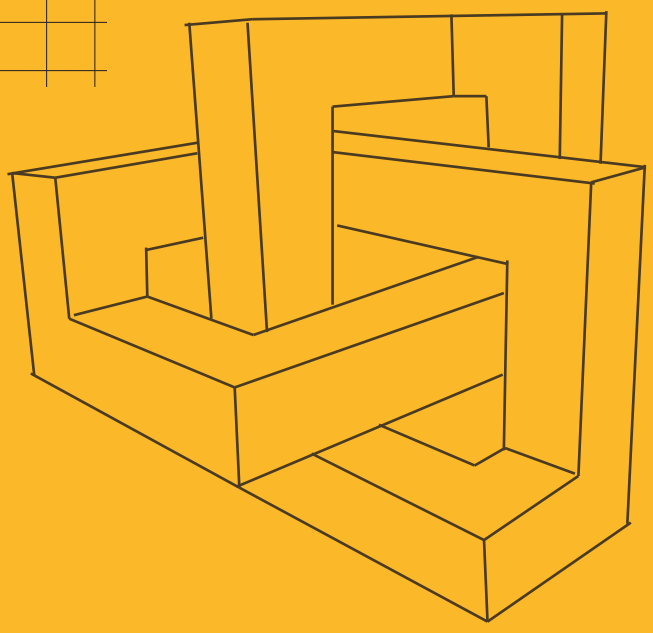
AN INTRODUCTION OF INDUSTRIALISED BUILDING SYSTEM

MANUAL

FOR DEVELOPER



CIDB MALAYSIA

MPC

REHDA

CREAM
Construction Research Institute of Malaysia

EXECUTIVE SUMMARY

The Construction Industry Development Board (CIDB) together with Malaysia Productivity Corporation (MPC) are developing an introductory manual for starting a business in the Industrialised Building System (IBS) specifically for developers, considering that no similar standard is currently available in Malaysia. The manual will be used as a basic understanding for new entry developers in embarking their business in IBS.

This "IBS Manual for Developers" provides an overview of the nature of the business of developers. It outlines the barriers and difficulties of starting up a business in the IBS industry and proposes recommendations to overcome them. It explains such issues as starting a business venture, marketing, and development.

The beginning developer will find this manual a useful guide as it summarizes business models that can be used in their ventures.

This manual consists of six (6) sections. Section One presents a general introduction to IBS and the Malaysian construction industry as a whole. Section Two focuses on the barriers and difficulties a developer faces in the IBS industry. Section Three describes the process flow for housing construction by developer. Section Four explains the productivity comparison between conventional and IBS construction. Section Five suggests a business models and frameworks that can be used in starting up a business in the IBS industry. Section Six concludes with certain key points that a developer should consider before venturing in IBS businesses.

The data collected in this manual was generated from the "Workshop on IBS Manual for Developers" conducted on 13th November 2013 at the Vivatel Hotel in Kuala Lumpur. The workshop involved 16 developers who shared their knowledge on and experience in the IBS industry.

The authors hope that the use of the IBS Manual for Developers will provide a generic framework in starting a business in the IBS industry, encourage the involvement of additional construction players in the IBS industry, and thereby contribute to the growth of the construction industry. Further development of the manual will be done soon to ensure the detail of the manual will be addressed.

ABBREVIATIONS AND DEFINITIONS

AIS	Assessment of IBS Status
BIM	Building Information Modelling
CCC	Certificate of Completion and Compliance
CIDB	Construction Industry Development Board
CIMP 2006-2015	Construction Industry Master Plan 2006-2015
C&S	Civil and Structural
DBKL	Kuala Lumpur City Hall
IBS	Industrialised Building System
ICU	Implementation Coordination Unit, Prime Minister's Department
M&E	Mechanical and Electrical
MC	Modular Coordination
OSC	One Stop Centre
ROI	Return of Investment
SME	Small Medium Entreprise

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1.0 GENERAL

1.1 Introduction

Industrialised Building System (IBS) is a highly competitive industry, such as construction, where profit hovers from 5 % to 10 % and risks are extremely high, unfamiliar techniques, such as the Industrialized Building System (IBS), can easily spoil the 5% to 10% profit. To sustain the market demand of IBS and to prevent housing developers, contractors, and manufacturers from incurring unprecedented losses, an effective strategy must be formulated. This strategy must consider the government's current policies and certain aspects of the sustainability of IBS. It must focus on the need of achieving economies of scale in the IBS industry and seek ways to overcome the unaccommodating perception and lukewarm response to IBS. The objective is to make IBS the preferred mode of design and construction so that both clients and stakeholders instinctively choose the standardization of components from the onset of any construction project.

1.2 IBS Definition

The Construction Industry Development Board (CIDB) of Malaysia has published its definition and classification of IBS, which now comprises the common reference point of researchers and practitioners in the country (CIDB, 2003; CIDB, 2007; Hamid et al., 2008; Kamar et al., 2009; CIDB, 2007).

The term IBS was defined by Abdullah and Egbu (2009) as a method of construction developed due to human investment in innovation and on rethinking the best ways of construction work deliveries based on the level of industrialisation.

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 use of highly developed components.

Therefore, CIDB has defined IBS is a construction technique in which components are manufactured in a controlled environment (on or off site), transported, positioned, and assembled into a structure with minimal additional site work.

1.3 Objective of the Manual

The objective of this introductory manual is to provide a basic guide for the developers to start a business in IBS. This manual will feature an overview of the nature of IBS business for developers. The challenges of starting up a business in the IBS industry and proposed recommendations are also explained in this manual.

1.4 IBS and Component Classification

Six main classifications of IBS components, as follows, have been adopted from IBS Roadmap 2003-2010 and IBS Roadmap 2011-2015:

Table 1: IBS and Component Classification

System	Component
Pre-cast Concrete System	Column
	Beam
	Wall
	Slab
Formwork System	Column
	Beam
	Wall
	Slab
Steel Framing System	Column
	Beam
	Roof truss
Prefabricated Timber Framing System	Column
	Beam
	Roof truss
Block Work System	Column
	Beam
	Wall
Innovative System	Wall

1.5 Productivity Performance of Construction Sector

In 2012, the construction sector contributed RM 25.33 billion to Malaysia's GDP and employing 1.16 million workers. During the same period, the construction sector recorded productivity level of RM 21,765.00.

In comparison, the productivity level of construction is much lower to the level recorded by manufacturing at RM 83,876,00 services at RM 60,672.00 and agriculture at RM 34,182.00.

1.6 Productivity Tools

To drive efficiency and contribute to higher productivity, players in construction sector most focus on operational excellence. Operational excellence which is a strategy to nurture work culture emphasizes on excellence, performance, waste reductions, standards and systematic work processes.

In achieving these objectives, the following productivity tools can be utilized:

i. 5S Practices

5S Practices is a tool that encourage a clean, safe, and conducive working environment. It is derived from the Japanese words: *Seiri*, *Seiton, Seiso, Shiketsu* and *Shetsuke.* In English, these words are translated to Sort, Set-in-Order, Shine, Standardise and Sustain. Studies have indicated the application of 5S Practices in organizations have promoted a clean and systematic workplace that contributed to higher productivity.

ii. Lean Management

Lean management refers to the principles and methods that focus on the identification and elimination of non-value added activities (waste) to the customers. The objectives of this initiative are to map the existing work flow, identify non-value added activities to customers and eliminate those activities. The final outcome is an efficient organization with drastic reduction in wastages and improved service delivery to customers. For sustainable lean culture, the implementation of 5S is necessary as it provides a strong foundation prior to the lean implementation.

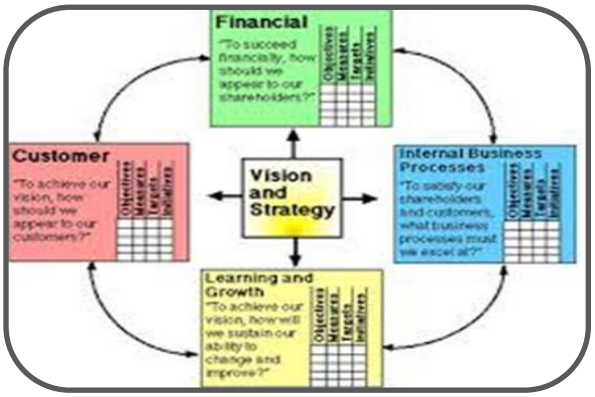
iii. Small Group Activities (SGA)

Small Group Activities (SGA) is a teamwork-based problem solving approach. The purpose is to harness workforce capabilities, bringing the best from their experiences and creativity to identify root causes of problem affecting the work process and identify solutions. Eventually it is expected better work process with continuous kaizen activities that contribute to higher productivity.

