Ministry of Education Malaysia, consultants and project contractors. A total of 143 respondents participated in the study by answering the given questionnaire. The results of the questionnaire were analyzed using SPSS to obtain the frequency, percentage, mean value and standard deviation value to meet the set objectives of the study.

III. RESULTS & DISCUSSION

3.1 Causes of project completion delay.

Ishikawa diagram is one of the methods of identifying factors, causes or effects which can be improved involving human resources, measurements, methods of implementation, materials, equipment or environment. It has been used in analyzing the causes of delays in the completion of physical construction projects implemented by PT Rekayasa Industri in Indonesia [19] as well as delays in the completion of construction projects in Oman [20]. Accordingly, the findings of the study from the feedbacks provided by the 143 respondents regarding the causes of delays in this project were categorized, based on the Ishikawa diagram.

Table -1 Causes of delay based on Ishikawa Diagram.

Category	Frequency	Percentage (%)
Management	710	34.80
Process	552	27.06
People	383	15.69
Material	248	12.16
Equipment	133	6.52
Environment	77	3.77

Management.

a. Improper planning: The locations of the projects, with no land link roads available or located in remote area made the delivery of IBS components, building materials, machinery and equipment difficult.
b. Financial problem: Poor financial management on the part of the contractors, besides delayed payments for work certified to be completed by the contractors caused problems to the project cash flow.
c. Delayed site possession: Work on the construction site could not be started immediately due to the delay in handing over possession of the construction site to the contractor.
d. Weak site management: Work planning carried out on the construction site should consider the number of workers, building materials, machinery and equipment required at any one time.
e. Weak communication: The distance between the project sites and the project team headquarters was far away, rendering clear information and instructions not being able to be conveyed effectively.
f. Unsuitable implementation method: A short project completion period and implementations of projects awarded in packages were not suitable to be implemented due to the much time required for the design process and the application for approval from local authorities.

g. Indecisive: The construction industry is a dynamic industry where various issues and problems may arise during the project implementation period, for example, floods, health of workers being affected, shortage of building materials and others which need immediate decisions to be made.

Process.

a. Land matters: The process of the project site land title transfer was not completed.
b. Insufficient data for design purposes: The need for additional time to obtain data related to the project site such as land type, site boundary, existing electricity and water supply, potential natural disasters and others.
c. Delayed Testing and Commissioning (T&C): Delay in implementing T&C by the project team and project consultants.
d. Delayed utilities installation: The delay in providing and installation of the electricity and water supply by the service providers rendered the buildings not being able to be handed over to the users.
e. Delayed design approval: The design process took much time due to design errors or design amendments.
f. Delayed approval from local authorities / utilities providers: Approvals to carry out construction work were received late from local authorities or utilities providers.

People.

a. Quality of Work: Irregular construction or installation work caused a re-work on the affected structure or installation.
b. Argument: Disputes with neighboring landowners or local residents caused construction work to be delayed.
c. Insufficient manpower: Shortage of workforce, either from the project team or staff at the construction site.
d. Lack of knowledge / experience: Lack of knowledge or experience among the workers, resulting in tasks to be performed repeatedly or delayed completion.

Materials.

a. Delayed delivery of materials: Difficulties in delivering building materials to the project site because there were no roads available leading to the sites or the projects site located in remote areas, thus requiring a longer delivery period.
b. Insufficient storage area: The lack of storage space for building materials caused the delivery of building materials to be carried out in small quantities.

