CRITICAL SUCCESS FACTORS AND BARRIERS FOR INDUSTRIALISED BUILDING SYSTEM (IBS) ADOPTION IN CONSTRUCTION PROJECT

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ABSTRACT

Industrialised Building System (IBS) were introduced to Malaysia to solve issues associated with dependencies of foreign workers, raising demand of affordable accommodations and improving image, quality and productivity of construction industry. This research is to highlight the current development of IBS in Malaysia construction industry and potential challenges related to the implementation of IBS. This research is to study the current awareness of the usage of IBS in Malaysia. It will be analyses ways to improve the implementation of IBS in Malaysia and also to identify the success factors and barriers for IBS adoption in Malaysian building construction industry. The information and data gathered through questionnaire and processed using average index method. The study will focused on success factors and barriers of IBS in current scenario in the local construction industry and therefore the strategic plan will be produced in this study. From the finding analysis, the success factors which is adopting in Malaysian building construction industry is Flexibility is the main factor. While, for the barriers factors is the initial cost is the on main factors.

ABSTRAK

Sistem Bangunan Berindusti (IBS) diperkenalkan di Malaysia untuk mengatasi isu-isu yang berkenanan dengan masalah yang berkaitan dengan buruh asing, permintaan yang kian meningkat terhadap perumahan dan juga untuk meningkatkan imej,kualiti serta produktiviti bagi seluruh indusri pembinaan. Kajian ini adlah untuk menitikberatkan pengembangan Sistem Bangunan Berindustri dalam industri pembinaan Malaysia dan juga cabaran yang berkaitan dengan perlaksaana Sistem Bangunan Berindustri.Oleh itu, satu kajian dilakukan untuk mengetahui tahap kesedaran tentang penggunan IBS di Malaysia. Seterusya menganalisa kaedah untuk meningkatkan penggunaan IBS di Malaysia dan menentukan faktor kejayaan kritikal dan halangan dari IBS.Kajian ini tertumpu pada faktor kejayaan dan halangan terhadap perlaksanaan IBS di Malaysia. Kaedah Indeks Purata digunakan untuk menganalisis data. Oleh itu, plan strategik diperolehi untuk meningkatkan penggunaan IBS. Dengan keputusan yang diperolehi, factor kejayaan dan halangan dalam melaksanakan Sistem Bangunan Berindustri ini telah dikenalpasti dan dibincangkan. Menurut kajian ini,Fleksibiliti adalah factor utama dalam kejayaan melakasanakan sistem ini manakala faktor harga adalah halangan utama dalam perlaksanaan Sistem Banguna Berindusti (IBS) di Malaysia.

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CHAPTER 1

INTRODUCTION

1.1 Background Study

Industrialised Building System (IBS) has been introduced to cope with a growing demand of affordable housing, solving issues associated with foreign labours and improving image, quality and productivity of construction industry. The limited take up on IBS have triggered many research initiatives attempting to scrutinized the barriers and seek the way forward. For contractors, the call to use IBS is less attractive due to cost and risk issues, lack of professional trained in IBS, limited Information Technology (IT) adoption and lack of guidance (Pan et al. 2008; Pan et al, 2007 and Blismas, 2007).

The transformation process from traditional practice to IBS has left the contractors with noticeable difficulties in IBS implementation while remain to be competitive and profitable (Eichert & Kazi, 2007). The Malaysian government has spared no effort to bring IBS to the drawing tables of all professionals involved in the built environment. The IBS Roadmap 2003 -2010 has been endorsed by the Cabinet of Ministers to be the blueprint document for the industrialisation of the Malaysian construction sector.

Nevertheless, towards the last two (2) years of the roadmap period, the effort to promote the usage of IBS as an alternative to conventional and labour intensive construction method has yet to make headway (IBS Roadmap, 2003).

Therefore, this study tends to investigate the Critical Success Factors (CSFs) on the perspective of contractors involve in IBS. Then, this study validates the CSFs through a pilot interview with representatives from any of the contractors in Malaysia. To date, there has been little discussion about CSFs of contractors who transformed from traditional contractor to IBS. This study also intends to discuss the underlying barriers of IBS implementation in Malaysia which require attention from different parties. This will eventually add to the body of knowledge and provides fresh updates to previous studies and reports in this area by Hamid et al (2008), Hussein (2007), IBS Steering Committee (2006), IBS Roadmap Mid-Term Review (2007), Rahman & Omar (2006) and Thanoon et al (2003).

