

Industrialised Building Systems (IBS): Current Shortcomings and the Vital Roles of R&D

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1.0 INTRODUCTION

One of the challenges facing our construction industry is the acute shortage of construction workers. This, together with the social problems associated with foreign workers, further aggravates the situation [7]. As such, the Industrialised Building System (IBS) is introduced to reduce our dependency on foreign workers. Nevertheless, early effort by the government of Malaysia to promote usage of IBS as an alternative to conventional and labor intensive construction method has yet to make headway. Although members of the industry are open to the idea, a major portion of the industry stakeholders are indifferent, perhaps due to resistance towards change, insufficient information and lack of technology transfer method to support feasibility of change to IBS. In this case, it has proven that it is difficult to introduce new technologies and method in the construction sector when compared to other sectors. According to Hervas (2007), construction sector is known as traditional sector that can be characterised as reluctant and even resistant to change. This paper discusses the current implementation of IBS in Malaysia, its shortcomings and the way forward.

2.0 IBS DEFINITIONS

To date there has been no one commonly-accepted or agreed definition of IBS. However, the authors have gathered few definitions by researchers who studied into this area previously, that is reflected to IBS concept accepted by the Malaysian construction. IBS is defined as a construction system which components are manufactured in a factory, on or off site, positioned and assembled into structure with minimal additional site work [1]. Dietz (1971) earlier defined IBS as total integration of all subsystem and components into overall process fully utilising industrialised production,

transportation and assembly techniques. Parid (1997) defined IBS as a system which use industrialised production technique either in the production of component or assembly of the building or both. Lessing et al (2005) defined IBS as an integrated manufacturing and construction process with well planned organisation for efficient management, preparation and control over resources used, activities and results supported by the used of highly developed components. Trikha (1999) defined as a system in which concrete components prefabricated at site or in factory are assembly to form the structure with minimum in situ construction. IBS also defined as a set of interrelated element that act together to enable the designated performance of the building [17]. Esa and Nurudin (1998) asserted that IBS is a continuum beginning from utilising craftsmen for every aspect of construction to a system that make use of manufacturing production in order to minimize resource wastage and enhance value end users. Junid (1986), identify IBS as process by which components of building are conceived, planned and fabricated, transported and erected at site. The system includes balance combination between software and hardware component. The software element include system design, which is complex process of studying the requirement of the end user, market analysis and the development of standardise component.

3.0 HISTORY OF IBS IN MALAYSIA

IBS began in early 1960's when Ministry of Housing and Local Government of Malaysia visited several European countries and evaluate their housing development program [15]. After their successful visit in the year 1964, the government had launched pilot project on IBS to speed up the delivery time and

built affordable and quality houses. Nearly, 22.7 acres of land along Jalan Pekeliling was dedicated to the project comprising 7 blocks of 17 stories flat (3000 unit of low-cost flat and 40 shop lot. This project is taken by Gammon/Larsen Nielsen using Danish System of large panel of pre-fabricated system. In 1965, the government of Malaysia launched second project, a 6 block of 17 story flats and 3 blocks of 18 stories flat at Jalan Rifle Range. The project was awarded to Hochtief/Chee Seng using French Estoit System (Din, 1984). Between 1981 and 1993, PKNS a state government development agency acquired pre-cast concrete technology from Praton Haus International based on Germany to build low cost house and high cost bungalow in Selangor [2]. In Malaysia construction industry today, the use of IBS as a method of construction is evolving. More local manufacture is established themselves in the market. As a result pre-cast, steel frame and other IBS were used as hybrid construction to build national landmark such as Bukit Jalil Sport Complex, LRT and Petronas Twin Tower. It was reported that at least 21 of various manufactures and suppliers of IBS are actively promoting their system in Malaysia [15]. IBS move to next step of the development through the establishment of IBS Centre initiated by CIDB at Jalan Chan Sow Lin, Cheras, Kuala Lumpur. The obligation to implement IBS strategies and activities from this centre serves concurrent both to improve performance and quality in construction, also to minimize the dependency of unskilled foreign labours flooding the construction market.

4.0 SHORTCOMING OF IBS

CIDB has published IBS Roadmap 2003-2010 which entailed the needs and requirement of Malaysian construction industry. This roadmap was endorsed

by cabinet on 29 October 2003. The roadmap is a comprehensive document that divided the IBS programme into the five main focus areas that reflect the inputs needed to drive the programme, each beginning with M. They are Manpower, Materials, Management, Monetary, and Marketing [7]. The inputs are then divided into its elements and the activities to be implemented for each element were then identified and included into the time span of the roadmap in order to achieve the mission within the stipulated time-frame. The content of this roadmap is focused towards achieving the industrialisation of the construction sector and the longer term objective of Open Building Systems concept. It has been five years since the launching of the roadmap and after more than half-way through the mission of industrialising construction [10]. It is pertinent to examine the progress and how close to the completion of the mission to date. More importantly, it is imperative to evaluate whether the implementation of the roadmap has met the market response to the IBS programme so far. Most policy issues have been resolved and implemented, while all relevant documents required to support the programme have been developed. In particular activities under the charge of CIDB are all meeting their datelines. Notwithstanding these achievements a number of implementation snags were identified as being potential hurdles to the implementation of the roadmap. These include the following which have been identified by IBS Steering Committee 2003-2005 [10]:

- Development of standard plans and standard component drawings for common use,
- Apprentice and on-the-job training in the area of IBS moulds and casts, and assembly of components,
- IBS testing and evaluation programme,
- Vendor development program,
- Readiness of designers and consultant practices, quality control, production of standard components in the field of IBS.