The SGA can be implemented using various forms such as Innovative and Creative Circle (ICC), KAIZEN Team, Work Improvement Team (WIT), Process Improvement Team (PIT).

iv. Balanced Scorecard (BSC)

The Balanced Scorecard (BSC) is a strategic planning and management tool to align business activities to the vision and strategy of the organisation, improve internal and external communications, and monitor organisation performance against strategic goals. The four perspectives viewed are: Learning and Growth, Business Process, Customer and Financial Perspectives.



BSC is applied to monitor organisational performance against the set business purpose and undertake organisational action plan to meet the objective.

1.7 IBS and the Malaysian Construction Industry

Since 2003, the Malaysian government, together with its agency, the CIDB, has aggressively urged the construction industry to use the IBS method of construction. Such lobbying is part of an integrated effort to further enhance the capacity, capability, efficiency, and competitiveness of the industry and to reduce the industry's reliance on foreign workers. It is also an effort to promote a cleaner, safer, simpler, and more efficient method of construction.

In line with the objectives of the IBS Roadmap 2003-2010, Budget 2005 declared that all new government building projects are required to comprise of at least 50 % IBS content. To attract private clients, the second announcement levied exemption on housing projects with a minimum IBS Score of 50 %. Since then, boosted by the Construction Industry Master Plan 2006-2015 and the 9th Malaysia Plan 2006-2010, numerous activities have been spearheaded by the government.

Two of the major initiatives are the release of the Treasury Circular Letter No. 7, Year 2008 (Surat Pekeliling Perbendaharaan Bil. 7, Tahun 2008) and the announcement of the Action Plan for IBS Implementation in Government Projects (Pelan Tindakan Pelaksanaan IBS dalam Projek-Projek Kerajaan).

These initiatives have replaced the earlier instruction released by the Treasury on July 6, 2005 for the usage of 50% IBS content in all government projects. Released on October 31, 2008, the Treasury Circular Letter was issued to all Secretary Generals, Heads of Federal Department, State Secretaries, Heads of Federal Statutory Bodies, and all local authorities. The essence of the instruction is the usage of Open Building, Modular Coordination (MC) design and 70 % IBS Score for all projects. Agencies are required to submit periodical reports of IBS project implementation to the Implementation Coordination Unit, which acts as the central monitoring agency. Exemptions are offered for certain classes of projects and the IBS Centre functions as the main technical reference centre.

With the encouragement of the government, the use of IBS in Malaysia has increased, resulting in numerous housing projects in the past years. During the five years of the 9th Malaysian Plan, the country has built one million dwellings, often to the amazement of visiting building professionals. The use of IBS has transformed the Malaysian housing industry into one that mass-produces more houses on a per capita basis than any other country in the world. Recently, the Government of Malaysia has encouraged the use of IBS, especially in new government office building projects, by mandating the use of IBS components up to 70 % in 2008 and finally up to full industrialization by 2010.

The government should require developers of projects worth RM 100 million and above to use the IBS, suggested the CIDB.

Over the long term, the adoption of IBS will benefit the construction industry through faster delivery time, improved productivity, and reduction of unskilled workers. Under the IBS roadmap for the period 2003 to 2010, the CIDB had undertaken a considerable amount of research and development activities.

Housing developers are urged to adopt IBS in their construction methods to achieve quality construction, thus helping reduce problems in housing development.

The use of machines to accomplish tasks previously done manually will cut the cost of wages and building materials, which in turn will influence the prices of houses and properties. At first, these changes may be costly to the developers because they must purchase the machines, but over time, the machines can save costs in terms of wages and building materials.

1.8 IBS Roadmap Reviews

To promote and encourage the adoption of prefabricated construction or IBS, the Malaysian Government, via the CIDB (together with construction industry captains) formulated a master plan for IBS known as the IBS Roadmap 2003-2010 and is currently on its second IBS Roadmap 2011-2015. The IBS Roadmap 2011-2015 can be accessed and downloadable at www.ibscentre.com.my. Please refer to **Appendix 1**.

Two of the main objectives of IBS Roadmap 2011-2015 are as follows:

i. To sustain the existing momentum of 70 % IBS content in public sector building projects until 2015

Status: In November 2008, the Treasury Malaysia issued a Treasury Circular Letter, now referred to as the SPP 7/2008, instructing all Malaysian government agencies to increase the IBS contents of their building development projects (RM 10 million and above) to a level not less than 70 points of the IBS score. In this sense, IBS must be incorporated as part of the contract document for

tender. The decision aimed to create sufficient momentum for demand for IBS components and to create a spill-out effect throughout the country. The Ministry of Education is the largest IBS construction project buyer, with its rapid construction of secondary and primary schools, amounting to a total of RM 2.4 billion. However, only 10 % of the 4000 completed government projects since 2008 used IBS as their construction method as a result of the lack of government monitoring and the incapability of contractors and sub-contractors in delivering IBS projects. Smaller contractors tend to view IBS as threat rather than an opportunity. The failure of the government to create an open system (and encourage the participation of small and medium components producers) has created a monopoly of manufactures, thus increasing the price of components and tender pricing.

ii. To increase the existing IBS content to 50 % in private sector building projects by 2015

Status: Residential projects, such as flats, condominiums, and terrace houses, have high IBS potential because of their repetitive nature. The private sector built residential projects worth RM 13.7 billion, compared with projects worth only RM 1.8 billion by the public sector. If more of the private sector is convinced to adopt IBS, the results will be manifold.

Based on a recent study by the CIDB, the current uptake of IBS in private sector projects in Klang Valley is at 45%. This encouraging uptake is because Kuala Lumpur City Hall has mandated the use of IBS for building projects constructed in the city. Iskandar Malaysia is another local authority currently implementing a similar mandate that has achieved a positive outcome.

The report discovered that high-rise development and factory-like buildings tend to have a higher adoption rate of IBS compared with landed properties and small commercial units. Moreover, the adoption of IBS in Malaysia is client driven rather than driven by customer demand.

On a positive note, additional private developers have emerged as leaders of IBS, including Sime Darby Property Sdn Bhd, Sri Pajam Sdn Bhd, and Zikay Group. Companies such as Eastern Pre-Tech and Kim Lun Sdn Bhd have also successfully penetrated Singapore's precast market.

By contrast, small private companies remain reluctant to invest in IBS, because of the cost and instability of the market. Another major factor that must be considered as a barrier is the resistance of established architects to use IBS, who are harder to convince than smaller and less established architects.

To date, 160 IBS manufactures are registered under the Assessment of IBS Status (AIS) for company certification or accreditation of components, companies, and installers. The majority of manufacturers are single plant operators concentrated in selected states only. They propagate their own proprietary system, do not operate in full capacity, and have difficulty meeting the demands of contractors. The majority of locally developed products are based on traditional material, such as reinforced concrete, and most innovative materials used are based on imported technology.