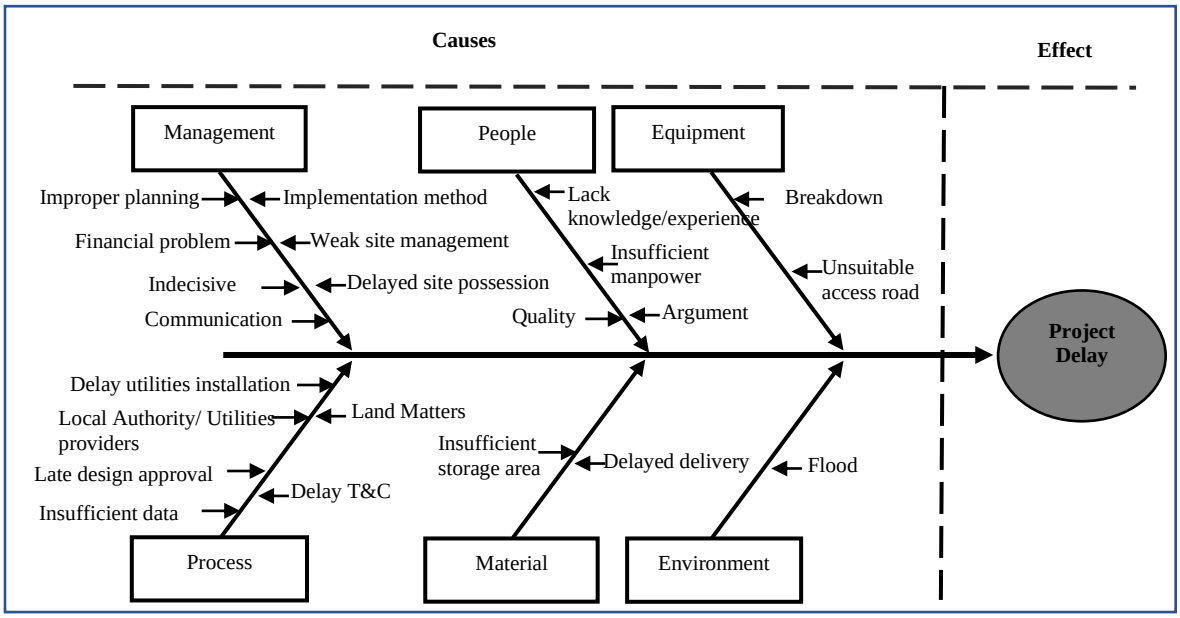
Equipment.

a. Unsuitable access road: There were no suitable access roads which could accommodate the weight of the machinery used and which would not cause jeopardize the safety of students and users of existing access roads, thus the construction of temporary access roads was required.
b. Equipment breakdown: Factors related to height and weight of building materials, minimum labour and others caused the urgent needs for machinery and equipment. Machinery breakdown delayed the project completion.

Environment.

Natural disasters were an unavoidable contingency factor. Flood caused the construction work to be delayed and the construction work had to be stopped until the flood level receded completely. Construction work completed before the flood needed to be re-examined to ensure that the quality of the construction work was not affected.

Figure 1 Causes of delay using Ishikawa diagram.



3.2 Project completion criteria

i. Table of mean score of inclination levels.

To develop the criteria for the completion of the construction of additional school buildings project using the IBS method, a total of 38 questions were asked to the respondents. A 5 Point Likert Scale was used in the questionnaire; 1 = strongly disagree, 2 = disagree, 3 = not sure, 2 = agree, 3 = strongly agree. The values of this Mean Score were categorized based on the Mean Score Tendency Level Table; low, medium and high as in Table 2

Table-2 Mean score interpretation.

Mean Scores	Interpretation
1.00-2.33	Low
2.34-3.66	Average
3.67-5.00	High

ii. Validity and Reliability Tests.

The validity and reliability of the instruments used while conducting the study is very important [21]. It is to ensure that the results of the study are unquestionable and reliable. The validity test was carried out by obtaining views from the parties directly involved with the implementation of physical development projects involving IBS, such as, contractors, consultants, local authorities, service providers and others. Subsequently, a draft of the questionnaire was distributed to several parties who were experts and knowledgeable in the implementation of this project to get their final comments on the validity of the content, for it to be able to be used in meeting the objectives of the study. Meanwhile, SPSS software was used to obtain the value of Cronbach's Alpha which measured the level of reliability of the study. The value of Cronbach's Alpha obtained for this study was 0.927 which indicated an excellent level of reliability.

iii. The results of the questionnaire related to the success factor of project implementation.

Completion of projects that comply with the intended quality of construction, within the allowable cost range and completed within the stipulated period is very important so that planning on the use of related facilities can achieve the target. The delay in the completion of the project is not only costly to the Government financially, but it also affects the opportunities for students and teachers to use safe, comfortable and conducive educational infrastructure facilities. The mean scores for all 38 questionnaires that were submitted by the respondents related to the project implementation success factor are as shown in Table-3.

Table-3 Mean score values.