1.2 Problem Statement

Early survey in 2003 reported in IBS Roadmap 2003-2010 (2003) and IBS Survey (2003) indicated that only 15% of overall construction projects in Malaysia used IBS. However, recent study in 2006 published in IBS Roadmap Review shows that the percentages of completed projects using more than 70 % of IBS components in the construction project are in the range of 10%. Additionally, less than one – third of total construction projects using at least one IBS product in the year (IBS Roadmap Review, 2007). This percentage is lower than expected despite huge publicity campaign from the government.

The actual projection for percentage of completed projects using IBS is in the range of 50 % in 2006 and 70% in year 2008 (IBS Roadmap, 2003). Despite well-documented benefits, the take-up so far, while reasonable, is not as high as the government anticipated at this stage. Relatively, the low labour cost in Malaysia is the root cause of the problem (IBS Roadmap Review, 2007). Although the members of the industry are open to the idea, a major portion of the industry stakeholders are indifferent, perhaps due to resistance towards change and insufficient information to support feasibility of change (Hamid et al, 2008). Thus, the problem of limited IBS take-up in Malaysia has triggered this study to identify the success factors and barriers, seek ways forward. Therefore, by using IBS, it is hoped to minimize the problems faced in the conventional construction methods.

1.3 Objectives

The aim of this study is to improve the application of IBS in Malaysia construction Industry. Therefore, in order to achieve the above aim, the following objectives have been identified:

i. To identify the success factors and barriers for IBS adoption in Malaysian building construction industry
ii. To rank the implementation success factors and barriers of IBS adoption
iii. To suggest the strategic implementation plan of IBS in Malaysia.

1.4 Scope of Study

The scope of this study is according to, the contractor's perspective and aim to identify CSFs for contractors to embrace in IBS. The contractor or building contractor deals with project management activities and therefore they are responsible for installation of components (assembler) at site and the term contractor is used throughout this paper to represent building contractor or installer as a matter of simplification. This study also focusing in Conventional Method and Industrialised Building System (IBS) in Malaysia and limited to only housing projects or residential buildings in JOHOR BAHRU. The study is limited to clients or developers, consultants, contractors and suppliers from the government agencies, private construction companies, and local contractors in Malaysia construction industry.

1.5 Methodology of Study

Figure 1.0 shows the flowchart of methodology that has been used in the study.