1.9 History of IBS Implementation in Malaysia

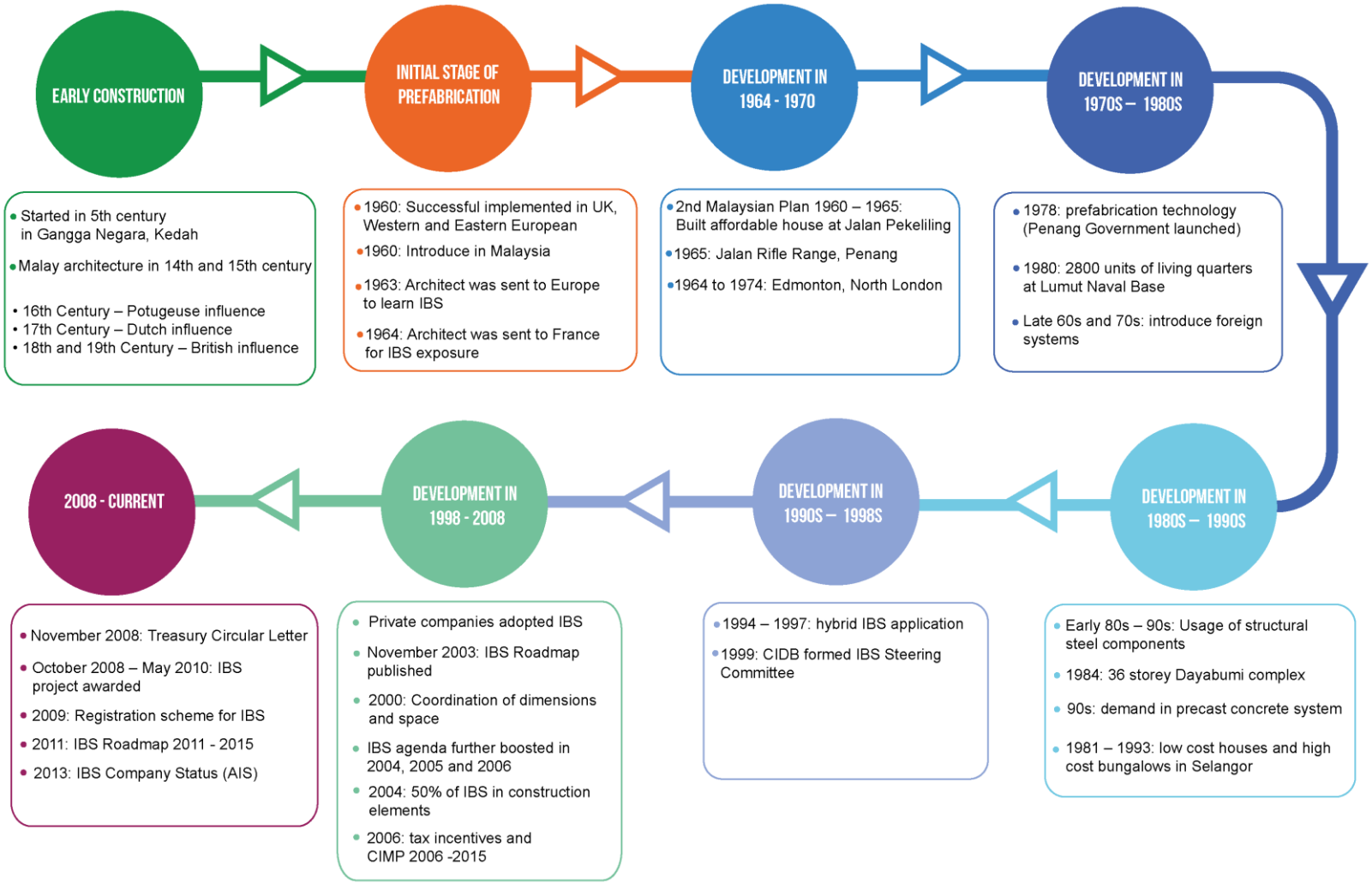


Figure 1: History of IBS Implementation in Malaysia

1.10 Benefit of IBS

Using IBS as an approach in construction will give salient points to the developers.

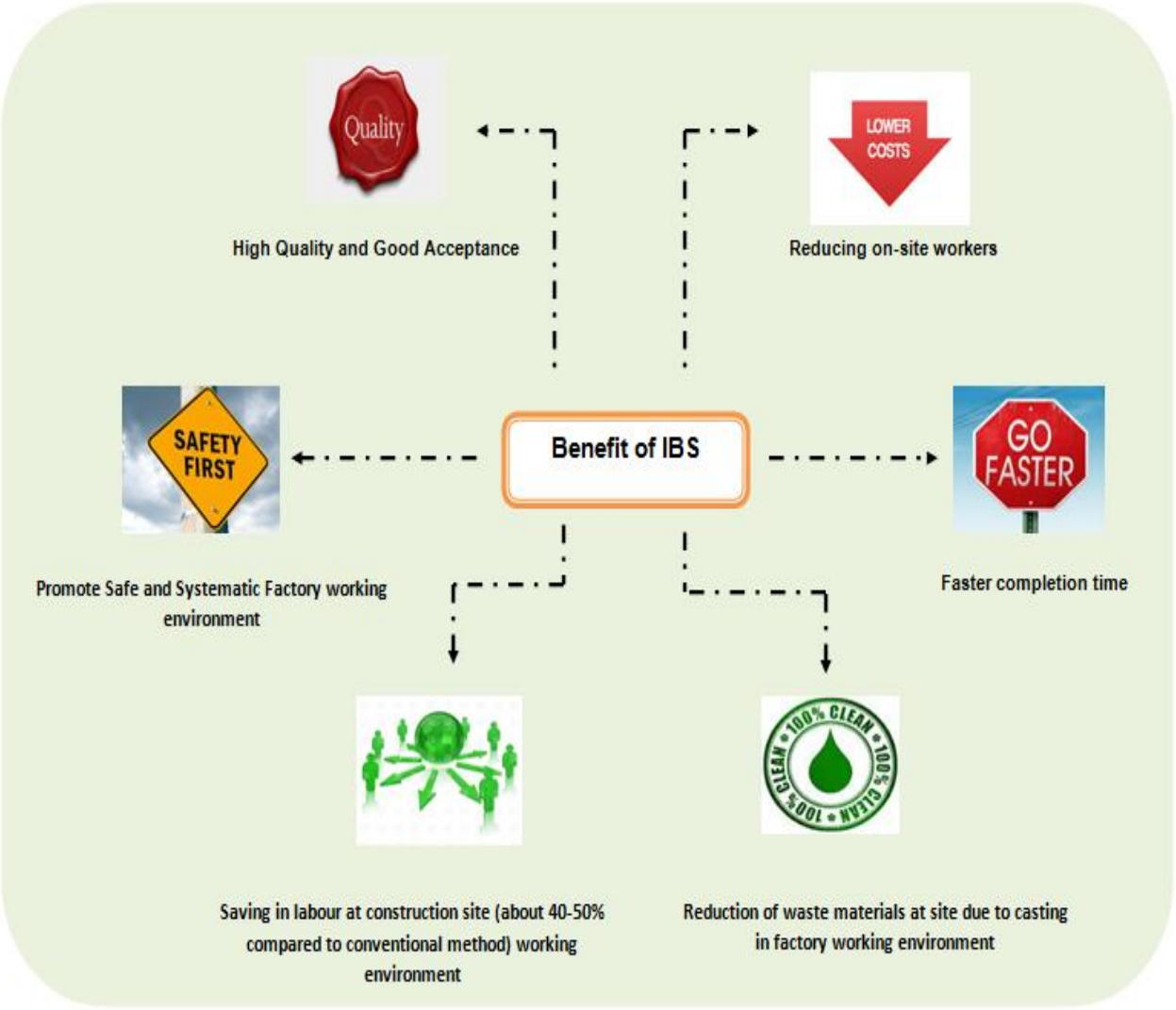


Figure 2: Benefit of IBS

1.11 The IBS Experience of Other Countries

Reportedly, at least 21 suppliers and manufacturers are actively involved in the dissemination of IBS in Malaysia. The majority of these originate from the United States, Germany, and Australia, with a market share of 25%, 17%, and 17%, respectively.

1.11.1 Japan

The industrialization of the housing industry in Japan started in the 1960's. Since then, the market share of IBS has dramatically changed. The construction of prefabricated houses in Japan represents approximately 20% of all houses in the Japanese fiscal year of 1999 (April 1999 to March 2000). Of the total, the steel framing system dominated the prefabricated market with a 73% share, compared with wood framing system with 18% and reinforced concrete framing with 9%. The wood-framed housing grew by 2% and the steel-framed housing by 3%, whereas the concrete framed housing experienced a major setback of –12%.

1.11.2 Argentina

In Argentina, the market for IBS was estimated at approximately USD 41.5 million in 1995 to USD 65.9 million in 1996, a 10% increase in annual growth rate. Of this increase, the total imported prefabricated materials amounted to USD 22.5 million in 1996, during which the US dominated 70% of the import market. Traditionally, IBS concentrates on the low-income group because of the affordability and short utility required by life span houses. Indeed, the government intended to build a minimum of 150,000 low-cost units from 1997 to 1999. However, the high-income group continues to prefer conventional building methods comprising solid blocks and plaster, which can last more than a lifetime. However, the trend in this group is currently moving towards more industrialized housing that incorporates features such as thermal and acoustical insulation, as well as efficient and environmentally friendly houses.

1.11.3 Singapore

In Singapore, in the early 1960s, the need to build many apartments prompted the Housing and Development (HDB) to adopt the IBS concept. Owing to the critical demand, in 1963, the HDB launched the first prefabricated method using a proprietary French large panel and fabrication system on 10 blocks of standard 16-storey flats. However, the project experienced numerous technical and management problems, until it needed to be completed by the conventional method. However, despite its earlier failures, the HDB proceeded and undertook

the brave initiative of attempting the IBS again in 1973 and 1979, in view of the need to complete 100,000 dwelling units in the Fifth Building Programme target (1981-1985). As a result of continuous effort, the HDB has ensured the remarkable adoption of IBS in the construction of public housing program.