Statement	Mean Score	Interpretation
Contractors appointed to implement a project must have strong financial resources without expecting a loan from a Loan Institution / Bank.	4.25	High
Adequate and qualified number of construction site workers play an important role in the completion of a project.	4.47	High
Connection problems between components, irregular installation, low quality control and others are caused by less skilled workers in IBS component assembly.	4.24	High
The quality aspect of construction is something that needs to be emphasized by all parties in completing a project.	4.54	High
Contractors appointed to implement a project must have experience in implementing such a project, whether based on contract costs, technology used, locality and others.	4.43	High
Construction site management / work planning on the part of the contractor must be organized, detailed and dynamic so that the project can be completed within the stipulated period and the problems at the construction site can be addressed quickly and effectively.	4.45	High
Unsatisfactory quality of construction will be detrimental to various parties taking into account the additional costs and time required for repair work.	4.41	High
Disputes between contractors and subcontractors / suppliers should be resolved immediately so that it does not interfere with project completion planning.	3.38	Average
Amendments to the Uniform Building By-Law (UBBL) must be implemented so that the IBS industry can grow as planned by the Government.	4.20	High
The conditions for Planning Permission (KM) approval for each local authority are different, depending on the UBBL standard applicable.	4.17	High
Each local authority has its own UBBL standard in approving development applications.	4.15	High
The period of approval by the local authority from the receipt of a complete application until the letter of approval is issued must be reasonable.	4.35	High
The period of approval by the service provider from the receipt of a complete application until the letter of approval is issued must be reasonable.	4.32	High
The installation of water / electricity supply by the service provider from the date the application is made must be reasonable.	4.36	High
Delays in the delivery of building materials including IBS components will delay project completion.	4.42	High
The selected IBS supplier must have its operations or its manufacturing plant located in the project region to reduce transportation costs and delivery time of IBS components.	4.32	High
Payment to the companies/contractors for the work that has been verified be completed must be made within a reasonable period of time, so that the smooth completion of the project is not affected.	4.49	High
Team spirit and cooperation play an important role in ensuring that the projects implemented can be completed within the stipulated period.	4.50	High
There are many IBS-related courses implemented by the Government or stakeholders.	4.08	High
Attendance in construction-related courses, especially those about exposure to the IBS industry, can help employees to better understand the technical requirements and needs of project implementation.	4.37	High
The project completion period based on the contract signed must be appropriate and reasonable.	4.52	High
Project implementation planning should consider views of all stakeholders to avoid confusion and misunderstanding after the project is implemented.	4.41	High
Users feel comfortable and safe after the completed buildings.	4.37	High
Regular meetings must be held and attended by all parties involved in the implementation of the project, so that project information and progress can be jointly monitored.	4.43	High
Action and direction / decision requirements during the construction period must be implemented immediately so that the construction process at the construction site is not delayed.	4.49	High
Support from top management in terms of required resources, including manpower and finance is very important for project completion.	4.47	High
Weaknesses in communication between teams will cause failures for information to be conveyed accurately and effectively.	4.41	High
Delays in finalizing the design will cause a delayed commencement of the construction work at the construction site.	4.29	High
All parties, including the users should be involved in the project design process so that their views can be considered.	4.29	High
A change of design once the construction process begins will delay the completion of the project.	4.48	High
Construction methods using IBS are not suitable to be implemented in rural / remote areas which do not have good link roads.	3.93	High
The status of project site ownership must be ascertained and resolved before the application for the project implementation is made.	4.39	High

Statement	Mean Score	Interpretation
The need to ensure that there are no constraints at construction site related to the storage of IBS components and construction machinery is important in the implementation of the project.	4.24	High
The selected project sites should be avoided from disaster areas such as floods, landslides, blockades from local people and others.	4.31	High
The selected project site should be accessible by roads to cater for the transportation project building materials and machineries to be used during construction.	4.36	High
Delays in handing over the project site to the contractor will result in delays in the commencement of the construction work.	4.48	High
The unavailability of a Survey Plan complicates the project design process.	4.29	High
The project design of the should be appropriate to suit location and needs of the users.	4.48	High

iv. Criteria for the completion of additional school building construction projects using the IBS method.