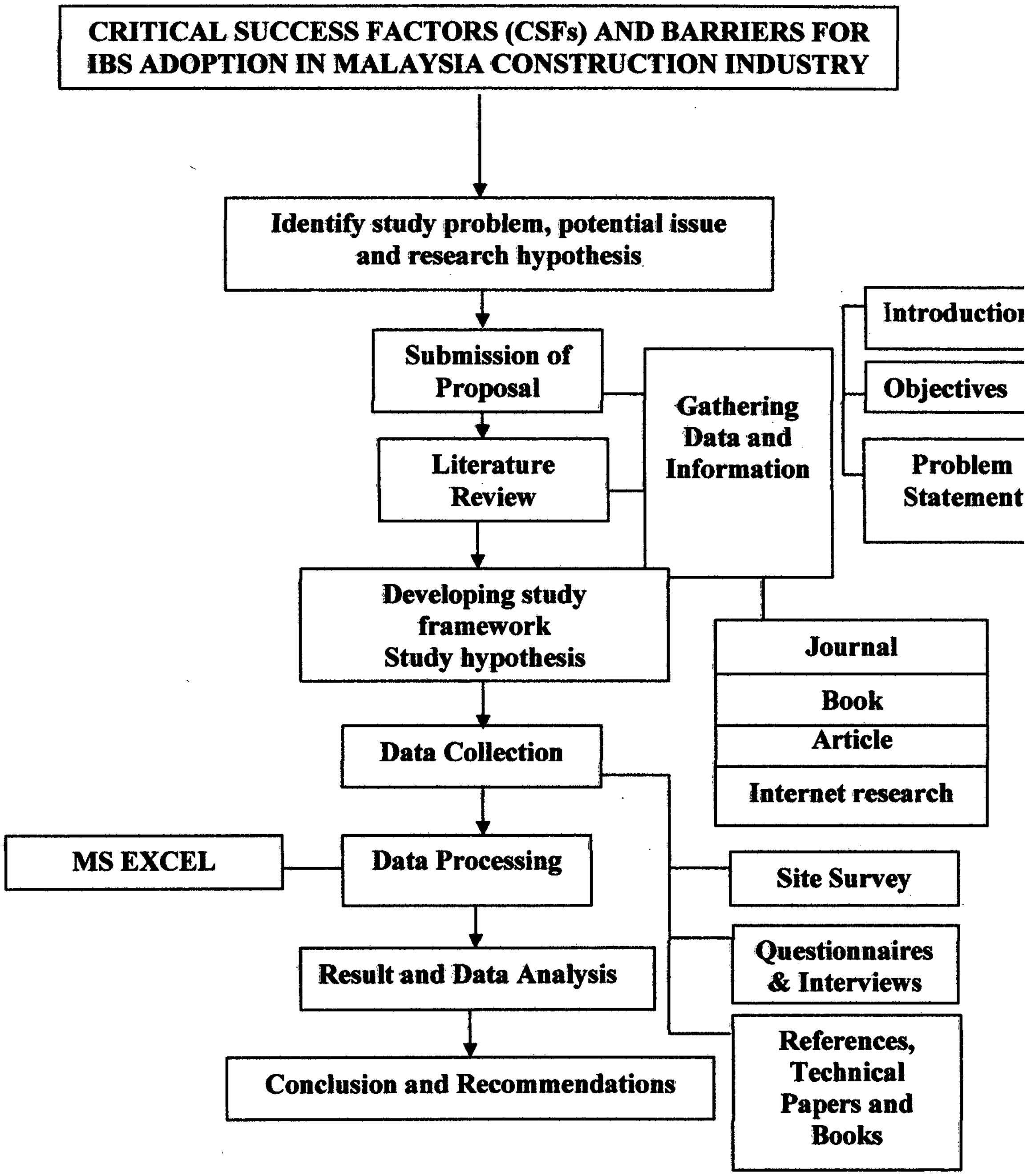

Figure 1.0: Flowchart of Methodology

1.6 Significance of Study

The purpose of this study is to improve knowledge on the application of IBS in the construction industry. The application of the IBS in the construction will eventually speed up the process of Malaysia to achieve Vision 2020 to become part of the developed nation. Nonetheless, the IBS management that can be looked into to conduct a research for further studies and further improvement can be made. The following recommendation can be considered and used as reference for future study purposes.

Significance or importance of study towards of industry is, it can Increase the level of awareness of IBS adoption which is based on the IBS implementation plan by introducing policy and guidelines for effective implementation. From this study also we can identify the financial aspect as in the loan and the payback system that can be implemented in the current banking system.

Besides that, the adoption IBS can Reduce the implementation of the conventional method and this can be done on the by improving the strategy of implementing IBS as the globalization will change the environment of the construction in Malaysia and to Increase the productivity and the quality of construction industry by using IBS.IBS also can give promote this advance technology for construction industry in Malaysia.

While, the significance of this topic to the current study is it can Provide more knowledge about IBS in Malaysia Construction Industry and also can provide the more information technology in Construction Industry, can Able to identify the IBS as a potential method to improve overall construction performance. Thus, we can derive a benchmark criteria gaps between IBS and another system. From this study we can try to understand and familiarize with the concept of IBS.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The industrialization has demonstrated a high capacity to reduce the costs, improve the quality and get complex products available to the vast majority of people. It is the case for most products offered on the market today, including construction materials and components (such as the roof trusses, prestressed concrete slabs, windows, curtain walls, and others.). But so far, industrialization is not really applied to the building as a whole. The industrialized process are involves a building program schedule by the builders with their consultants which requires architectural and technical performance, accomplish the end-user or client needs and cost level generally low as possible but without sacrificing on quality. It is inter-disciplinary field of activity involve. Moreover coordination of the process is very crucial in industrial building system since its development involves system design which is a complex process of studying the need of the end-user or client, market analysis, development of standardized components, establishment of manufacturing and assembly layout and process, allocation of resources and materials.

2.2 Definition of Industrialised Building System (IBS)

The Industrialised Building System (IBS) can be defined in which all building such as wall, slab, beam; column and staircase are mass produced either in factory or at site factory under strict quality control and minimal wet site activities. Industrialisation process is an investment in equipment, facilities and technology with the objective of maximizing production output, minimizing labour resource and improving quality while a building system is defined as a set ten (10) of interconnected element that joint together to enable the designated performance of a building (Warswaski, 1999).

