Abstract

This paper aims to look at the current construction environment in Malaysia to examine and review all aspects of the information used during construction. An educational building selected as a case study in order to have through a monitor of the construction processes. This involves information and problems involves during the construction progress and sustainable practice. This study focus on the progress in the construction environment in Malaysia related to the management of information in the area of construction to provide new knowledge about the sustainability in construction progress. The paper concludes with a brief discussion and finding that can be used by future researchers, consultants, construction teams and the community.

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Peer-review under responsibility of the Association of Malaysian Environment-Behavior Researchers, AMER (ABRA malaysia).

Keywords: Architecture; Design Information; Construction and Sustainability

1. Introduction

Constructions are unique and synonym with the issue of delays and problems on site (Aibinu, 2002), particularly in terms of design and architectural design. Design initially in perfect taste would change in the slightest these changes inevitably remove from architecture in the site because it is one of the design characteristic and the beauty of design. Construction delays will occur on the site even become worst if
these changes in design unmonitored properly, Delays at the construction site involved internal and external factors. Internal factors such as dealing with local authorities, suppliers and business users will also cause many other factors such as loss costs, waste of time, materials and negative view of the customer.

Therefore, the Architect should play an important role in addressing this problem. Architect is a team leader in the building should be knowledgeable and experts in overcoming the problem. Knowledge of the nature of design and understanding characteristic of the design in the construction process is essential. In Addition, the central element is information that could help the construction process successfully. What is the action of which should be taken by an Architect to ensure that this problem can be overcome? How to reduce the risk of a delay in the construction process? By studying the design characteristic and capacity, access to essential information available at the construction site during the construction process, then we can make inferences and assumptions relating to the design changes.

1.1. Construction in Malaysia

Building construction in Malaysia started in the early day of Federation of Malaya 1948. The construction of Malay traditional house relies on the strength of complex jointing system made rigid by the use of timber wedges (Wan Hashimah, 2005). Starting with the carpenter who built the house with various forms over time and prevalence of local construction without drawing up the design and construction of more evolved and complex and required an Architect (Tajuddin, 2008).

Construction process divided into two essential parts (1) the process of design and (2) construction process. Design process begins with a discussion with the client to find out the requirements for the building needed. Visiting at the site, site survey and analysis to ensure that the design made in accordance with the context and situation of the construction site. After that, the sketches and the original ideal provided according to customer requirements and presentations. The customer satisfied with the design inspired by the architecture, the process will enter the second phase; construction process. In the construction process, more and more parties involved such as Structure Engineer, Landscape Architect, Quantities Surveyor and many more depends on the project requirement. Table 1 shows phases involved during construction progress.

Development in Malaysia is no stranger to the present. There are many new buildings built over the state from small buildings to complex buildings. This construction process becomes more complicated and unique process because many parties involved in this process. Although this growth is expanding rapidly and using various types of construction and latest technology, construction delays still occur. This delay is indeed the norm and yet so if not seriously will be worse. Sambasivan and Wen Soon (2006) said that Construction in Malaysia is one of the fast developing countries in South-East Asia, but still facing the problems of delays.

Table 1. Phases in the construction project

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Typical Task and Activities</th>
<th>Typical Means of Visual Presentation</th>
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<tbody>
<tr>
<td>A</td>
<td>Pre-design</td>
<td></td>
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<tr>
<td></td>
<td>-Depth analysis and document of needs</td>
<td>-programme report</td>
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<tr>
<td></td>
<td>-Goals</td>
<td>-problem identification</td>
</tr>
<tr>
<td></td>
<td>-Objectives</td>
<td>-diagrams</td>
</tr>
<tr>
<td></td>
<td>-Identification of space</td>
<td>-charts</td>
</tr>
<tr>
<td></td>
<td>-Issue</td>
<td></td>
</tr>
</tbody>
</table>
Source: Mahgoub, Y (2010)

2. Information in construction

Information is a very essential element in the success of a plan including during the construction phase for building. Construction information is the development, execution and supervision of plans, policies, programs and practices that control, protect, deliver and enhance the value of data and information assets. Systematic data storage management guarantees the construction process smooth and orderly. There are nine important elements in Architecture Information in construction. Construction drawing, document Tender, work programme, minute meeting, progress report, site photo, request for information (RFI), site memo, and noncompliance report.

All data must be carefully recorded to make it for future reference back, and problem solved faster. Delay information and evidence recorded and represented in different records, documents and schedules during the construction phase. List below is the important information in details needs to be cared as much as possible by An Architect and consultant during the construction period.