1.11.4Thailand

The market share of IBS in Thailand is growing rapidly because of labour shortage and high interest rates. The major IBS components include prefabricated walls and slabs. The former system has been used since more than 20 years ago, whereas the latter system has been used in the market for only 10 years. Another system that has gained popularity in recent years is the autoclave aerated concrete, a lightweight brick locally known as Superblock. The annual growth rate of IBS in Thailand was approximately 30% in 1996. Approximately 20 IBS suppliers exist in the market.

1.11.5 Australia

The first precast concrete lighthouse was erected in 1904 at Bradley's Head, Sydney. In the early 1950s, the Australian government invited George Wimpey & Sons Ltd of the UK to build houses using the precast "tilt slab" construction system to help overcome the acute shortage of accommodations in Canberra. The use of IBS in Australia became evident after the devastation of Darwin by Cyclone Tracy on December 25, 1974. After the incident, approximately 425 cyclone-proof precast concrete houses were built at a rate of one house per day. Despite the achievement of IBS, its acceptance was somewhat low in Australia because of the continued preference of the public for the conventional construction system.

2.0 CHALLENGES IN IBS IMPLEMENTATION

The construction industry is one of main important contributors to economic activities in the country. As such, the Malaysian government has continuously encouraged the industry to use, partly or wholly, IBS, which is considered an important part of the sustainable construction initiative. However, the system has so far failed to gather momentum. A workshop was held on 13th November 2013 aimed to identify the challenges of IBS implementation with regards to ***people***, ***process*** and ***technology***.

2.1 Workshop Output

The output from the workshop on the challenges of IBS implementation is summarised in Table 2.

Table 2: Challenges in IBS Implementation

	Challenges
PEOPLE 	• Professional issues: Lack of design engineers for production, moulding, and fabrication. Lack of experienced professional engineers to lead IBS implementation at site. Lack of land surveyors for the guideline panel.
	• Lack of specific course taught on IBS at the undergraduate level.
	• Unchanging cultural mind-set. Developers prefer conventional construction in building terrace houses.
PROCESS 	• Coordination issues of design and building. The preference for the same team rather than skilled external people to implement installation
	• Progress payment for material on site for conventional and IBS
	• Cost (material, labour, and machinery) - Negative business investment. Conventional vs IBS. Progress payment for material on site for conventional and IBS
	• Business - To do or not to do, market continuity; if developer builds new plant for IBS panel, small target of buyers
	• Issues on and management of contracts

TECHNOLOGY 	• Problems of flexibility, types of building requiring different designs (i.e., different types of approaches for high-rise buildings as compared with terrace houses) • Skill training • Different tools and IBS systems used for different types of construction • Technology transfer

i. People

Generally, Malaysia remains lacking in professional skilled workers. The majority of local professionals and contractors lack an experienced professional engineer to lead the implementation of IBS on site. Moreover, the lack of a design engineer to lead the production, molding, and fabrication and the lack of land surveyor for the guideline panel constitute barriers to the implementation of IBS. As such, additional intensive training programs are needed to develop specialized IBS skills, such as system integration or assembly. However, these programs require more time and investment.

Universities and colleges should offer a course on IBS in the undergraduate level. Future professionals should be exposed to IBS early in their education.

Developers more often use conventional construction methods than the IBS system and have not changed their mind set. They believe that the IBS system is effective only for high-rise buildings. They prefer to employ the conventional construction method for terrace houses because of the higher costs involved when using the IBS system.

ii. Process

The demand for on-site manual labourers, particularly carpenters, bar benders, and concreters, is less under the IBS system. The system demands more machine-oriented skills, both on site and in factories. The industry needs a team to facilitate the IBS system. The housing developers prefer the same team, rather than externally sourced skilled people to install the system and to avoid coordination issues of design and building.

In current practice, before a construction begins, the client pays the awarded contractor between 10% and 25 % of the total amount of the contract value as an initial payment (Nawi et. al., 2007a). However, in an IBS project, the contractor is expected to spend for the initial expenditures, mostly to be paid to manufacturers before any progress in the payment is made. However, local contractors do not have sufficient funds to finance the initial phase of IBS projects. As Nawi et. al. (2005) highlight, IBS manufacturers are normally required to advance approximately 75% of the capital to manufacture the IBS components before delivering these components to construction sites. The situation is the

same for housing developers. The progress of payment for materials on site in the conventional and IBS systems is different. The costs of material, labor, and machinery are not deemed a good business investment, compared with the conventional system. The housing developers are must have sufficient funds to use the system.

In attempting to apply the IBS system in their housing projects, the developer is thus placed in a dilemma because of the market continuity factor. For example, if the developer builds a new plant for IBS panels, the return of investment is not guaranteed because of the small target of buyers and the difficulties of securing any project.

iii. Technology

Housing developers claim that problems of flexibility exist in types of building that require a different design. The approach for the design of high-rise buildings, compared with that of terrace houses, is different. Developers believe that the IBS system is suitable only for high-rise buildings because of the repetition program, thus generating high volume. If the same principle is applied to terrace houses, more cost is involved.

The skill level of IBS workers is more demanding compared with the skills demanded of workers under conventional construction methods. The system demands more machine-oriented skills, thus requiring the reorientation in terms of the training and education of human resources in a given organization.

Technology transfer is also one of barriers in the implementation of the IBS system. As such, local developers depend on foreign expertise and technology. As most of the machines and materials used in the design of IBS components are imported from developed countries, the cost of producing IBS components and their installation is not competitive in the case of Malaysian developers. They have no recourse but to bear the high cost of applying this system.

3.0 PROCESS FLOW FOR HOUSING CONSTRUCTION BY DEVELOPER

Developers are one of the key players that can transform the construction scene in Malaysia. With land for any type of development, a developer wields the authority to choose the most economical construction method. Developers make the final decision regarding which method of construction to be used. Site location, the availability of manufacturers, and user acceptance are typical factors that influence the decision making of a developer. A developer with complete in-house capability, ranging from planners, designers, contractors, IBS factory, to other trades in the supply chain, definitely includes more flexibility in exploiting the fullest advantage of IBS construction.

Figure 3 shows a comparison of the process flow of housing construction in the conventional and IBS systems. IBS transforms the conventional design into integration of the architectural plan, civil and structural (C&S), mechanical and electrical (M&E), and workshop drawing, to ensure the effectiveness of design coordination. IBS components are manufactured in a factory on- or off-site, and are delivered for assembly and erection onsite. Manufacturers of IBS components are commonly involved only after the tender stage, whereas IBS must be addressed immediately from the design stage to ensure the successful optimization of the design and construction considerations. Currently, the insufficient number of manufacturers who cater to the demand for IBS components affects developer involvement.

The issue of transportation for IBS component is main issue for manufacturer and developer. The study by Warszawski (1999) on the suitable distance from the new potential development area to the fabrication plant should be the distance with a variance from 50 km to 100 km radius. The developers need to consider the location between factory and project development area before embarking the planning of the project using IBS method of construction.