In another definition, Esa and Nuruddin (1998) claimed that IBS is a continuum beginning from utilizing craftsman for every aspect of construction to a system that make use of manufacturing production in order to minimize resource wastage and enhance value for end users. Another definition of IBS in the construction industry includes the industrialized process by which components of building are conceived, planning, fabricated, transported and erected on site (Thanoon (2), 2003).

Meanwhile, elaboration of IBS was clarified by Junid (1986) whereby the IBS in construction industry includes the industrialised process which the components are conceived, planned, fabricated, transported and erected on site. The system balance combination between the software and hardware components. The software elements include system design which study the requirements of end user, market analysis, development of standardize components, establishment of manufacturing and assembly layout and process, allocation of resources and materials and definition of a building designer framework. The software elements provide a prerequisite to create the conducive environment for industrialised building system (IBS) to expand.

2.3 Types of IBS

IBS system can be classified according to the structural systematic aspects. Abraham Warszawski (1999) classifying IBS into three (3) categories as linear system or frames (beams and column in Figure 2.1), the Panel System (Figure 2.2) and the Rectangular or Boxes system or three dimensional system (Figure 2.3).

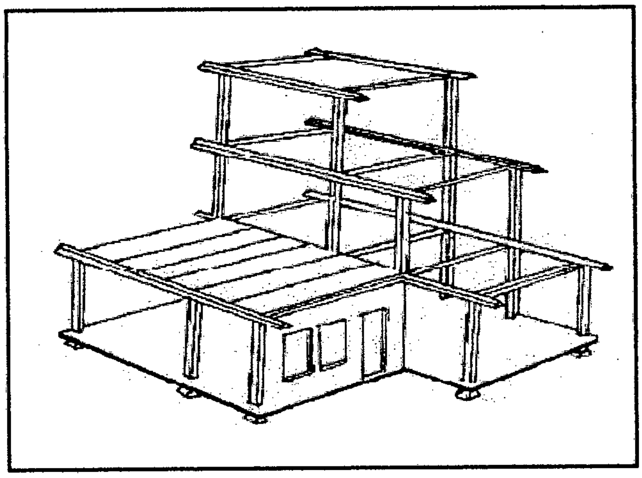

Figure 2.1: Frame System (Junid, 1986)

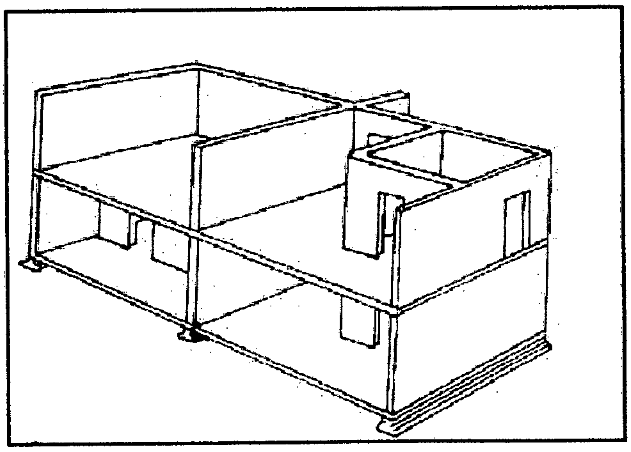

Figure 2.2: Panel System (Junid, 1986)

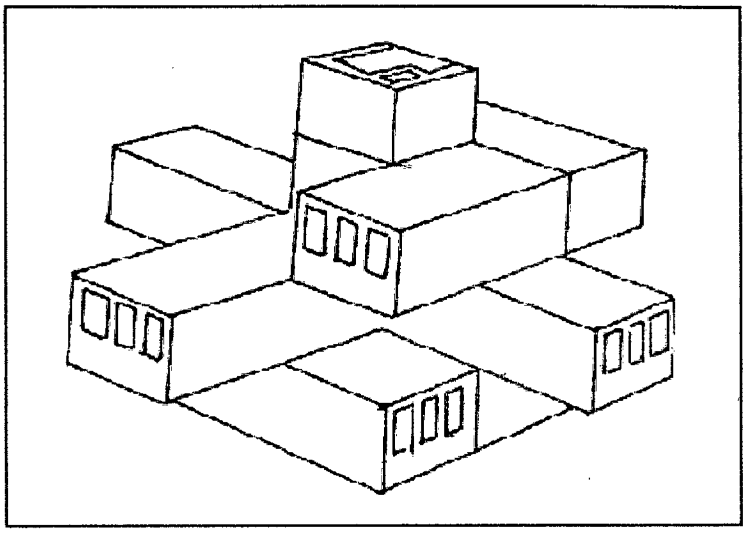

Figure 2.3: Box System (Junid, 1986)