Realising the implementation of IBS is still to make headway, CIDB through its research arm, Construction Research

Institute of Malaysia (CREAM) has taken the initiative from the problem identified earlier and has continue to conduct three workshops session with the industry between 2006 and 2007. After a lengthy deliberation with the stakeholders, it was concluded that the factors contributing to the delays of IBS implementation are as follows [3]:

- IBS is not popular choice among the design consultants
- Lack of knowledge among the designers
- The needs of mindset change and providing proper education
- Costing – chicken and egg problem
- Private sector adoption
- Proprietary systems make it hard to be adopted by designers
- Poor quality products
- Joints are not standardised making it hard to design as the design will have to be fixed to a particular manufacturer
- Insufficient push factor
- Lack of technical know-how e.g. structure
- Volume and economy of scale
- The monopoly of big boys, limiting opportunities to Bumiputra contractors. Required appropriate training for Bumiputra contractors
- Low offsite manufacturing of construction components to guarantee quality, mechanization and standardization
- To consider IBS design that promote energy conservation
- Sustainability of construction industry, government to lead during downturn
- Require onsite specialised skills for assembly and erection of components
- Lack of special equipments and machinery which hampered work. Require more local R&D, support Services, technologies and testing labs
- Insufficient capacity building for contractors to secure project in construction (G1-G7)
- Below 10% IBS construction involvement from Bumiputra contractors
- Mismatch between readiness of industries with IBS targets by CIDB
- The cost depends on volume and types of the projects
- Earthquake resistant design pertaining to IBS components (e.g jointing system, seismic performance and design guidelines)

- Earthquake protection of IBS buildings (base isolation and rubber damping systems)
- No standard joint developed for building component

5.0 THE WAY FORWARD

The establishment of CREAM should be seen as very significant development in the structure of R&D, which was previously at very formative stages rather organisationally ad-hoc and often confusing. CREAM can be assigned a task of managing the IBS research.

The R&D themes and topics for IBS identified through series of workshops organised by CREAM are aligned to the requirement of IBS Roadmap 2003-2010 [1]. The initiatives in IBS though lead by CIDB, participative from contractors, consultants, universities, companies and research institutes are critical. The obligation to implement IBS serves concurrent both to improve performance and quality in construction, also to minimise the dependency of unskilled foreign labours flooding the construction market. It is a daunting task as 2010 is just around the corner. The process and mechanism to achieve the target depend on the integration and acceptance of the players towards IBS. Three years ahead will be a challenging one. A strategic approach will be the way forward. As the R&D arm for CIDB, CREAM's R&D output will geared towards industry's application and requirements.

CREAM shall take the following actions as a pre requisite to expedite the success of the roadmap implementation with respect to R&D in IBS [8]:

- A long term and strategic approach of conducting research on IBS shall be established,
- Involvement of universities, companies, organisations and research institutes right from the onset of any IBS R&D projects,
- Participation and inclusion of IBS in JKR building design, i.e. JKR IBS Design must be incorporated in its Rekabentuk Bangunan Piawai for government quarters, schools and government administrative offices. (CREAM should discuss this matter further with JKR on any issues related to R&D).

- Malaysian standard joints for IBS (wet or dry) must be designed and made available for use by the industry,
- CREAM initiatives to lead Centre of Research Excellence (CORE) on IBS and act as One Stop Centre for R&D are critical as this moves will consolidate the effort to centralise and able to identify issues and problems first hand from the industry,
- The formation of R&D laboratory and acts as CORE for IBS is urgent and CREAM should initiate and take the lead,
- CREAM is to apply for a double deduction status foundation to expedite participation from private entities as they will also in return be benefited in getting tax rebates when contributing research fund to the industry,
- Open Building System must be competitive in terms of cost, performance and quality as compared to Proprietary system and conventional methods in order to be sustainable in the construction market,
- Not reinventing the wheel on R&D but to focus on IBS applied research,
- Soft issues related to IBS such as marketing, social impact, involvement of Bumiputera contractors in vendor development program as highlighted in the roadmap should be taken on board right at the early stage,
- A complete comprehensive study on IBS solutions encompassing the entire value chain will ensure its success. These shall include verification, validation and certification of process on IBS components, fabricator, factory, erector and related skills of specialisation,
- A technology transfer model via knowledge management adapted from EU, Japan and Singapore best practices in implementing IBS will add value and expedite the implementation process.

A combination of integrated approach and long term strategic partnering among stakeholders tackling specific agenda on IBS 5M strategies are the way forward. A well coordinated planned R&D themes and titles discussed in previous section have to be implemented simultaneously with all

players mentioned earlier in synergic and strategic way. ■

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