The main goal of the implementation of this project is to provide comfortable and safe educational facilities to the target group. However, delays in project completion will be detrimental to various parties whether in terms of cost, finance or opportunity. Based on the analysis that has been implemented on the findings of the study, the following are the criteria for the completion of an additional school building construction projects using the IBS method.

a. Payment for work certified completed on site to be made within a reasonable period of time: The need to ensure that the project cash flow is not disrupted is very important to have a timely project completion, especially in physical infrastructure projects. This is to ensure that payments to suppliers, employee salaries and other costs are not affected. SPSS analysis based on the respondents' feedback also showed that, the mean score for questions related to this matter has a high category tendency level of 4.49 points.
b. Project site owned by the Federal Lands Commissioner: The matter of obtaining approval from the local authority and utilities provider will be difficult if the site does not belong to the Federal Lands Commissioner due to the conditions set in accordance with the Local Authority Act. This will cause delays in commencing work at the construction site and, in turn, will cause delays in the project completion. The mean score for questions related to this matter has a high category inclination level of 4.39 points.
c. Selection of project sites which have good land link roads: The need to ensure that the project site is connected with good land link roads is very important because it will facilitate the delivery of building materials, equipment and machinery that will be used while carrying out construction work. The availability of link road is an important factor for the success of a project that uses the IBS method because the IBS components produced in the factory need to be moved to the construction site [22]. The delivery period by road is also shorter than that by river, and this will indirectly help speed up the completion of the project. The mean score for the statement 'The selected project site should be connected to suitable roads to cater for the transportation needs of project building materials and machinery / equipment to be used during construction' is 4.36, while the statement 'Construction methods using IBS are not suitable to be implemented in rural /remote areas which do not have good link roads' have a mean score of 3.93. The mean scores for both of these statements have a high category tendency level.
d. Selection of project sites which are safe from natural disasters: Natural disasters such as landslides, tides, rains, floods and others are events that occur beyond human control. However, previous natural disaster data should be taken into account in determining the location of project implementation. The mean score for the questionnaire statement, 'Selected project sites should be avoided from disaster-prone areas such as floods, landslides, resistance from locals and others' is also categorized as having a high category level of 4.31.
e. Handing over of the construction site to the contractor is to be carried out within the stipulated period: The calculation of the contract period is from the date of handing over of the construction site to the contractor until the date of completion of the project stated in the signed work contract. Delays in the handing over of construction sites will interfere with the planning done and, in turn, can cause a delay in the project completion. The importance of handing over the construction site within the stipulated period is also accentuated by the findings of the analysis using the Likert scale where the mean score obtained shows that it has a high level of inclination of 4.48 points.
f. Appointment of experienced contractors with a strong financial background**:** The selection of contractors who are experienced, qualified and have a strong financial background is very important to ensure that the planned project can be completed within the agreed period, achieve the required quality and do not exceed the approved cost. The mean score for the statement 'Contractors appointed for a project must have

experience in implementing similar projects, whether based on contract cost, technology used, locality and others.' is 4.43 points while the mean score for the statement 'Contractor appointed for a project must have strong financial resources without relying on loans from the Loan Institution / Bank' is 4.25 points. Both of these statements are categorized as having high tendencies.

g. Selection of appropriate project implementation method: The project completion period should be appropriate taking into account the design preparation requirements as well as matters involving local authority and utilities provider. The number of projects available in one package should also be reduced to a more reasonable amount. The mean score for the statement 'Project completion period based on the contract signed must be appropriate and reasonable' has a high level of inclination of 4.52 points. This value is the second highest of the mean score recorded, based on the survey questions.

h. Involvement of all parties in planning project implementation: Various views, especially from officials at the state and district levels are very important in implementing project implementation planning because these will give a clearer picture to the project team regarding the identified location, actual needs, communication path as well as advantages and constraints found in project sites. The mean score for the statement 'Project implementation planning should take into account the views of all stakeholders to avoid confusion and misunderstanding after the project is implemented' as well as 'Team spirit and cooperation play an important role in ensuring the project implemented can be completed within a set period' have high tendency levels of 4.41 and 4.50, respectively.

i. Project monitoring is carried out regularly and consistently: The aspect of project monitoring whether through meetings, discussions or visits to the construction site is very important in ensuring the progress of the work that has been carried out on the construction site is based on the agreed work schedule. Regular meetings must be held so that information and project progress can be monitored jointly by all parties involved [23]. Mean score for statement 'Regular meetings must be implemented and attended by all parties involved with project implementation so that project information and progress can be monitored jointly' has a high level of inclination of 4.43.