2.4 The Features of IBS

The main features of an Industrialised Building System (IBS) are thus (Warszawski, 1999) as many of the building elements are prefabricated offsite, at a central facility, where specialized equipment and organization can be established for this purpose. The various building works are incorporated into large prefabricated assemblies with minimum erection, jointing and finishing work onsite. The materials and component handling at site is extensively mechanized; in concrete work, large standard steel forms, ready-mixed concrete, and concrete pumps are used. The design, production, and erection onsite are strongly interrelated. They must be viewed therefore as parts of an integrated process which has to be planned and coordinated accordingly.

2.5 Classification of Building System

There are four (4) types of building system in Malaysia according to Badir-Razali building system classification. (Badir et al. 1998). The building systems are namely conventional column-beam-slab frame system with timber and plywood as formwork, cast in-situ system with steel or aluminums as formwork, prefabricated system and the composite building system as shown in Figure 2.4. Each building system is represented by its construction technology, functional and geometrical configuration.

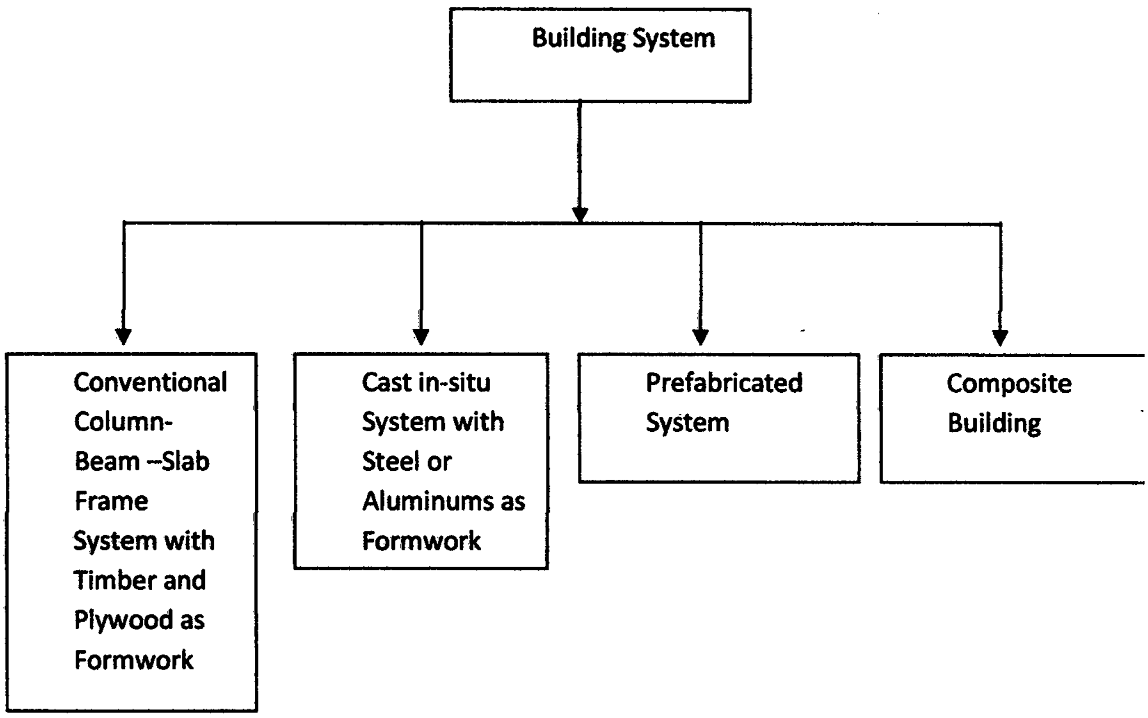

Figure 2.4: Types of Building System in Malaysia (Majzub, 1977)

However Majzub (1977) has another different concept in classifying the building system. He explained that the relative weight of the components should be used as a basis for building classification which consists of frame system, panel system and box system as presented in Table 2.1. The factor weight has significant impact on the transportability of the components and also influence on the production method of the components and the erection method on site. This classification method is not suitable in Malaysia as it is found inadequate to incorporate other building systems which flourish recently.

Table 2.1: Building system classification according to relative weight of component (Majzub, 1977).