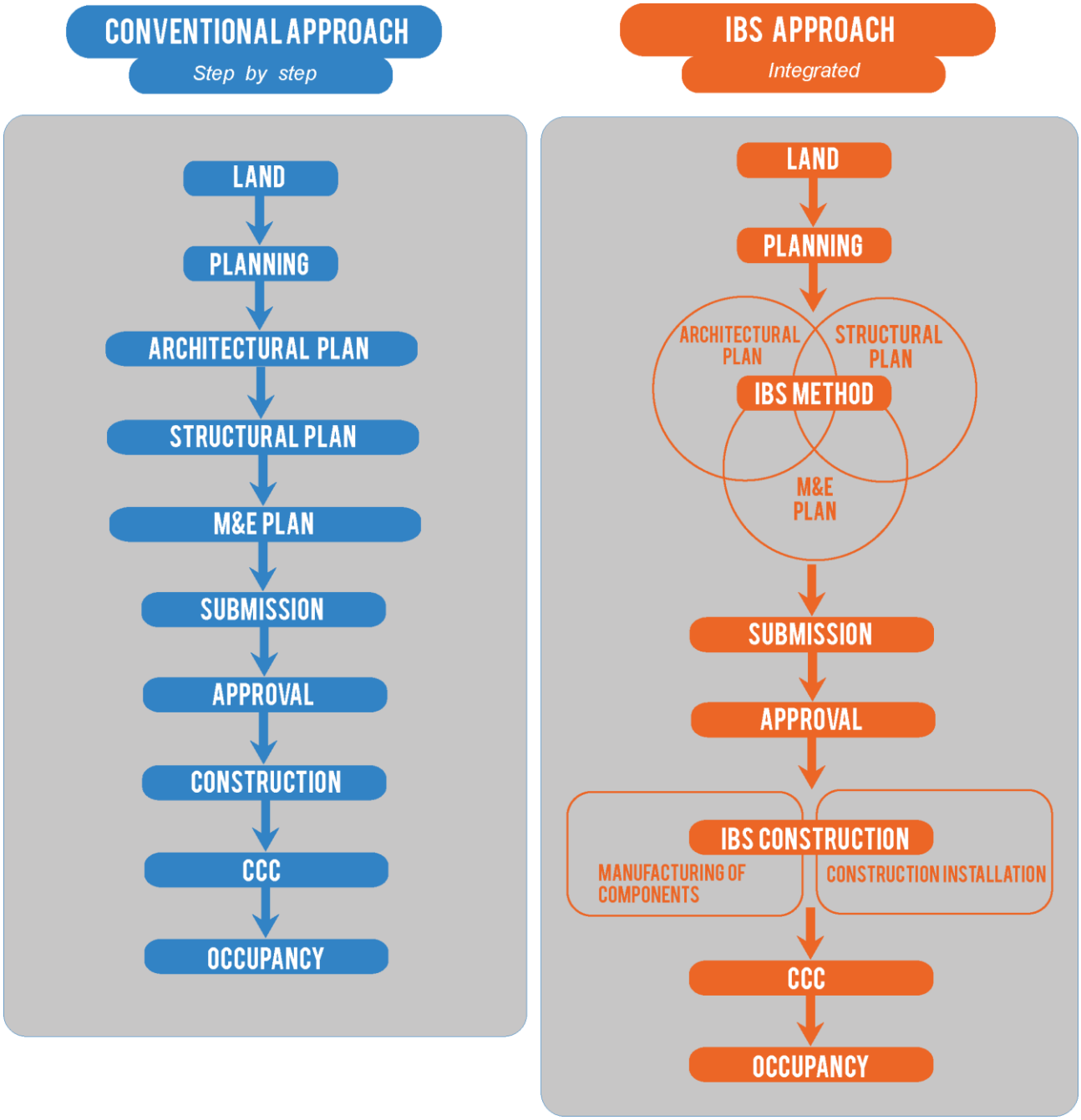


Figure 3: Process Flow using Conventional and IBS Approach for Housing Construction by Developer

Below is the explanation of the IBS process in order for new entry developers to embark their business.

(a) Land

The development of a housing scheme is hugely dependent on the client and the developer. Before any development, a feasibility study that evaluates the competitiveness and viability of the project is vital. Based on the feasibility study, the profit margin and return of investment become the main criteria that influence any decision involving land development.

Any further process for any land development requires approval from the *Majlis Mesyuarat Exco Kerajaan Negeri.* For this phase, the developer is required to follow the guidelines in the *Pembangunan Tanah Berdasarkan Peruntukan Kanun Tanah Negara 1965 (Act 56)* and refer to each state local authority because each state has different procedures and requirements.

(b) Planning

Akta Perancang Bandar dan Desa, 1976 (Act 172) states that the planning for any land development must be approved by the local authority. For the planning phase, developers must follow all the processes documented in the *Akta Perancang Bandar dan Desa, 1976 (Act 172).* In addition, developers also need to liaise with each state local authority. Planning approval is different in each state.

(c) Design Using IBS Method

Architect, C&S, and M&E integration in IBS design accelerates the time it takes to complete the project and improves its coordination. In this phase, each appointed consultant is responsible for providing any documentation and drawing required by the local authority. As such, the consultant must refer to each local authority One Stop Centre (OSC).

Table 3: Reference Website for Local Authorities OSC

State	Local authority	Reference Website
Wilayah Persekutuan	Dewan Bandaraya Kuala Lumpur	www.dbkl.gov.my
	Perbadanan Labuan	www.pl.gov.my
	Perbadanan Putrajaya	www.ppj.gov.my
Selangor Darul Ehsan	Majlis Bandaraya Shah Alam	www.mbsa.gov.my
	Majlis Bandaraya Petaling Jaya	www.mbpj.gov.my
	Majlis Perbandaran Ampang Jaya	www.mpaj.gov.my
	Majlis Perbandaran Kajang	www.mpkj.gov.my
	Majlis Perbandaran Klang	www.mpklang.gov.my
	Majlis Perbandaran Selayang	www.mps.gov.my
	Majlis Perbandaran Subang Jaya	www.mpsj.gov.my
	Majlis Perbandaran Sepang	www.mpsepang.gov.my
	Majlis Daerah Hulu Selangor	www.mdhs.gov.my
	Majlis Daerah Kuala Langat	www.mdkl.gov.my
	Majlis Daerah Kuala Selangor	www.mdks.gov.my
	Majlis Daerah Sabak Bernam	www.mdsb.gov.my

For other states, refer to http://www.epbt.gov.my/.

(d) Submission

The submission of the architect, C&S, and M&E is reviewed by the local authority and can only be implemented upon approval. In this phase, the approval is made based on the fulfilment of the building specifications and guidelines determined by the local authority. All applications must be submitted to the building department of each local authority.

(e) Approval

All documents submitted by the applicant are reviewed by the technical department. During this period, comments and amendments are made. The construction can only be started after the approval of the local authority.

(f) IBS Construction

After approval, the IBS construction can be started. The project must achieve 70% of IBS Score for a government project of more than RM 10 million. The calculation for the IBS Score can be accessed via the “Smart IBS Calculator” Book at www.ibscentre.com.my. Along with the process, the designer can refer to the “User Guide: IBS Catalogue for Precast Building System Vol. 1” for the selection of components in the design. The manual can be purchased at IBS Center, Jalan

Chan Sow Lin, Kuala Lumpur. The list of IBS supplier can be referred to website *www.ibscentre.com.my*

(g) Certificate of Completion and Compliance (CCC)

The procurement of this certificate of approval is a stipulation under *Akta Jalan, Parit dan Bangunan 1974 (Act 133)* for any type of building. The CCC will be awarded by the local authority after its technical department evaluates the building.

(h) Occupancy

Once the CCC is granted by local authority, the building can be occupied by the residents / tenants.

The involvement and role of a developer in IBS construction is shown in **Figure 4**. To start up a business in IBS, two types of approach may be implemented by the developer. Based on the capabilities of the developer, the in-house approach requires a complete supply chain from the beginning to the construction process. IBS components are produced by the developer in his own factory. This approach is more suitable for a developer with good financial leverage and big organisation. In the second approach, outsourcing is the best method for a new developer to start up a business in IBS. Outsourcing enables a developer with a small financial and organisational capability to secure business continuity and at the same time develop their capability. Therefore, in developing a business start-up strategy in IBS, the integration of few factors is identified based on the problems and barriers faced by the developer. People, business, process, and technology integration creates a better strategy for the new developer. The explanation of business strategies for new entry of developers is shown in **Figure 5**.