j. Creating a simple and effective communication medium: One of the main reasons for the low performance of construction projects is due to communication barriers [24]. Project implementation using the IBS method involves complex processes and requires the involvement of various parties at various levels. It starts from the design process, manufacturing of IBS components in factories, transportation, construction on the construction site, monitoring the progress of the project until the completion of the project. Accordingly, all information must be conveyed quickly and accurately so that it does not cause a delay in the completion of the project. The use of applications such as smartphones, email and virtual platforms allows information to be conveyed quickly and easily. The importance of effective communication is also evidenced by the high inclination mean score of 4.41 for the statement 'Weaknesses in communication between teams will cause information to fail to be conveyed accurately and effectively'.

k. Design suitability: The design preparation needs to be tailored to the project location, the type of road link to the project site, the IBS system to be used as well as the potential natural disasters that can occur at the project location. Data that can assist in the design process such as the latest site plan, the position of the existing building on the construction site, the source of water and electricity supply and other data should be provided before implementing the design process. A number of statements regarding the design process were given to the respondents to assess the extent of the importance of these criteria in meeting the project implementation objectives. All statements of the questionnaire regarding these criteria have mean scores categorized as highly inclined, as shown in Table 4.

Table-4 Mean scores for design suitability criteria.

Statement	Mean Score	Interpretation
A change of design once the construction process begins will delay the completion of the project.	4.48	High
All parties, including the users, should be involved in the project design process, so that their views can be considered.	4.29	High
The unavailability of a Survey Plan complicates the project design process.	4.29	High
The project design should be appropriate to suit the location and needs of the users.	4.48	High

l. Expediting instructions and decisions related to project implementation: The construction industry is a dynamic industry and is constantly evolving, well in tandem with the passage of time. The need to take quick and accurate actions is very important to ensure that whatever has been the planned will be translated

into actions as intended. Therefore, instructions and decisions on matters related to the project progress should be made timely, accurately and reasonably. The respondents admitted that delays in decision making will interfere with the smooth implementation of the project. The mean score for the statement 'Actions and direction / decision requirements during the construction period must be taken immediately so as not to delay the site construction process' is 4.49 while the mean score for the statement 'Delay in finalizing the design will cause construction work at the construction site to start late' is 4.29. Both of these statements have high tendency mean scores.

m. Quality compliance based on industry standards: Construction quality is one of the identified elements in determining a successful completion of a physical development project. Emphasis on quality must always be given in all stages of project implementation, whether in the pre-construction, construction and post-construction phases. The latest technical specifications and compliance with industry standards should be applied to ensure that the completed buildings are safe, in compliance to the set quality standards. Contractors and consultants involved in the project should also be encouraged to obtain a recognized quality management certification, such as ISO 9000. Respondents' feedback on the questionnaire statements related to the quality of construction were found to be positive. The construction quality was viewed as a very important by the respondents in their evaluation of a successful implementation of a physical development project. Construction quality criteria also obtained the highest mean score, compared to all the questions asked to the respondents. Table 5 shows the mean score for the statements that have been submitted to the respondents regarding these criteria. Buildings built without neglecting the quality in construction will result in reduced maintenance costs to the Government in the long run.

Table-5 Mean scores for quality adhered to industry standard criteria.

Statement	Mean Score	Interpretation
Consumers feel comfortable and safe using the completed buildings.	4.37	High
Problems related to connections between components, poor installation, low quality control and others are due to incompetency of workers in the installation of IBS components.	4.24	High
The quality aspect of construction is something that needs to be emphasized by all parties in completing a project.	4.54	High
Unsatisfactory quality of construction will be detrimental to various parties, taking into account the additional costs and time required for repair work.	4.41	High

n. Effective construction site management: Construction site management is one of the important elements in a building construction project. This relates to the management of manpower, machinery and equipment, control over cost, quality and time, health and safety, coordination of work, site organization and meetings at construction sites. An efficient construction site management system will result in positive impacts on productivity and the overall performance of the project. The mean scores for the statements related to the management of the construction site show a high and moderate level of inclination. This shows an efficient construction site management to be one of the factors for the success of school buildings construction projects using the IBS method. Table 6 shows the mean scores for the statements related to these criteria.