2.1. Construction drawings

Drawing is the main data for reference in the construction process. It is one of the most valuable elements of communication. Construction drawings are very significant for all the data, and the use of measurements indicated in the drawing.
2.2. Document tender

Tender Document covers all information related to the construction of the run. A tender document is to describe the facts. The construction team will use tender to determine the amount of price and material used in this project.

2.3. Work programme

Work programme or Critical Path Method (CPM) schedule used to monitor the construction project. Work programme shows the details of the construction process from initial work up to the end of the project implementation.

2.4. Minute meeting

The effectiveness of the discussion at each construction meeting related to complete minute meeting. Writing minutes should not be summarizing for fear of loss of data and the minutes. Minutes meeting are necessary to record the decisions made, and the facts support. Starting the information required and outlines many of the agreed actions. Action should be taken as soon as possible so that to achieve the agreed goals. Action is useful when there are things in the minutes need to ensure that the actions of a member and their performance all the tasks that need to be done.

2.5. Progress report

Progress report should be presented by each contractor during site meetings. In this report usually contains the planned rate of progress and the pace of the current work. Payment schedule to the contractor recorded in this report. Discussions related problems and report on the construction site as workers safety arrangements, equipment and number of employees working at the site.

2.6. Site photo

Site photo can also be one of the information on site to examine and records of the project construction. Site photo must be consecutive and the same view in order to make reference timelines and construction process. Typically, the pictures on the site always update every month and presented during the meeting held site.

2.7. Request for information

Request for information will usually be issued by the contractor to the consultant. There any discrepancies, conflict of drawings, contract document and installation during construction.

2.8. Site Memo

A memo issued from the consultant (Architect / Engineer) during the construction. The contractor fails to perform the duties in accordance with the construction contract document and accordance with a preset specification. The memo issued by the consultant should be answered by the contractor in a preset time.
2.9. Non-Compliance Report (NCR)

Non-compliance reports issue by the consultant if the contractor is not performing as well as the instructions task been forwarded by the memos site. If NCR issued the client reserves the right to withhold the payment of the claim by the contractor until the NCR prepared and done accordingly.

3. Previous study

Researchers have done study related to the factors causing project delay in construction project. In Nigeria, Mansfield (1988) identified 16 key factors which cause delays and costs. A survey carried out by contractors, consultants and client organizations in Nigeria. They concluded that the causes of the delays and cost overruns occur in the construction of Nigeria associated with the financial and payment arrangements, poor contract management, lack of materials, estimation, and the overall price fluctuations.

Assaf et al. (1995) in their research identified 56 causes of delay in a large building construction projects in Saudi Arabia. The relevant factors found out based on contractors side are; (1) preparation and approval of shop drawings, (2) delays in the contractor’s progress, (3) payment by owners and (4) design changes. From the view of the consultant, cash problems during construction, the relationship between subcontractors and the slow decision making process of the owner were the main causes of delay. The owner’s point of view agreed that the design problems and changes, labour shortages and inadequate labour skills were essential delay factors.

In Hong Kong, Chan and Kumaraswamy (1997) conducted a survey to evaluate the relative importance of the significant factors causing delays in construction projects. They analyzed and ranked main reasons for delays and classified them into two groups: (1) the role of the parties in the local construction industry and (2) the type of projects. Results found out that five primary causes of delays were: site management and supervision, unforeseen ground conditions, low speed of decision making involving all project teams, client initiated variations and necessary variations of works.

M. Sambasivan and Y. Soon (2007) used integrated approach and attempts to analyze the causes and effect. A questionnaire survey conducted among 150 respondents (client, consultant, and contractor). They found out that ten most important causes were contractor improper planning, contractor’s poor site management, inadequate contractor experience, inadequate client’s finance and payment for completed work, problems with subcontractor, shortage in material, labour supply, equipment availability and failure, lack of communication between parties, and mistakes during the construction stage. Six main effect of delay were; time overrun, cost overrun, disputes, arbitration, litigation and total abandonment.