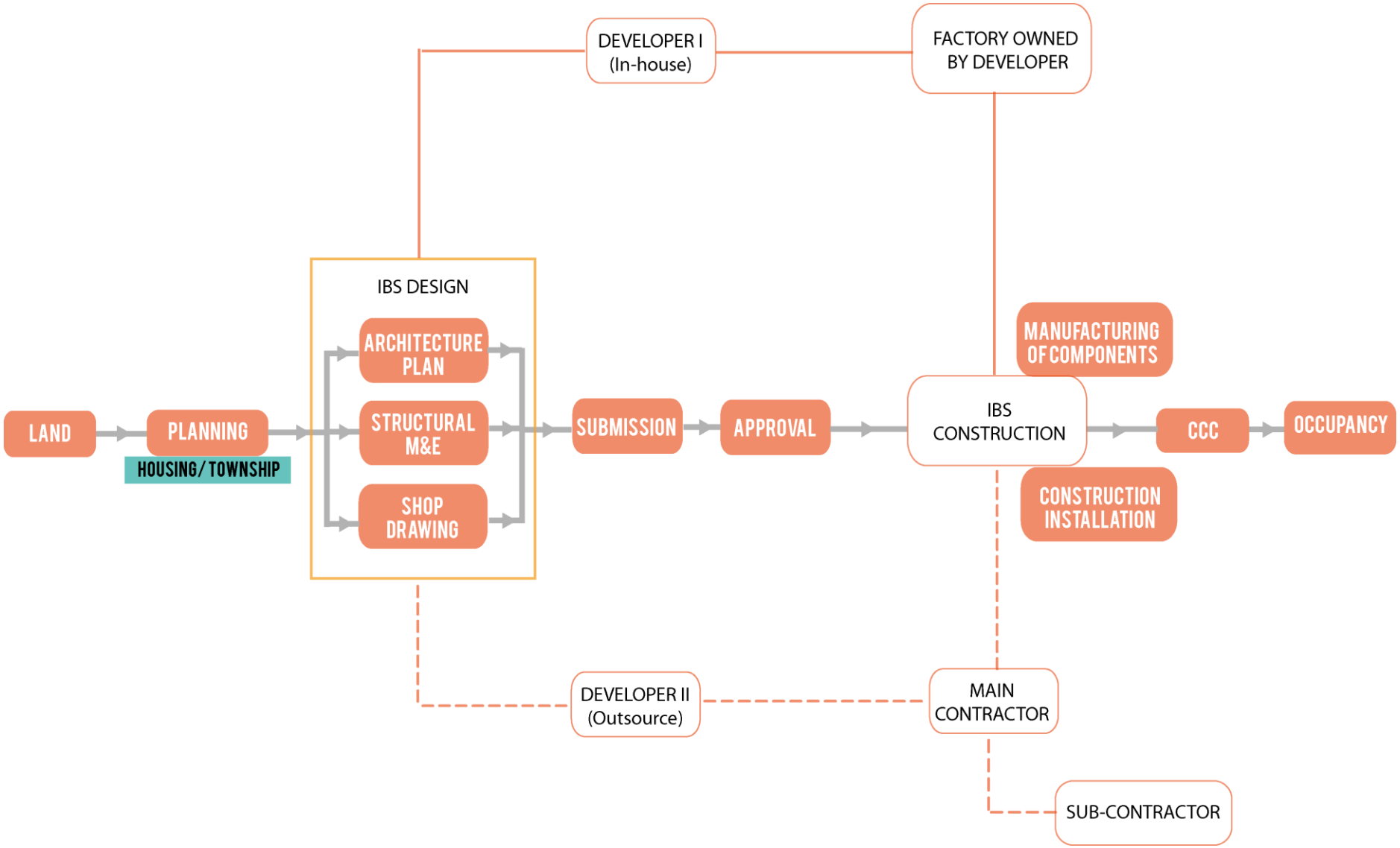


Figure 4: Process Flow and Involvement of Developer in IBS Construction

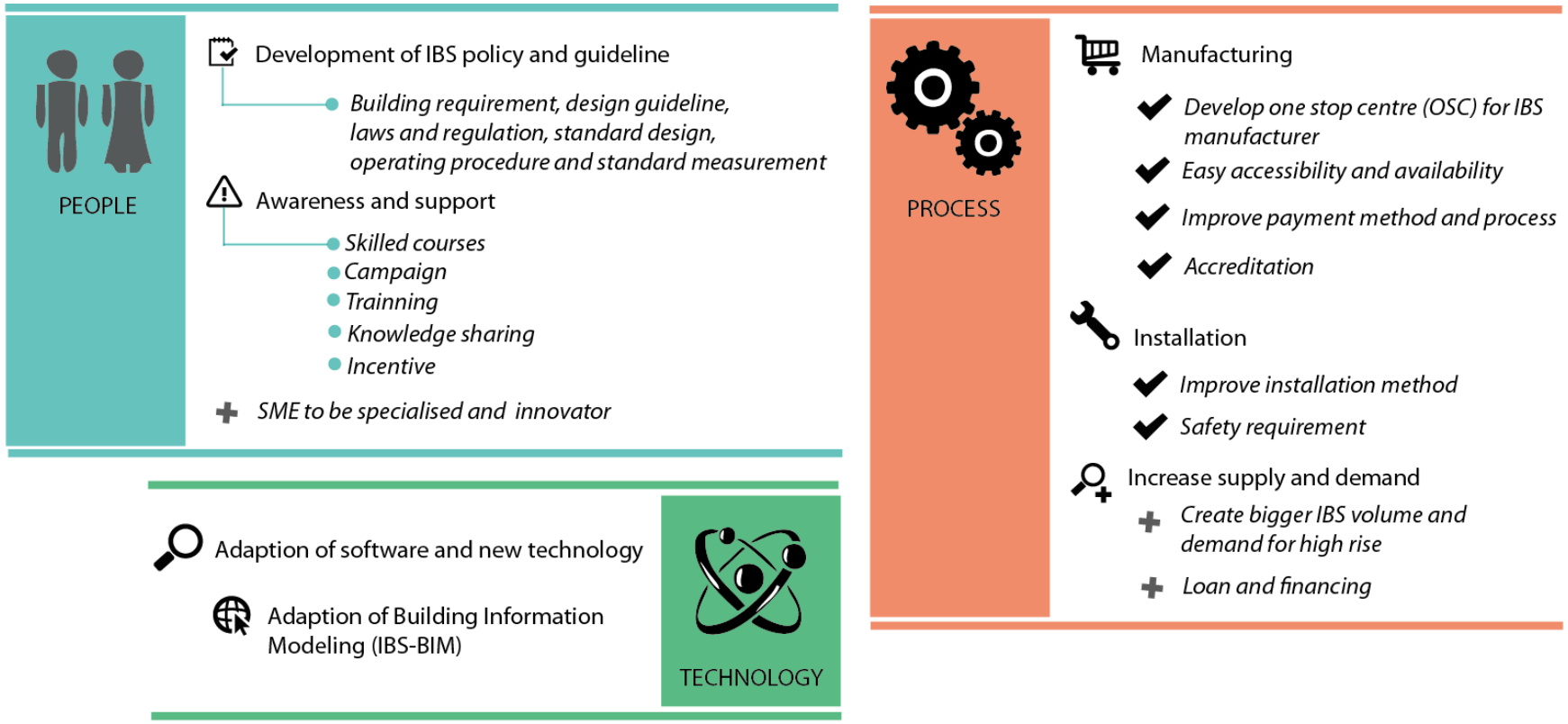


Figure 5: IBS Business Strategy for New Entry Developers

4.0 PRODUCTIVITY COMPARISON BETWEEN CONVENTIONAL AND IBS CONSTRUCTION

Table 4: Productivity Comparison between Conventional and IBS Construction

Component	Approach	
	Conventional Construction	**IBS Construction**
Cost	Conventional construction require higher cost in terms of: • Material costs • Labour costs • Equipment costs • Overhead costs	IBS will reduce construction wastage and increases the cost savings as follows: • Material costs • Labour costs • Equipment costs • Overhead costs
Speed	• Longer construction period • Delay completion of the project due to the on-site construction • Components are disaggregated and difficult to assemble and erected.	• Shorter construction period • IBS construction permits a faster completion of the project because of its rapid and all-weather construction • The components are easy assembled and erected.
Wastage	Wastage of steel, followed by brick, cement, concrete, and timber are **close to 10%** of the total material used in the construction project.	Wastage of timber, followed by cement, brick, soil, and concrete is **less than 5%** of the total material used.
Quality	• Low quality and poor finishes due to workmanship • Require higher maintenance expenses because of low quality	• Provide higher quality and better finishes due to production occurs under a sheltered environment and produced in the factory. • Better quality reduces the maintenance expenses because prefabricated components require less repair and preventive maintenance.

Table 5: Business Productivity in IBS Construction

Component	Business Productivity
People	• Reduce the number of workers at construction site • Accurate hours worked • Reduce labour cost • Reduce the number of workers to decrease labour cost and increase business profit • Collaboration between an SME's and a large developer or manufacturer that produces IBS components. • Awareness and support from government or statutory bodies • Development of design standards and guidelines for IBS practitioners • Enforcement implemented by developing IBS policies and guidelines will increase the use of IBS in construction projects.
Process	• Improvement in the management and coordination of trade processes to eliminate non-productive time and re-work. • Improvement in pre-fabricated components such that total cost is reduced and/or the performance of the constructed product is improved. • The speed of construction in IBS is much faster than that in the conventional system. The project coordination is more effective and avoids overhead cost. • The IBS OSC enables people to have all the information on accredited IBS manufacturers, products, and installers
Technology	• Improvement in trade processes through the adoption of new machinery and equipment, new materials, or new methods. • The use of new machinery and material improves overall project performance. It reduces the cost of labour and equipment. • Adoption of Building Information Modelling (BIM) in IBS