Table-6 Mean scores for site management efficiency criteria.

Statement	Mean Score	Interpretation
Construction site management / work planning on the part of the contractor must be well organized, detailed and dynamic, so that the project can be completed within the stipulated period and the problems at the construction site can be addressed quickly and effectively.	4.45	High
The need to ensure that there are no constraints at construction site related to the storage of IBS components and construction machinery is important in the implementation of the project.	4.24	High
The selected IBS supplier must have its operations or its manufacturing plant located in the project region to reduce transportation costs and delivery time of IBS components.	4.32	High
Adequate number of construction site workers with required qualifications plays an important role in the completion of a project.	4.47	High
Delays in the delivery of building materials, including IBS components will delay project completion.	4.42	High
Any dispute between contractors and subcontractors / suppliers should be resolved immediately so that it does not cause any interruption to the project completion planning.	3.38	Average

o. Sustainable and continuous management and development of human resources: Sustainability and competency of human resources are very important for an organization to achieve its set targets. The top management of an organization must ensure that the workforce allocated to perform a task is sufficient. The lack of manpower, both on the part of the contractor or the project manager will increase the workload, while the desired output will not reach the set target. Sufficient workforce in carrying out assigned tasks will help to reduce stress on employees, thus boosting the productivity and performance of the project, as a whole. Competency development for the relevant employees must be done on a continuous basis, such as organizing courses related to the work carried out for the success of a project or sending them to training centres which offer related courses. The need to have the management and development of human resources on an ongoing basis was also agreed to by the respondents based on their feedback submitted through the survey form. The mean scores for all statements related to these criteria have a high level of inclination as shown in Table 7.

Table-7 Mean scores continuous improvement on human resource management and development criteria.

Statement	Mean Score	Interpretation
Support from top management in terms of required resources, including manpower and finance is very important for project completion.	4.47	High
There are many IBS-related courses conducted by the Government or stakeholders.	4.08	High
Attendance in construction-related courses, especially those about exposure to the IBS industry, can help employees to better understand the technical requirements and needs of project implementation.	4.37	High

p. Close cooperation by local authorities and service providers: Although the roles of local authorities and service providers are not tied to the contract signed between the Government and contractors, delays in their actions will delay the completion of the project. Local authorities and utilities providers should also be able to expedite the application for approval related to the acts under their supervision, for projects involving public interest, such as school building construction projects using IBS method. The actions by the service providers should also be tailored for immediate needs of electricity and water supply for the completed project. Close cooperation by local authorities and service providers is needed to ensure that such projects can be completed within the stipulated period. Feedbacks from the respondents for statements related to these criteria also show a high level of inclination as shown in Table 8.

Table-8 Mean scores close working cooperation with local authority and utilities provider criteria.

Statement	Mean Score	Interpretation
Amendments to the Uniform Building By-Law (UBBL) must be implemented so that the IBS industry can grow as planned by the Government.	4.20	High
Each local authority has its own UBBL standard in approving development applications.	4.15	High
The conditions for Planning Permission approval for each local authority are different, depending on the UBBL standard applicable.	4.17	High
The period of approval by the local authority from the receipt of a complete application until the letter of approval is issued must be reasonable.	4.35	High
The period of approval by the service provider from the receipt of a complete application until the letter of approval is issued must be reasonable.	4.32	High
The installation of water / electricity supply by the service provider from the date the application is made must be reasonable.	4.36	High

IV. CONCLUSION

The success in implementing a development project relies on various factors which are interrelated with each other. It begins right from the planning phase, including the settlement of site ownership, identification of link roads leading to the project site, suitability of project implementation methods based on terrain, potential natural disasters, implementation of work on the construction site, until the project hand over to users. The need for additional school buildings or replacement of dilapidated and unsafe buildings has always been given a priority by the Government and such projects will indirectly reduce the cost of maintaining school buildings in the long run. The feedbacks obtained from the respondents were analyzed using SPSS to find the relationships with the objectives of the study.

This study successfully identified the factors which caused delays in the completion of projects implemented in 2018. Through the analysis conducted, the criteria for a timely completion of construction projects for additional school buildings using IBS method were successfully developed, which can be used for future similar projects in Malaysia.

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