Table 2. A cross-section of related observation on the major factors causing delays in construction projects

<table>
<thead>
<tr>
<th>Factor causing project delay</th>
<th>Country where survey was conduct and investigator(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>US</td>
</tr>
<tr>
<td>Inclement weather</td>
<td>*</td>
</tr>
<tr>
<td>Labour shortage</td>
<td></td>
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<tr>
<td>Poor sub-contractor</td>
<td>*</td>
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<tr>
<td>performance</td>
<td></td>
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<tr>
<td>High degree of subcontracting</td>
<td>*</td>
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<tr>
<td>Variation (design changes)</td>
<td></td>
</tr>
<tr>
<td>Unforeseen ground condition</td>
<td>*</td>
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<tr>
<td>Material shortage</td>
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</tbody>
</table>
4. Methodology

The methodologies used in this study are a case study and multi-method approach to research (Groat and Wang, 2002). There are two types of case study research introduced by Groat, (1) Literal Replication and (2) Theoretical Replication. Literal replication is testing precisely the same outcome and principle or prediction establish by initial case study, and theoretical replication is a case study that produce contrasting result but for predictable reason. Literal replication used to validate the data about information in the construction phase to selected case study to find out which zones is more critical and need to pay attention among the consultant. A variety of data collection and analysis tactic used investigating holistic (Linda 2002).

Firstly, a case study on an educational building (Project A) is selected to analyze architectural information as initial data from Architect firm. Next, the information found in the content analysis of documents from the construction period captured and validated. Additionally, on-site observation and interview among the consultant and contractors conducted to evaluate the information and site environment. The case study based on an educational building referred as Project A. The study is try to understand and validate information on the site and analyse major problems happen during the construction period.

5. Finding and discussion

Based on the methodology, the result of the analysis revealed the following finding. The finding based on the data derived from information on the construction site. Based on the research and conclusions based on the previous study, we focus on: Inclement weather, labour, contractor performance, variation (design changes), ground condition, material (delivery and types), construction planning, (8) Delay design information, poor site management, poor Communication, payment, and drawings and document. Further this analysis is to identify the most major causes happen during the construction progress.

Table 3. A cross section between the problems and construction period

<table>
<thead>
<tr>
<th>Project A</th>
<th>Construction period (month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inclement weather</td>
<td>1</td>
</tr>
<tr>
<td>Labour</td>
<td>*</td>
</tr>
<tr>
<td>Contractor performance</td>
<td>*</td>
</tr>
<tr>
<td>Variation (design changes)</td>
<td>*</td>
</tr>
<tr>
<td>Ground condition</td>
<td>*</td>
</tr>
<tr>
<td>Material (delivery and types)</td>
<td>*</td>
</tr>
<tr>
<td>Construction planning</td>
<td>*</td>
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</tbody>
</table>
Table above shows that study between the problems and construction period. It can be concluded that the problems related to design (variation and design information) are most often occur at the site. This problem requires attention by the Architect consultant to ensure the project can run smoothly. Design change is not a problem due to errors in design alone, but involves many other factors including designer, client, used and legislator, Lawson, B. (2005). Dr. Ir. Henri Achten (2008) mentions that there are two quite different paradigms of design:-

- Design as rational problem solving.
  These paradigms pose problem decomposition, design solution and integrating partial solutions to whole solutions. In addition, quantifiable methods preferred among those qualitative methods.

- Design as reflective practice.
  The designer continuously decomposes the problem, but each of the problems is difference need occurs (naming), basic setup design problems (framing), creates a partial solution (moving) and finally check the result regarding the task (evaluating).

Many architects dislike talking about their own project and designing process in terms of method because it suggests a repetitiveness that is contradictory to creativeness. Changes occur in the design not much concern by the consultant make another problem arose. This variation closely related to problems such as poor communication, delay information and can cause a delay during the construction progress.

6. Conclusion

Architectural information is very essential element during the construction project. Fail to manage information will cause to the significant issues such as delay, time extension and over the budget of the construction. This study is to provide new knowledge about the sustainability in construction progress, consultants, team members and involvement of several parties regarding the information need to be cared on site for future researchers, consultant, construction team and community. Although there are many studies and research about the construction progress on site, there is still lack of study especially focus on architectural information field.

There are nine important elements in Architecture Information in construction. Construction drawing, document Tender, work programme, minute meeting, progress report, site photo, request for information, RFI, site memo, and noncompliance report. Consequently, the contribution of this study will help the consultant mostly for architects on understanding more on information and significant problems for make early action if they know what the problems is and how to overcome it.

Secondly, the study aims to provide exposure to the writing that has to do with architecture as a medium of communication between the public and for those who involved in the construction process. It can provide insight and knowledge about construction in Malaysia and contribution to the existing literature.
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