5.0 BUSINESS MODEL FOR IBS DEVELOPER

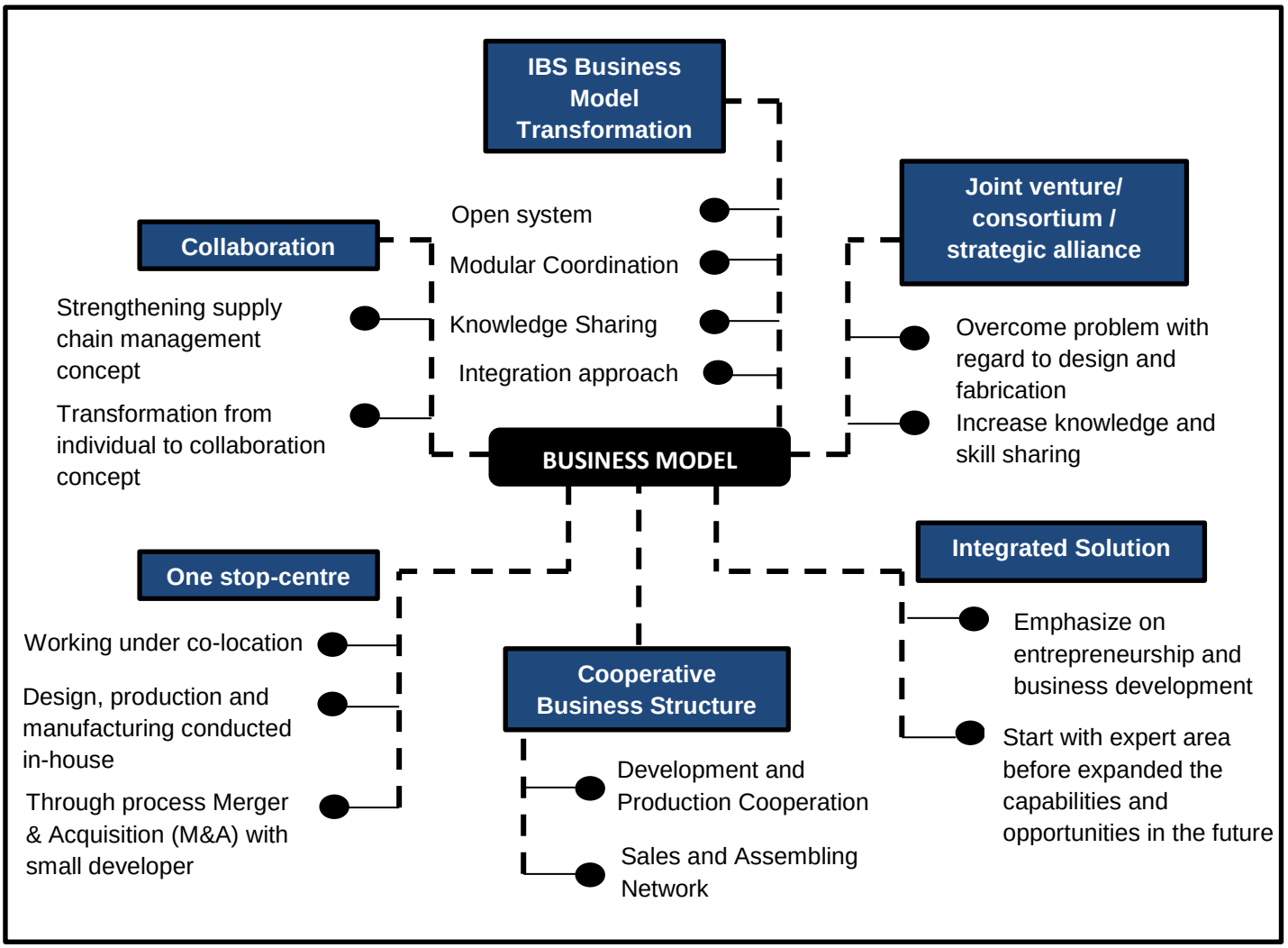


Figure 6: Business Model for IBS Developers

Figure 6 above shows the generic business model for new entry developers who wish to embark business in IBS. In this manual, it had been identified six (6) strategies for developers to look into.

(a) **The IBS Business Model Transformation** is a model that simulates the transformation from conventional to IBS system. The components that can be transformed include those from a closed system to an open system, from conventional to modular coordination, from individual approach to integration approach, and from automation to robotic application.

(b) **Joint venture:** Joint ventures aim to expand the scope and diversify field services to be provided by the results of the sharing of both companies. This approach not only helps solve the problem of financial capital, but also enhances knowledge sharing culture and skills (knowledge and skill sharing), which is the key limiting factor in the implementation of IBS in Malaysia.

(c) **OSC:** The concept of OSC includes developers, manufacturers, and IBS contractors in co-location. The purpose of this concept is to increase the profit margin through merger and acquisition (M&A) with a new entry developer.

(d) **Integrated Solution:** The integrated solution model emphasises entrepreneurship and business expansion. This model focuses on the aspect of flexibility to expand the business via different angles.

(e) **The Cooperative Business Structure** emphasises the relationship between one entity and another. Two types of this model are the Development and Production Cooperation and the Sales and Assembling Network.

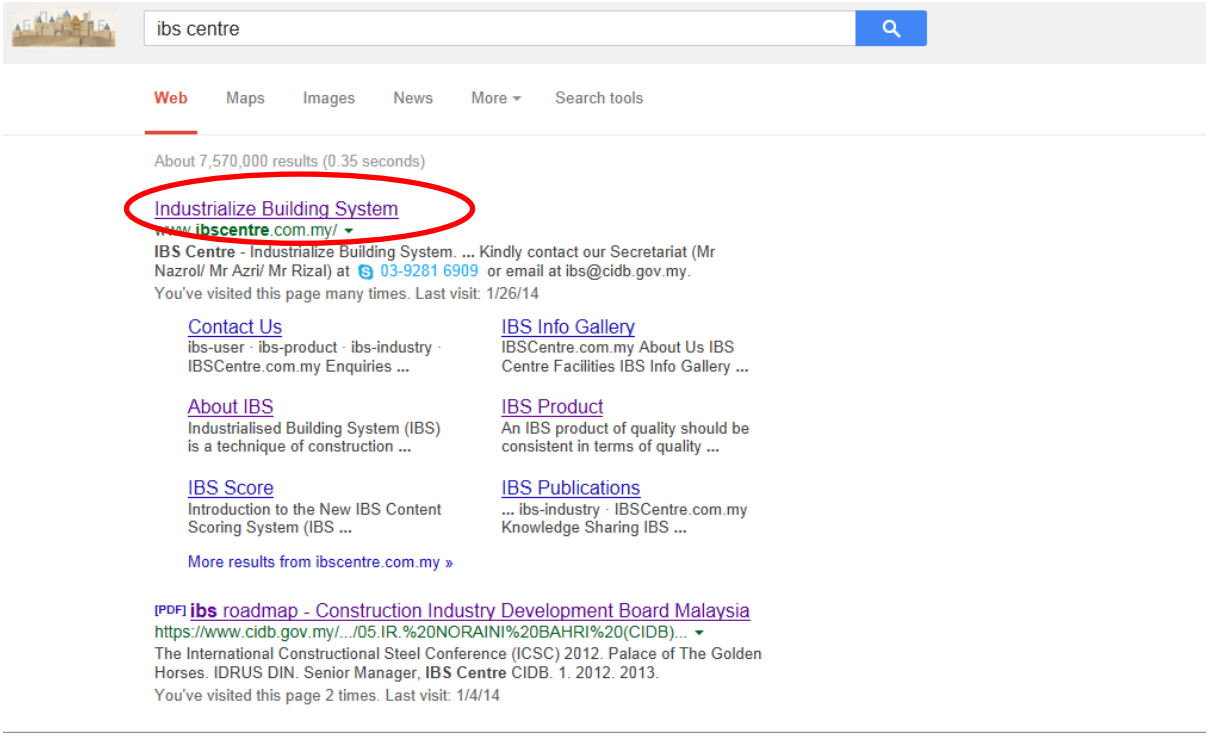
(f) **Collaboration:** The advantage of this model is that it encourages technology and knowledge transfer between two organisations. By using this model, the developer can increase their skills and confidence level in the IBS industry.