No	General System	System	Production Material
1	Frame System	Light weight frame	Wood, light gage metals
		Medium light weight frame	Metal, reinforced plastics laminated wood
		Heavy weight frame	Heavy steel, concrete
2	Panel system	Light and medium weight panel	Wood frame, metal frame and composite material
		Heavy weight panel (factory produced)	Concrete
		Heavy weight panel (tilt up-produced on site)	Concrete
3	Box system (modules)	Medium weight box (mobile)	Wood frame, light gage metal, composite
		Medium weight box (sectional)	Wood frame, light gage metal, composite
		Heavy weight box (factory produced)	Concrete
		Heavy box (tunnel produced on site)	Concrete

2.5.1 The Frame System

Frame structures may be defined as those structures that carry the loads through their beams and girders to column and to the ground. Junid (1986) also stated that, in such a system, the skeletal structures will help to reduce the number and sizes of load carrying members. Their important feature is the capacity to transfer heavy loads over large spans. For this reason, they are used in the construction of bridges, parking lots, warehouses, industrial buildings, sport facilities and so on. Figure 2.5 shows the examples of frame systems for industrialised buildings.

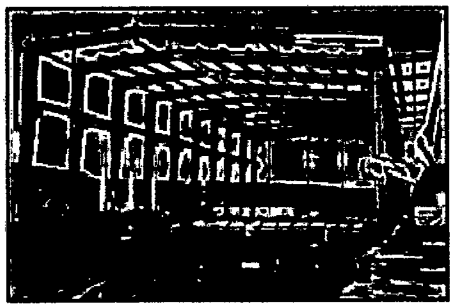

Figure 2.5 (a): Frame systems for industrialised buildings

Warszawski (1999) mentioned that different variants of the structural scheme allow for the most convenient partitioning of the frame into connected precast elements. For example, in a typical frame system, a rectangular frame shall consist of two (2) columns and a horizontal beam (Figure 2.6), connected so as to attain stability in the frame plane. For this purpose, the columns may be fixed at the bottom, and the beam is freely supported, which will make it easier for assembling purposes (the connection at the top does not have to transfer moments and is therefore simpler).

The frame structures on its own, forms only the skeleton of the building and do not enclose the space. Therefore, infill elements such as prefabricated panels or building the infill elements on site or both need to be put up to complete the system.

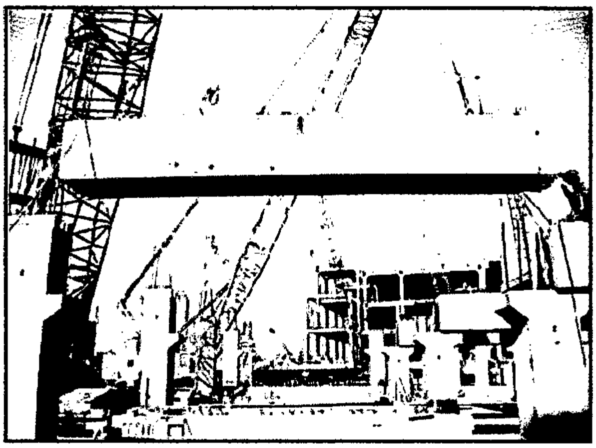

Figure 2.6: A typical rectangular frame that consists of two (2) precast concrete columns and a precast horizontal beam

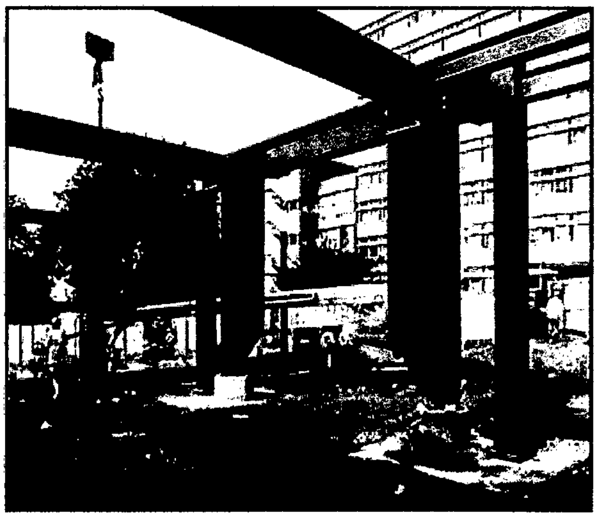

Figure 2.7: Another typical rectangular frame, which consists of two (2) columns and a horizontal beam, prefabricated using steel sections