6.0 SUMMARY

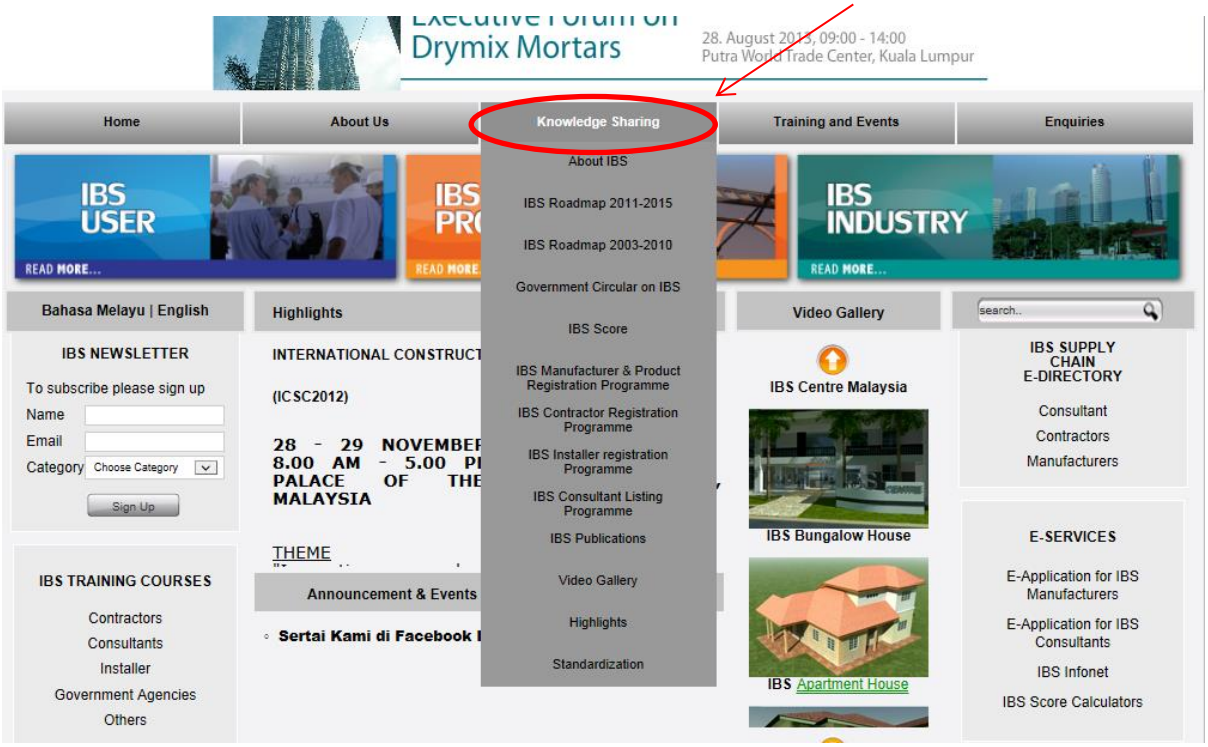
This basic manual will provides a generic guide for developer in venturing IBS business. The strategy comprises three basic components which are people, process and technology. The developers should equip themselves with capable and competent person to drive the IBS programme in the company. As such, additional intensive training programme are needed to develop IBS skills, such as system integration or assembly. In process flow of IBS construction, there are two different approaches between conventional and IBS construction. The critical part of IBS construction is at design stage which involve structural, architectural and shop drawing. As a developer, one of the main business strategies to be adopted is establishing One Stop Centre (OSC) for IBS industry. The establishment of OSC is to increase the profit margin of a new entry developer through collaboration between developers, manufacturers, and IBS contractors in co-location.

APPENDIX 1

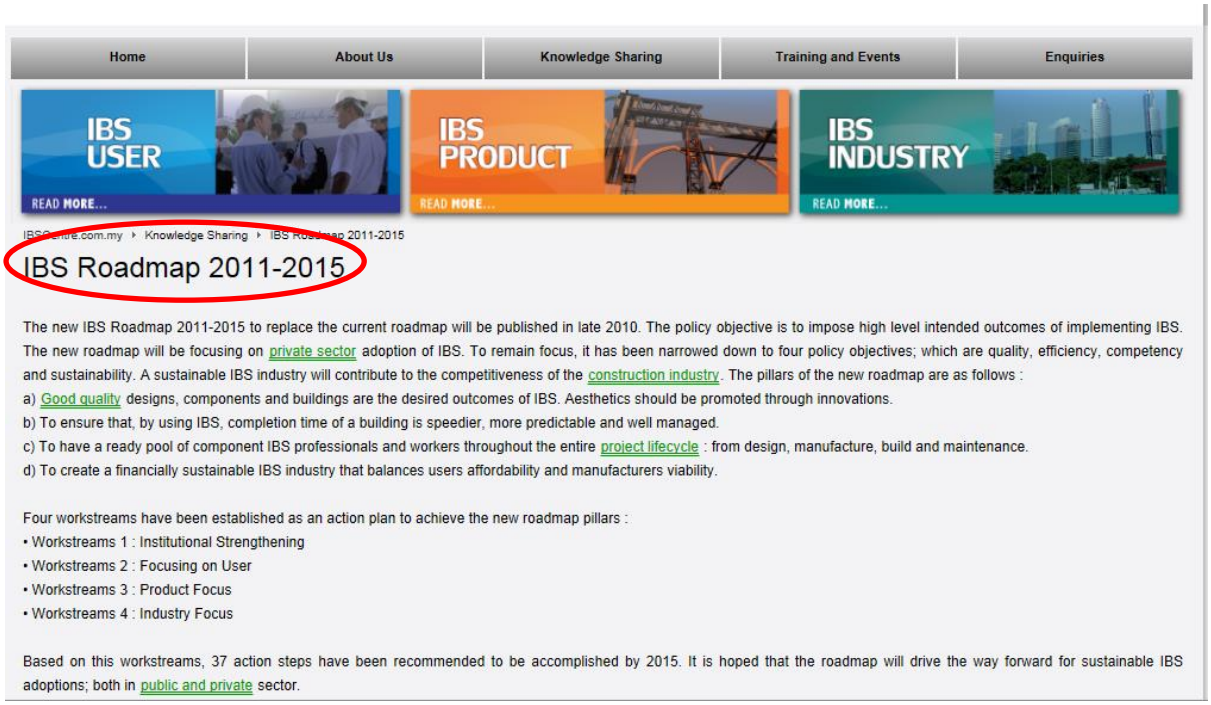
1. Search for ***IBS Centre*** and click at the first icon ***Industrialize Building System***



2. You will enter at main page of website IBS Centre. Then click ***Knowledge Sharing***.



3. You can click ***IBS Roadmap 2011 – 2015*** or ***IBS Roadmap 2003 – 2010***



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Prof. Ir. Dr. Zuhairi Abd. Hamid (CREAM)	Construction Research Institute of Malaysia
Ir. Noraini Bahri	IBS Centre, CIDB Malaysia
Mr. Mohd. Idrus Din	IBS Centre, CIDB Malaysia
Mr. Rofizlan Ahmad	IBS Centre, CIDB Malaysia
Mr. Mohamad Razi Ahmad Suhaimi	IBS Centre, CIDB Malaysia
Mr. Ab. Rahim Yusoff	Malaysia Productivity Corporation (MPC)
Mr. Mohd Yazid Jenin	Malaysia Productivity Corporation (MPC)
Mrs. Suzana Ismail	Malaysia Productivity Corporation (MPC)
Prof. Madya Dr. Christy A/L Pathrose Gomez	Universiti Tun Hussein Onn Malaysia (UTHM)
Mr. Mohd Harka Shaari	SP Setia Sdn. Bhd.
Mr. Lee Chi Kim	Seri Pajam Development Sdn. Bhd.
Mr. Yeo Say Yee	Seri Pajam Development Sdn. Bhd.
Mr. Zulkarnain Hasan	Sime Darby Property
Mr. Muhamad Bakhtiar Abd Wahab	Sime Darby Property
Mr. Anuar Mohamed	Zikay Development Sdn. Bhd.
Mr. Abdul Razak Mohamed Ali	Zikay Development Sdn. Bhd.
Mr. Mohd Iswardy Mohamad Yunos	PKNS Property
Mr. Mohd Fauzi Ahmad Razuki	PKNS Property
Mr. Mohd Ikhwan Ismail	Teraju Precast Services Sdn. Bhd.
Mr. Mohd Fairuz Mohd Nor	Teraju Precast Services Sdn. Bhd.
Tg Ahmad Izzat Tg Abd Rahim	Global Prefab System Sdn. Bhd.
Mr. Lim Soo Hoo	Global Prefab System Sdn Bhd
Mr. Mohd. Khairolden Ghani (CREAM)	Construction Research Institute of Malaysia
Ms. Natasha Dzulkalnine (CREAM)	Construction Research Institute of Malaysia

Mrs. Ihfasuziella Ibrahim (CREAM) — Construction Research Institute of Malaysia

Mr. Ahmad Farhan Roslan (CREAM) — Construction Research Institute of Malaysia

Mrs. Maria Zura Mohd. Zain (CREAM) — Construction Research Institute of Malaysia

Mr. Ahmad Hazim Abdul Rahim (CREAM) — Construction Research Institute of Malaysia